Review of Income and Wealth
Series 54, Number 3, September 2008

INCOME INEQUALITY WITHIN EUROPEAN REGIONS: DETERMINANTS AND EFFECTS ON GROWTH

BY CRISTIANO PERUGINI* AND GAETANO MARTINO

University of Perugia

Economic inequality across Europe has been largely investigated by analyzing the determinants and dynamics of the disparities between countries and regions. Similarly, many studies have focused on inequality within European countries. So far, less attention has been devoted to economic inequality within European regions, mainly due to data shortages. The aim of this paper is to shed some light on this level of analysis. After the introductory section, the first part of the paper presents the conceptual bases of the study, examining relevant theoretical and empirical arguments about (i) the determinants of economic inequality, (ii) the relationship between economic inequality and growth, and (iii) the desirability and specificity of regional analysis. The second part of the paper, using various econometric approaches, provides evidence of the centrality of labor market qualitative and quantitative aspects and of some country-level institutional settings for regional inequality levels. As regards the effects of inequality on growth, the results suggest a positive relationship.

1. INTRODUCTION

The aim of this paper is to shed light on the sub-national level of income inequality by analyzing its determinants and possible effects on regional economic performance. Although income inequality is one of the most frequently examined issues in social sciences, a shortage of data has largely inhibited a promising shift to a territorial level below the country dimension, so far limited to American states or regions of single EU countries. The recent availability of data supplied by the Luxembourg Income Study (LIS) and the results produced by researches based on their use, have greatly contributed toward filling this informative gap, also with reference to Europe.

The paper is organized as follows. After the introductory section, the first part (Section 2) poses the conceptual bases of the study, considering the most important theoretical and empirical arguments on the determinants of income inequality, the relationship between inequality and growth, and the specificities of the regional (intended as sub-national) level of analysis, focusing in particular on the effects of factor mobility. The empirical part of the paper (Section 3) first presents the databases employed and then some descriptive statistics. Section 4 describes and discusses the econometric approaches adopted (4.1), the theoretical expectations and the results obtained by modeling the determinants of regional inequality (4.2), and the evidence about the relationship between regional inequality and growth (4.3). Section 5 summarizes and concludes.

Note: An earlier version of this paper was presented at the 9th EACES Conference (Brighton, UK, September 8–10, 2006). The authors would like to thank Stephan Klasen and the two anonymous referees for their helpful comments. The usual disclaimers apply.

*Correspondence to: Cristiano Perugini, University of Perugia, Department of Economics, Finance and Statistics, Via A. Pascoli, 20, 06014 Perugia, Italy (perugini@unipg.it).

Our findings show that most determinants of inequality within European regions lie in qualitative and quantitative features of regional labor markets and in national-level institutional settings. As regards the effects of inequality on growth, although it was not possible to carry out econometric tests with panel techniques recommended by various important contributions, our outcomes suggest that a positive relationship may exist.

2. Income Inequality Determinants, Inequality–Growth Nexus, and the Regional Level of Analysis

The empirical and theoretical literature regarding inequality of income distribution is ample and articulated (Slottje and Raj, 1998) and a substantial part of it contains contributions aimed at identifying its determinants and at evaluating its possible impacts on economic growth. Section 2.1 briefly reviews the factors most often considered in explaining income inequality within economic systems; more in-depth discussion of this literature is provided when the empirical model is presented (Section 4.2.1). Section 2.2, without any claim to be exhaustive, discusses the theoretical and empirical literature on the relationship between income inequality and economic growth. Section 2.3 examines the specificities of regional levels of analysis.

2.1. *Structural, Socio-Demographic and Institutional Determinants*

The factors affecting income distribution include social, institutional and economic forces, which have been examined in a very extensive theoretical and empirical literature. They may be classified into a few groups. The first one regards the general economic and structural features of the economic systems, and obviously includes the stream of literature initiated by Kuznets (1955), which establishes a quadratic relationship between the stage of economic development and income inequality. With respect to the initial formulations, this approach has evolved in various directions, focusing on the roles of specific factors connected with structural and technological change. A very rich literature has concentrated in particular on the effects of qualitative evolutions of labor demand toward higher skill intensity (SBTC; skill biased technical change hypothesis) on inequality (e.g. Berman *et al.*, 1994; Acemoglu, 1998), and on its interactions with some features of labor supply, i.e. human capital. The impacts of these evolutions may be accelerated by growing trade integration (Richardson, 1995; Li *et al.*, 1998; Barro, 2000) which normally boosts the adoption of new technologies and the demand for skilled labor (Wood, 1995; Kim, 1997). The distributive consequences of these processes clearly depend on the countries' positions in the international division of labor (e.g. Robbins, 1996; Barro, 2000; Dollar and Kraay, 2004).

Besides skills endowment and distribution, other characteristics of labor supply are usually considered. They include the consequences of demographic features—average age and structure of the population (e.g. Partridge *et al.*, 1996; Panizza, 2002), and also the factors which most affect relative wage levels and dynamics. The literature has focused in particular on the pressures on unskilled wages and the risks of structural unemployment generated by high participation rates of specific segments of the labor force (Topel, 1994), and by migration flows (e.g. Borjas *et al.*, 1992; Borjas and Ramey, 1994; Mauro, 1995; Barro, 2000).

Another important group of factors associated with inequality patterns refers explicitly to institutional aspects, primarily related to labor market regulations (e.g. Blau and Kahn, 1996; Fortin and Lemieux, 1997; Koeniger *et al.*, 2004), but also to the structure and size of the fiscal and social security systems (e.g. Esping-Andersen, 1990; Castles and Mitchell, 1992; Korpi and Palme, 1998; Holsch and Kraus, 2002). Other aspects, specific to developing economies, are the degree of democratization (existence of civil liberties, electoral rights, rule of law) and the accessibility of education systems, which in turn depends on the existence and efficiency of credit markets, and which may constrain the conservative pressures of the rich minority and thus the imposition of anti-distributive policies (e.g. Bénabou, 1996a; Li *et al.*, 1998; Barro, 2000).

The extensive literature about the determinants of income inequality, also due to the variety of its theoretical and empirical perspectives, cannot always provide conclusive evidence on the relationships existing between the various factors considered and inequality. The complexity of these links is also augmented by the interactions existing between the possible determinants. The building of a comprehensive theoretical model of regional inequality determinants is clearly beyond the aim of this paper, which is instead addressed to a first theoretical and empirical exploration of possible linkages happening at sub-national levels. This attempt is clearly constrained by data availability, which allows shedding light only on a limited set of aspects: we discuss their specific theoretical background and propose consequent testable hypothesis when presenting the empirical specification (Section 4.2.1).

2.2. *Inequality and Economic Growth: Conflicting Theories and Empirical Evidence*

The direction of causality of the inequality/growth relationship is uncertain and debated; the works of Bertola (2000) and Aghion *et al.* (1999) are examples of contributions discussing the effects of growth on inequality. In view of the aims of this paper and of the data available for empirical analysis, we focus here on the possible effects of initial income inequality levels on subsequent growth.

The theoretical and empirical literature does not provide univocal evidence of an existing clear and stable relationship between inequality and growth, and may be divided into two main classes, which predict a negative and a positive link, alternatively.

The first view was prevalent in the early 1990s and predicted and supported empirically—using mainly cross-sectional data—a negative relationship (e.g. Bertola, 1993; Galor and Zeira, 1993; Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Garcia-Penalosa, 1995; Perotti, 1996). The motivations adduced for this relationship may be summarized into three main streams of argument, related to (i) political economy/institutional mechanisms, (ii) human capital endowments, and (iii) the effects of social and political dissatisfaction. The *political economy* argument was first put forward by Persson and Tabellini (1994) in a two-stage model in which economic inequality creates political pressures, via the election of governments with redistributive priorities or growing social conflicts, to alter tax or transfer systems and this reverberates on growth (see also, among many others, Alesina and Rodrik, 1994; Bénabou, 1996a; Perotti, 1996; Tanninen, 1999; Barro, 2000). The net effects on growth depend on the structure of government intervention and social transfers, and on the strength of the distortion that taxation introduces on economic decisions and incentives. These aspects are considered in an institutional perspective by North (1994), who emphasized how the institutional setting shapes the set of economic incentives and the consequent existence of different kinds of organizations (see Section 2.3).

The second main channel of negative influence on growth relates to the consequences of inequality levels of human capital endowment, distribution and access. In more unequal societies, relatively worse-off individuals lack the opportunity to engage in costly investments (especially in human capital), giving up productivity improvements, individual higher returns and curbing aggregate growth rates. The possibility of undertaking such investments may be hampered by the existence of credit constraints (Li *et al.*, 1998), credit market imperfections (Galor and Zeira, 1993), and poorly developed financial markets (Greenwood and Jovanovic, 1990).

A third way in which inequality negatively affects growth refers to the social dissatisfaction it generates (e.g. Bénabou, 1996a; Perotti, 1996; Barro, 2000), which produces adverse effects on growth via (a) direct or indirect waste of resources, and (b) more importantly, via the discouraging effects on investments that threats to property rights exert.

A second group of contributions, consistent with remarkable theoretical antecedents (Kaldor, 1957; Stiglitz, 1969; Okun, 1975; Arrow, 1979), has challenged the conjecture of inequality as being harmful for growth firstly on empirical grounds, contending that the evidence provided using cross-sectional approaches was to be considered unsatisfactory. This was essentially motivated by the poor robustness to any sort of sensitivity analysis of outcomes obtained in cross-sectional studies, due to two main problems (Forbes, 2000): (i) measurement errors in inequality, due to poor quality data; and (ii) omitted-variable bias, essentially due to the existence of country specific effects distorting ordinary least squares (OLS) estimates. The two problems were simultaneously addressed with a new dataset by Deininger and Squire (1996), who assembled a much larger, more reliable, consistent and comprehensive dataset, and provided several measures of inequality over time for each country. This panel structure allowed the omitted variable bias to be limited to the unobservable country-specific features which evolve over time.

These aspects were acknowledged by a number of authors who used various panel econometric approaches to study the relationship. With the important exceptions of Panizza (2002) for a panel of American states and Sukiassyan (2007) for some European and former Soviet transition economies, these studies provided evidence of a positive (Li and Zou, 1998; Forbes, 2000; Frank, 2008) or mixed (Barro, 2000; Banerjee and Duflo, 2003) relationship between inequality and growth. These outcomes legitimated the recovery and development of the eclipsed theoretical justifications of the beneficial effects of inequality on growth: first is the fact that greater overall dispersion of income may indicate greater economic incentives. Interestingly, the other explanations put forward use, in different ways, the same argumentations considered for the opposite case. Thus, inequality may increase when the pace of technological change is fast (Galor and Tsiddon, 1997; Barro, 2000), since the subsequent skill adaptation of workers, their concentration into high-skill sectors, and strong innovation inflows foster economic growth. As regards the role of human capital, if the most productive investments require a minimum threshold (high relative to median income), more unequal distributive patterns may be good for growth (Barro, 2000). Similarly, Bénabou (1996b) emphasizes the positive effects on growth that the complementarities of human capital endowment of heterogeneous individuals may produce. In a Keynesian setting, as the rich save more than the poor, more inequality would mean more aggregate savings, investments and long-run growth (Barro, 2000). On the political economy side, Saint-Paul and Verdier (1993) contend that, if higher taxation provides considerable funds for financing education, among other activities, this may enhance human capital bases and promote future growth. Li and Zou (1998) adopt a theoretical approach similar to that of Alesina and Rodrik (1994), but assuming that government spending is wholly driven by public consumption, which enters the individual utility function together with private consumption. In a median voter perspective, more equal distributive settings will drive collective preferences toward higher income taxes, curbing subsequent growth.

Lastly, as argued by Forbes (2000), a positive and a negative relationship may not be alternative, since they may be valid in different time dimensions. Most of the channels envisaged to transmit negative effects from inequality to growth do unfold in the long term. The two-stage political economy argument of Persson and Tabellini (1994) is clearly a long-term process, i.e. in the short and medium terms, tax and transfer systems may be considered as given. Other factors (e.g. the effects of investments in human capital) also typically produce the expected negative effects on growth in the long term. So growth-promoting factors of income inequality—first, the signaling of greater economic incentives—may dominate the short and medium term, and give way to negative effects in the long term.

2.3. *The Regional Dimension of Income Inequality*

The very few studies conducted at a disaggregated "regional" level have provided interesting insights on many aspects. The papers by Topel (1994), Partridge (1997, 2005, 2006), Fallah and Partridge (2006), Panizza (2002), Wu *et al.* (2006) and Frank (2008) are interesting examples of "state" level analyses for the U.S. As regards Europe, the sub-national level has so far been almost totally neglected, exceptions being the work of Galbraith and Garcilazo (2005), the studies referring to the regions of single countries (e.g. Monastiriotis, 2000; Goerlich and Mas, 2001; Cannari and D'Alessio, 2003), and the papers related to the Luxembourg Income Study (see next section). This is to some extent surprising, given the strong political interest in regional aspects in Europe, mainly addressed to social cohesion targets. In addition, if income inequality influences subsequent growth, regional distributive aspects may also gain policy interest in growth/convergence frameworks.

Beyond these policy aspects and the fact that spatially detailed analyses may uncover remarkable within-country differences (Mahler, 2002), motivations to carry out disaggregated regional analysis also exist on theoretical grounds. As a premise, if the people's well-being is not determined in absolute terms but by their social and economic condition in society (Runciman, 1966), and the more the extent of this "society" represents the real space of economic and social life, the more inequality measurement may be informative. From a micro-economic point of view, the regional level of inequality may be the most significant one in shaping individuals' incentives, by supplying direct evidence of the returns achieved in the same economic, social and institutional environment (Rainwater *et al.* 2001; Jesuit *et al.*, 2002).

As suggested by Partridge (1997) and Panizza (2002), some aspects which are typical of sub-national levels may gain centrality in explaining inequality and its link with growth, namely *factor mobility* which is normally higher and thus more important within geographically and culturally contiguous areas. In a simplified world where factors of production are perfectly or sufficiently mobile across sectors and space to close return differentials (Wildasin, 1995), we should expect the long-run adjustment process to produce a Pareto-optimal allocation of resources, with zero inequality across space, classes and individuals. However, differences in factor endowments and their specificity may produce distributive effects linked to specialization patterns. In contexts endowed with human and physical capital, specialization in high-skill products, outsourcing of labor-intensive processes, and inward migration of unskilled workers may widen the gap between the returns of skilled/unskilled workers, and skilled labor and capital (Kim, 1997; Wildasin, 1998), thus fostering inequality. Opposite dynamics may occur in poorer regions. Other insights about these aspects may be derived from other streams of the literature, e.g. the basic versions of the New Economic Geography (NEG) models, in which the coexistence of sector- and space-specific and perfectly mobile productive factors generates the well-known core-periphery structure. Although the effects of agglomeration/specialization patterns on the *within* (region) component of income inequality have not received much scholarly attention so far (one exception is Fallah and Partridge, 2006), they may encourage inequality where specific and mobile labor segments coexist (core regions) and have the opposite effects in peripheral regions, fully specialized in the traditional sector. Although this distributive characterization may change in more advanced models (Fujita *et al.*, 1999), for example with the introduction of rents, these considerations also suggest that factor mobility increases income inequality in richer regions and reduces it in poorer ones.

Greater factor mobility also introduces the important question of the role of institutional, and particularly fiscal, competition among regions and its distributive consequences. First, factor mobility may curtail the ability of regional governments to engage in redistributive actions, thus weakening (Partridge, 1997; Panizza, 2002), or inverting (Partridge, 2006), the negative inequality/growth conjecture of Persson and Tabellini. Greater labor and capital mobility may indeed, *ex-ante* discourage sub-national governments from engaging in income distribution interventions. *Ex-post*, mobility may inhibit growth in unequal regions which undertake redistributive actions, since factors react to poor incentives by migrating and magnifying growth response in the area of destination where incentives are better. Redistributive policies, in the presence of capital and labor movements, may even produce undesired distributive outcomes. Wildasin (2000, 2006) shows that taxes charged on mobile factors (e.g. skilled labor and capital) in order to provide benefits to immobile resources (e.g. low-skilled workers), will reduce the amount of mobile resources in the local economy and the returns to the immobile factors, which suffer a net loss, also considering the redistribution to them of resources collected. In a dynamic framework, mobile factors are perfectly so only in the long run, being afflicted by adjustment costs in the short run, so that immobile resources may initially enjoy distributive benefits (Wildasin, 2003). However, as regards the EU area studied here, despite the general trend of decentralization of political and administrative functions to regional authorities, the main redistributive tools (i.e. personal income, firms' profits and capital taxation) are decided and implemented at national levels. Therefore, these factors should reverberate on cross-country factor mobility which is, although increasing, relatively low for some segments of capital and especially labor (e.g. Ederveen *et al.*, 2007). Conversely, the EU's priority objective of economic and social cohesion attributes much importance to regional policies aimed at providing material and immaterial infrastructures, firm localization incentives, subsidies to high-tech firms, higher education or R&D activities, public goods which attract high-skilled people, etc. In a simple static approach in which mobile and immobile factors coexist (Wildasin, 2000, 2006), these policies may succeed in attracting mobile factors, thus increasing demand and gross returns to immobile factors, e.g. unskilled labor. As these measures are financed by resources collected in richer regions (as happens with EU structural funds), the gross and net effects on returns to unskilled labor do not diverge. Thus, such interventions may not only favor convergence, but also produce a drop in the inequality levels of poorer regions.[1] Again, we may then expect lower levels of economic development to be associated with lower inequality.

3. Data and Descriptive Analyses on Inequality Measures within European Regions

We now provide a description of the available data regarding income inequality within EU regions (3.1) and some preliminary descriptive analyses (3.2).

3.1. *Data on Income Inequality at the Sub-National Level in the EU*

The scarce availability of sub-national data at European level has so far strongly influenced research on the causes and effects of regional inequality. The relatively recent work carried out by the LIS does much to fill this gap. The LIS provides harmonized data regarding household incomes, collected in large representative household surveys conducted in many European and non-European

[1]The introduction of rents may obviously affect these redistributive outcomes, depending on which immobile resources are more favored, on their distribution and initial returns.

countries. This means that analyses covering differing states can be carried out, providing a number of observations (in our case, regions) sufficient to allow econometric analysis.

Here, we do not use LIS microdata to build inequality measures at the regional level. Rather, we take advantage of work already done by others (e.g. Forster *et al.*, 2002; Jesuit *et al.*, 2002; Mahler, 2002; Hoffmeister, 2006a, 2006b), who use the same data source and make inequality indexes available. In particular, we use the two datasets published by Mahler (2002) and Hoffmeister (2006a), which provide three inequality measures, fulfilling the three criteria for the minimum qualitative standards suggested by Deininger and Squire (1998), i.e. to be based on household surveys, to have coverage of all sources of income, and to be representative of the whole population of the unit of analysis.

The first (henceforth, Mahler) builds regional measures of income inequality for various developed countries, including some EU nations, in order to analyze the relationship between inequality and electoral turn-outs. The income measure used to calculate inequality measures is the *adjusted (disposable) household income* which, in the LIS harmonization process, is defined as the income from all sources, net of income taxes and mandatory social insurance contributions. This harmonized measure was adjusted by Mahler, in order to take into account scale economies within the household, by dividing the household income by the square root of the household size, and then weighting the household by the number of its family members (Atkinson *et al.*, 1995, pp. 18–21). Thus, incomes are compared at the individual level, but accounting for the structure of the household in which those individuals live (Jesuit and Mahler, 2006). Of interest here, Mahler provides two inequality indexes: the well-known Gini index, and the 90/10 percentile ratio, i.e. the ratio of the income of a household at the 90th percentile to that of one at the 10th percentile. The data used here, identified in the LIS dataset as Wave IV (i.e. national surveys with reference year around 1995), refer to NUTS1 regions of Germany (16 units) and the U.K. (12 units), and NUTS2 regions of France and Italy (22 and 19 units, respectively). Mahler also provides data for Denmark, but at the NUTS3 level: this poses issues of size homogeneity with the remaining units and other data availability, and therefore these regions were excluded. Similarly, the Mahler dataset distinguishes between East and West Berlin but, since the other data used in the following econometric analysis only refer to the Berlin region as a whole, these two observations were excluded. Our final "Mahler" dataset is therefore composed of 67 regions, listed in Table A1 in the appendix.

The second dataset (henceforth, Hoffmeister) refers to Wave V (around 2000). Like Mahler, Hoffmeister uses the LIS variable *disposable household income* as a starting point, again adjusted for household size by dividing the household income by the square root of the household size and thus transformed into individual "equivalent" disposable income. As an inequality measure, Hoffmeister calculates the mean logarithmic deviation (MLD), of the class of generalized entropy indicators. He computes and renders the MLD available for 63 regions belonging to 15 European countries: 11 from the old EU-15, and 4 from the Central and Eastern European countries that joined the EU in 2004 (see Table A1 for details). The Hoffmeister database ensures a high degree of territorial size homogeneity, since it covers all NUTS1 regions with the only exception of Finland, for which the inequality measure is provided at the country level, rather than distinguishing the two NUTS1.

In view of the high variability of outcomes highlighted by the literature with respect to the measure employed and the geographical scope, we considered the availability of two geographical datasets and three inequality indicators as advantages. In particular, the Gini index and the MLD are well-known to be aggregate measures, and are sensitive to changes in the whole distribution. However, the MLD is more sensitive to changes in the lower tail (Litchfield, 1999; Hoffmeister, 2006b). Instead, the 90/10 percentile ratio refers to limited sections of the distribution measuring the distance between two groups and is thus insensitive to shifts of income within the boundaries, but it does emphasize extreme values. The implications for empirical analysis of the differences between the inequality measures are discussed later.

3.2. *Descriptive Analyses of Intra-Regional Income Inequality Indicators*

Table 1 lists some basic descriptive statistics of the three inequality measures considered. In the Mahler dataset, the Gini coefficients range between 0.19 for the German regions of Sachsen and Thüringen to 0.39 for the region of Sicily (Italy), with a median value below the mean. The percentile (90/10) ratio reports the minimum value (2.31) again in the Sachsen region, and the highest (7.02) again in Italy (Molise). As the coefficient of variation shows, this measure has greater variability than the Gini index.

This is also clear when looking at the plots obtained by the kernel density estimations of Figure 1, which may be considered as the continuous equivalents of histograms, in which the number of intervals tends toward infinity (Silverman, 1986). For both measures bimodality emerges, but the higher variability of the percentile ratio significantly affects the shape of the distribution. However, it is interesting to note that the two measures are highly correlated: 0.886 for the Bravais coefficient and 0.908 for the Pearson rank correlation index.

In order to appreciate country differences in the levels and regional dispersions of income inequality, we provide country box plots for the two inequality measures (Figure 2).

The MLD measure (Hoffmeister database) shows a median value almost coinciding with the mean, and the lowest and highest levels for German's Sachsen

TABLE 1

Descriptive Statistics of Inequality Measures at Regional Level for Some EU Countries

	Mahler–1995		Hoffmeister–2000
	Gini	90/10	MLD
Mean	0.29	3.79	0.16
Median	0.28	3.67	0.16
Standard deviation	0.05	0.88	0.04
Minimum	0.19	2.31	0.08
Maximum	0.39	7.02	0.27
Coefficient of variation	0.16	0.23	0.27

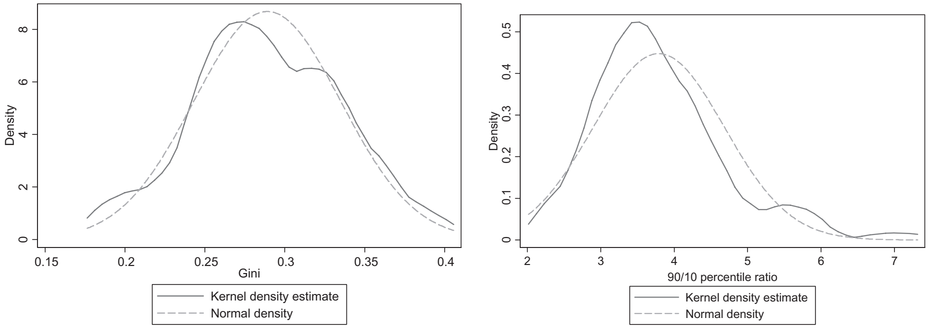

Figure 1. Kernel Density Estimations of Inequality Measures of Mahler–1995 Database

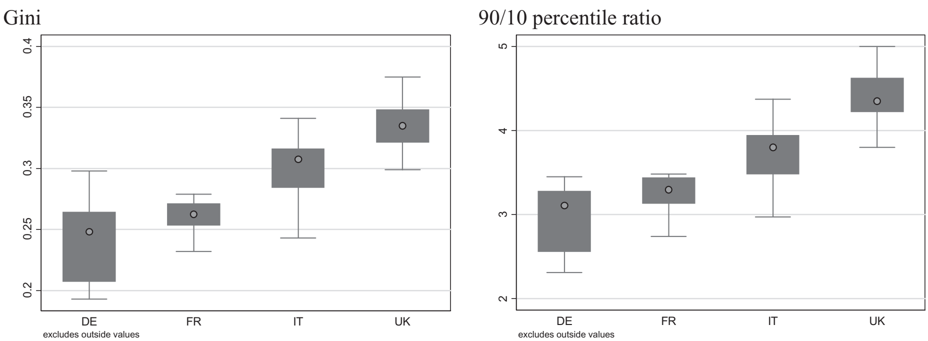

Figure 2. Box Plots of Inequality Measure of Mahler–1995 Database, by Country

region and the Italian Islands, respectively. The shapes of the K-densities are more similar to a normal distribution compared with the previous cases; in the box plots, country differences are clear-cut in terms of both levels and ranges of regional inequality (Figure 3).

The strong evidence of these country level differences encouraged formal testing of probable spatial autocorrelation patterns of regional inequality levels. Spatial autocorrelation arises when the value assumed by a variable in a given place is correlated, positively or negatively, with the value assumed by the same variable in a different place or in a set of different places—typically, neighboring regions. This may basically be due to: (a) measurement errors for observations referring to contiguous geographic units; or (b) actual spatial interaction patterns. Detection of spatial autocorrelation patterns is also an important preliminary step to analyses of regional inequality determinants, due to the potential econometric problems arising in the presence of contemporaneous correlations, very probably in the form of spatial autocorrelations when regional data are employed. Spatial interaction may be highlighted descriptively by using, for example, the Moran I spatial correlation index. The technical precondition for its calculation is the availability of a weight—or spatial lag—matrix (W), able to express the connections between the geographic units considered. Depending on the nature of the

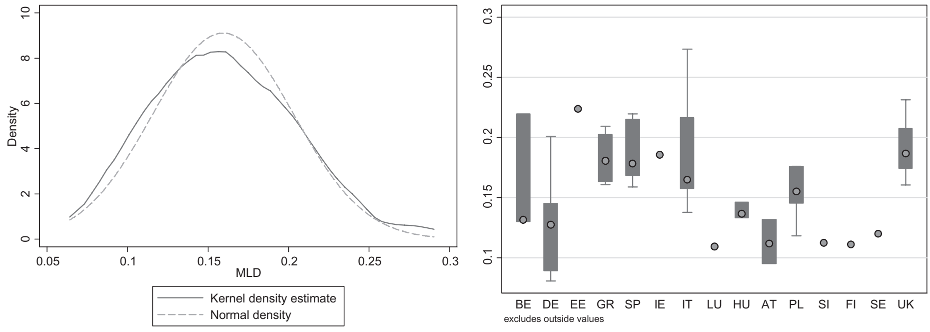

Figure 3. Kernel Density Estimations and Box Plots of Inequality Measure MLD of Hoffmeister–2000 database

TABLE 2
Spatial autocorrelation: Moran I index for Inequality at Regional Level

	Mahler–1995		Hoffmeister–2000
	Gini	90/10	MLD
Moran I Global spatial autocorrelation	0.60***	0.48***	0.55***

***Significant at 1%.

phenomenon studied, the weights may be represented in various ways. In our case, we considered a classical binary contiguity matrix, the cells of which assume a value of 1 if the corresponding regions have common boundaries, and 0 otherwise. Table 2 clearly demonstrates the existence of significant and positive spatial autocorrelations in the levels of intra-regional income inequality. This means that, when a region has a high (low) level of inequality, the neighboring regions also have high (low) values.

These outcomes clearly indicate that the spatial dimension is one aspect which must be taken into account in the following econometric analysis. The diversification of local spatial correlation measures referring to each region (not given here), reporting the levels and significance of the correlation between its value and those of neighboring regions, provides evidence that spatial clusters do not necessarily reflect national boundaries, i.e. inequality of some "inner" regions is not correlated with that of neighbors, and vice versa for "border" regions.

4. Econometric Analysis of Inequality Determinants and their Effects on Growth

This section first describes the econometric approach (Section 4.1) used to estimate the existence and statistical significance of the relationships (i) between some regional (economic, demographic, institutional) features and regional income inequality, and (ii) between regional inequality and subsequent growth. Sections 4.2 and 4.3 present the empirical models and discuss the results.

4.1. *Econometric Approach*

The characteristics of the available databases pose severe constraints on the use of econometric analysis, and limit it to cross-sectional approaches. The lack of a time dimension of the data on inequality prevents the use of panel econometric techniques, recommended in the analysis of the inequality–growth relationship in order to reduce the risk of omitted-variable bias due to the existence of unobserved region-specific features.

A first analytical step was the Ordinary Least Square (OLS) estimation of simple cross-sectional models of (i) the economic, demographic and institutional determinates of inequality, and (ii) the effects of income inequality levels at the beginning of the period on subsequent economic growth. In order to reduce possible omissions of country-level factors, we included country variables in the models (in the form of dummy or institutional variables).

For the three datasets (Mahler–Gini and Mahler–90/10, which refer to 1995; and Hoffmeister–MLD, which refers to 2000), the baseline cross-sectional OLS model of for region i is:

$$Ineq_i = \alpha(Econ)_i + \beta(Demo)_i + \gamma(Inst)_i + \mu(Country)_i + \varepsilon_i \tag{1}$$

where $Ineq_i$ is the inequality measure, $Econ_i$ and $Demo_i$ are baskets of regional economic/structural and demographic variables, respectively, and $Inst_i$ is a set of institutional variables, which are common to the regions belonging to the same country, adjusted when possible with regional features. These explanatory variables are described in detail Section 4.2.1, and their relationship with inequality is hypothesized on the basis of a discussion of the specific literature. $Country_i$ is the set of the country dummy variables capturing common national effects; for each country the dummy is one for all the regions belonging to the country, and zero otherwise. α, β, γ and μ are the corresponding vectors of coefficients, and ε_i is the error term.

On the basis of the theoretical and empirical contributions considered in Section 2.2, we also estimated a regional growth regression, including the effects of income inequality. So, we firstly estimated the following OLS cross-sectional models of GDP growth for region i, including inequality among the determinants:

$$\Delta GDP_{i,} = \kappa(GDP)_i + \varphi(Ineq)_i + \tau(Contr)_i + \mu(Country)_i + \varepsilon_i \tag{2}$$

where ΔGDP_i is the average annual per capita GDP (in PPP) growth rate for region i in the period considered, and GDP_i and $Ineq_i$ are log per capita GDP (in PPP) and the inequality level of region i at the beginning of the period, respectively. $Contr_i$ is a set of control variables observed at, or close to, the beginning of the period, and includes human capital, industry mix indicators[2] and R&D expenditures; $Country_i$

[2]For the Mahler–1995 dataset, HC is only available for 1999 and sector employment rates for 1996.

is again the set of the country dummy variables capturing common national effects. κ, φ, τ and μ are the corresponding vectors of coefficients, and ε_i is the error term.

Based on the descriptive evidence of significant and positive spatial autocorrelation of regional inequality, we estimated spatial autoregressive models able to take into account spatial interactions, also in order to capture unobserved region-specific features which have spatial dependence. As highlighted by the econometric literature (e.g. Anselin, 1988, 1999; Atzeni *et al.*, 2004), the traditional spatial autoregressive models may present: (a) the dependent variable correlated with its spatial lag (spatial LAG model); (b) the error term affected by spatial autocorrelation (spatial ERROR model); or (c) both spatial LAG and ERROR correlations. In the simplest formal terms, if W is the weight—or spatial lag—matrix, the starting point is:

$$y = \rho Wy + X\beta + \varepsilon \tag{3}$$

where: $\varepsilon = \lambda\, W\, \varepsilon + \eta$; $\eta \sim N\,(0, O)$, and the diagonal elements of the O covariance matrix of the errors $O_{ij} = h_i(z\varpi)$; β is a vector $K{\times}1$ of parameters associated with the explanatory variables X (matrix $N{\times}K$); ρ is the coefficient of the spatially lagged dependent variable; and λ is the coefficient of a spatial autoregressive structure for disturbance ε.

We have a spatial LAG model if $\lambda = \varpi = 0$ and $y = \rho\; W\, y + X\,\beta + \varepsilon$. We have a spatial ERROR model if $\rho = \varpi = 0$ and $y = X\,\beta + (I - \lambda\; W)^{-1}\,\eta$. In the first case, a typical omitted-variable problem arises and OLS estimation would produce biased and inconsistent estimates; these problems may be addressed using Maximum Likelihood (ML), Instrumental Variables and Robust approach estimates. It is also possible that correcting for the spatial lag of the dependent variable makes the error spatial autocorrelation disappear. Methods of estimations alternative to OLS are also recommended in the case of spatial ERROR correlation, since OLS would produce inefficient estimates. In this empirical analysis, we ran ML estimates of spatial LAG and spatial ERROR models using the spatial econometric application available in STATA (Pisati, 2001), which unfortunately does not allow the most general model (with both spatial LAG and ERROR) to be estimated. As done for the descriptive spatial autocorrelation, we used a binary weight matrix (row standardized).

In our specific case, the ML spatial LAG and spatial ERROR models for inequality determinants become, respectively:

$$Ineq_i = \rho W(Ineq)_i + \alpha(Econ)_i + \beta(Demo)_i + \gamma(Inst)_i + \mu(Country)_i + \varepsilon_i \tag{4}$$

and:

$$Ineq_i = \alpha(Econ)_i + \beta(Demo)_i + \gamma(Inst)_i + \mu(Country)_i + \lambda W\varepsilon_i + \eta_i \tag{5}$$

in which the symbols are the same as those described for equations (1) and (3).

Similarly, spatial LAG and ERROR estimates of the growth models are:

$$(6) \quad \Delta GDP_i = \rho W(\Delta GDP_i) + \kappa GDP_i + \varphi(Ineq)_i + \tau(Contr)_i + \mu(Country)_i + \varepsilon_i$$

and:

$$(7) \quad \Delta GDP_i = \kappa(GDP)_i + \varphi(Ineq)_i + \tau(Contr)_i + \mu(Country)_i + \lambda W\varepsilon_i + \eta_i$$

with the notations assuming the same meanings as in equations (2) and (3).

A final major problem in the present econometric analysis is specific to estimates of the inequality–growth relationship which, as mentioned in Section 2.2, may be subject to reverse causation. This effect can be ruled out if the explanatory variables of interest—as, in our case, the level of regional inequality—are measured at the beginning of the period considered for growth, and thus are statistically predetermined (Alesina and Rodrik, 1994; Partridge, 1997). However, it is possible that other factors simultaneously influence inequality and growth. For example, previous growth rates may influence both present inequality and subsequent growth; similarly, in the convergence theory, the initial level of economic development affects subsequent growth but, according to Kuznets' conjecture, also contemporaneous inequality. Therefore, to be sure that these factors did not influence outcomes obtained with OLS, we also estimated the inequality/growth relationship using instrumental-variables (IV) two-stage least-squares (2SLS) regressions. The IV approach could not be combined with the spatial regressions since this estimation option is not available in the software application used for them.

4.2. *Inequality Determinants in European Regions*

Before presenting the outcomes of our estimations, we briefly introduce the meaning associated with the specific explanatory variables and their expected relationships with inequality, hypothesized on the basis of existing literature (all variables are defined and listed in Table A2 of the appendix). The small number of observations (see Table A1) suggested including only a limited set of explanatory variables in the econometric models. For these reasons, and also in order to reduce collinearity problems, we reduced the number of regressors by eliminating the most important correlations and redundancies by applying, where possible, principal component analysis (PCA). In addition, we only present as final outcomes parsimonious estimations in which we kept the most important regressors from the theoretical viewpoint and those highlighting a certain stability of sign, size and significance of the estimated coefficient when other explanatory variables were included/dropped. All the economic/structural (*Econ*) and demographic (*Demo*) variables are drawn from the on-line Eurostat Regio database. The few missing data were reconstructed by means of linear interpolation.

4.2.1. Explanatory Variables and their Expected Impact on Inequality

The first specific variable of interest is of course the regional level of economic development. Its measure was obtained here by means of PCA on four strongly correlated indicators, i.e. per capita GDP (in PPP), employment rates in agriculture and market services, and population density; this new variable was named

DEV.[3] From the theoretical point of view, the relationship between development and inequality has been traditionally described as an inverted U-shape (Kuznets, 1955; Robinson, 1976), as a result of the dynamics of relative wages occurring during the transition from a rural/agricultural to an urban/industrial economy. However, as shown for example by Davis (1992) and Freeman and Katz (1994), this may not be the case for current economic development patterns, which are associated with declining shares of manufacturing or its low-tech segments (which harm blue-collar workers), increasing urbanization, and tertiary specialization. The latter is typically characterized by a bimodal pay structure (Bishop *et al.*, 1991) reflecting the relative roles of advanced versus traditional services. Therefore, more developed regional systems may be associated with increasing inequality.[4] This possibility is reinforced by the role played by factor mobility in shaping regional specialization patterns (see also the discussion in Section 2.3). Higher earnings dispersion may be expected in regions more endowed with human and physical capital as a result of specialization in capital-intensive products, outsourcing of labor-intensive processes (eased by capital mobility), and inward migration of unskilled workers (Borjas *et al.*, 1992; Topel, 1994; Kim, 1997; Wildasin, 1998). Similarly, in an NEG framework, core regions may undergo higher inequality due to the co-existence of space-specific and mobile labor segments, while returns are more homogeneous in peripheral areas specialized in the traditional industry. Lastly, the possible consequences of the EU cohesion policy (see Section 2.3) may lead poorer regions to face lower inequality if measures targeted at attracting mobile factors, thus increasing demand and gross returns to immobile factors, e.g. unskilled labor, are successful. On these bases, *the first hypothesis we test is that income inequality grows as the regional level of development increases*.

A second group of variables belonging to the *Econ* set aims at more explicitly representing the complex effects of technical change and the evolution of labor demand toward skilled labor. The variables available at regional level used to represent these aspects are measures of innovative input (*R&D* expenditures as a percentage of GDP), innovative output (patent applications per million inhabitants—*INN*) and human capital, approximated by indicators of various levels of education (*HC*, *HC_1*, *HC_2*) of the resident population (see definitions in Table A2). As usual in the empirical literature (e.g. Partridge *et al.*, 1996; Barro, 2000; Panizza, 2002), we use these measures of formal education of the population to capture the qualitative evolutions of interest occurring in the labor market. The impact of quantitative aspects is considered later, by means of labor market performance indicators. Our expectations about the link of skills endowment and technological change with inequality are derived from Aghion *et al.* (1999). In their model, growing earnings inequality is explained by acceleration of the relative demand for skills due to technical change, which in turn increases the skill

[3]This is the first factor resulting from the PCA, which extracts 67 percent of the total variance in 1995 and 66 percent in 2000, and is positively correlated with GDP, DENS and ER_mkt_serv, and negatively with ER_agri.

[4]This line of argument also envisages the possibility of an inversion in the relationship (therefore, recovery of an inverted U-shape), which may take place after a development level which corresponds to economies very (or fully) specialized in skill-intensive sectors.

premium.[5] In developed economies, this is due to three factors: (i) increased trade; (ii) skill-biased technical change (SBTC); and (iii) organizational change within firms. Therefore, *we test the existence of a positive relationship between innovation activity and human capital indicators, and inequality*.

Once the effects of technical change and skills have been controlled for, we also test the impacts of aggregate measures of labor market performances and features on inequality. The variables available at regional level include first, four traditional performance indicators—total and female employment rates, and unemployment and long-term unemployment rates—which showed very high levels of correlation and were again summed up by PCA. The first factor extracted, named *LAB_MKT_PERF*, explains 85 percent of the total variance in 1995 and 83 percent in 2000. Other indicators considered were part-time and self- employment rates (only measured after 1999) which also clearly signal labor market institutional settings, and the age structure of employment. The links between labor market performance and inequality are complex from a theoretical point of view, and uncertain on empirical grounds (Burniaux *et al.*, 2006). On one hand, better performances may be associated with lower economic exclusion and less discouraged workers, therefore with non-zero earnings of otherwise unemployed or inactive persons, and thus reduced inequality. On the other hand, greater participation rates on the part of certain segments of the labor force—e.g. women or young people—may produce pressures on unskilled wages and favor inequality (e.g. Topel, 1994). However, the new labor suppliers do not necessarily compete with low-wage groups (e.g. new female labor supply is often highly educated and competes with high-skilled males); in any case, the eventual downward wage effect only leads to earnings inequality, whereas higher inclusion (even though of low-wage earners) may affect household incomes positively (e.g. Bradbury, 1990; Partridge *et al.*, 1996; Gustafsson and Johansson, 1999). Since all our inequality measures are derived from household incomes, the prevalence of the inequality-reducing effect of a more inclusive labor market, also in terms of young (aged 15–24 years) and older (55–64) workers, may be hypothesized,[6] so *we test the existence of a negative relationship between labor market performance (and young and old employment rates) and inequality*.

As regards the relative importance of self-employment, the existing literature mainly addresses the possibility of a positive relationship with inequality (e.g. Jenkins, 1995; Meager *et al.*, 1996; Parker, 1999; Falter, 2007). Intuitively, this is due to the fact that self-employment incomes are more dispersed than incomes of employees, as a result of the higher and increasing heterogeneity of self-employed workers (e.g. Meager *et al.*, 1994; Parker, 1997) and of the movements in the relatively greater transitory component of income (e.g. Albarrán *et al.*, 2007). A

[5]The discussion refers here to earnings inequality. As clearly stressed by Atkinson and Brandolini (2006), the distribution of individual earnings, due to the relative importance of labor incomes, is closely related to household income distribution. However, they also differ for the other income sources and the distributive role played by the household.

[6]Similar conjectures may be made with regard to the effects of diffusion of part-time employment, although this aspect is more directly used in the literature to represent the disadvantaged positions of (typically female) workers locked in low-wage traps (e.g. Stier and Lewin-Epstein, 2000; McManus, 2007). For these reasons, it is harder to hypothesize, *a priori*, its relationship with inequality, which depends on which effects prevail.

growing share of self-employed workers increases the weight of their *within* component of, and thus overall, income inequality. Therefore *we empirically test the existence of the positive impact of the growing self-employment share on inequality*.

Due to scanty availability of data, the set of demographic variables (*Demo*) is very small, and the most interesting aspects, such as average age or ethnicity, language and religious heterogeneity (Topel, 1994; Barro, 2000) could not be considered. We were only able to include in the regressions the share of population aged 65 years or over, which is essentially used as a control variable. However, although variables measuring the dependency-burden have not attracted much attention so far (exceptions are Panizza, 2002, and Partridge *et al.*, 1996), a positive relationship of $POP > 65$ and inequality may be conjectured, due to the fact that people in dependent ages often have lower equivalent incomes than those in work-active ages (Gustafsson and Johansson, 1999).

Lastly, in order to consider the important effects attributed by theory to institutional settings,[7] we first included in the set *Inst* three country-level labor market institutional variables all provided by the OECD, i.e. union density, degree of bargaining centralization, and degree of bargaining coordination. All three indicators were weighted by the regional share of dependent employment, since they primarily influence this segment. Besides the effects of flexible contractual arrangements noted earlier, stronger unions (e.g. Di Nardo *et al.*, 1996; Fortin and Lemieux, 1996; Machin, 1997; Kahn, 2000; Card, 2001; Card *et al.*, 2003) and more centralized and coordinated bargaining (e.g. Edin and Holmlund, 1995; Erickson and Ichino, 1995; Manacorda, 2004) are thought to compress wage distributions by standardizing pay rates among workers within an establishment and across establishments, thus fostering equality (Blanchflower and Slaughter, 1999). A fourth institutional feature examined is the level of expenditure on social protection benefits (WELF), as a percentage of the GDP at country level, provided by Eurostat. Although limited budgets may increase benefit efficiency (Tullock, 1997), more generous redistributive or welfare systems are usually thought to reduce inequality (e.g. Gottschalk, 1993; Partridge *et al.*, 1996), albeit at the expense of efficiency and future growth. Therefore, *we expect stronger union density and collective bargaining to reduce inequality*. Similarly, *we test the existence of a negative relationship between the size of the welfare system and inequality*.

4.2.2. Results

Table 3 lists the results of the specification of equations (1), (4) and (5) using the two inequality measures provided in the Mahler dataset.[8] Subsequently, we ran

[7]We are aware of the possibility of endogeneity of institutional settings to inequality levels, but the data available did not allow us to address these problems here.

[8]The usual diagnostic tests were run for the final models. For models with GINI as dependent variable, no problems of heteroscedasticity (Cook–Wiseberg and White tests), collinearity (VIF) or non-normality of error (Jarque–Bera test) emerged. Similarly, the Ramsey test did not provide evidence of omitted variables, and the few outliers detected using the Cook distance did not prove to be influential on the signs or significance of the coefficients. Similar results were obtained using 90/10 as dependent variable but, in this case, the Jarque–Bera test for normality of error terms was slightly below the acceptance level. However, the outcomes are very robust to the inclusion/exclusion of variables and observations and transformations of dependent variables. The emergence of heteroscedasticity in a few estimates suggested using robust estimation.

TABLE 3

Determinants of Regional Income Inequality, Mahler–1995 Database

	GINI (×100)					90/10				
	OLS (1)	OLS (2)	OLS (3)	ML (S. Lag) (4)	ML (S. Error) (5)	OLS (6)	OLS (7)	OLS (8)#	ML (S. Lag) (9)#	ML (S. Error) (10)#
DEV	0.41*	0.21	0.21	0.35	0.35	0.06	0.02	0.03	0.05	0.05
HC_2	–1.41	9.60	–5.45	–0.19	–0.72	1.42	3.75*	0.62	1.49	1.49
INN	0.02***	0.01***	0.01**	0.01***	0.01***	0.00***	0.00***	0.00**	0.00***	0.00***
LAB_MKT_PERF	–0.81***	–0.55*	–0.55*	–0.69**	–0.74**	–0.28***	–0.23***	–0.24***	–0.26***	–0.28***
EMPL_15-24	–2.86	–21.74	–49.71**	–7.36	–7.53	–1.02	–2.96***	–7.35	0.39	0.69
CENTR_adj	–6.26***	–6.18***	–10.64*	–5.44***	–6.38***	–1.03***	–1.01***	–3.36*	–0.93***	–1.04***
WELF	–	–0.53**	–	–	–	–	–0.11*	–	–	–
UK_d	–	–	1.16	–	–	–	–	–1.05	–	–
Germany_d	–	–	7.67*	–	–	–	–	2.97*	–	–
Italy_d	–	–	0.18	–	–	–	–	–0.43	–	–
Constant	38.30***	52.81***	49.73***	32.70***	38.88***	4.81***	7.88***	9.53***	4.24***	4.86***
No. of observations	63	63	63	63	63	63	63	63	63	63
F	18.94***	17.70***	15.99***	–	–	10.56***	9.87***	10.13***	–	–
Log likelihood	–	–	–	–147.69	–148.02	–	–	–	–56.73	–57.03
F (dummy variables)	–	–	4.01**	–	–	–	–	2.60*	–	–
R^2	0.67	0.69	0.73	–	–	0.53	0.56	–	–	–
Adjusted R^2	0.63	0.65	0.69	–	–	0.48	0.50	0.62	–	–
Sq. corr. (pseudo R^2)	–	–	–	0.69	0.67	–	–	–	0.55	0.53
ρ / λ	–	–	–	0.16	0.11	–	–	–	0.12	0.06
Wald test ($\rho/\lambda = 0$)	–	–	–	0.94	0.29	–	–	–	0.61	0.07
Likel. R. test ($\rho/\lambda = 0$)	–	–	–	0.94	0.28	–	–	–	–	–
Lagr. M. test ($\rho/\lambda = 0$)	–	–	–	2.90*	1.57	–	–	–	2.52	1.14

Notes: For full definition of the variables, see Table A2 in the appendix.
***Significant at 1%; **significant at 5%; *significant at 10%.
#Robust estimates in order to account for heteroscedasticity.

similar regressions for the Hoffmeister database (Table 4). In order to have directly comparable OLS and ML estimates, we restricted the Mahler and Hoffmeister samples to 63 and 58 observations, respectively. Indeed, when running spatial econometric regressions, the availability of a contiguity (binary) matrix of weights entails the exclusion of observations with non-neighbors (i.e. fr83-Corse, itg1-Sicily, itg2-Sardinia and ukm-Northern Ireland for the Mahler dataset; and ee0-Estonia, gr4-Nisia Aigaiou.-Kriti, es7-Canarias, itd-Island-Italy and ie0-Ireland in the Hoffmeister sample).

In Table 3, the baseline regressions of columns (1) and (6) supply a first interesting piece of information, related to the positive sign of the development variable (*DEV*), which is consistent with the conjectured roles of factor mobility and urban/tertiary specialization. However, the coefficient is statistically significant in the first regression only, and the same occurs if *DEV* is replaced by the variables used in the PCA from which it derives. In order to test the possibility of a quadratic relationship, we also inserted squared *DEV* in the model, but this term was never significant. Similarly, the human capital coefficient (*HC_2*) is not statistically significant, as in the rest of the regressions, except for the model in column (7). The same happens if we consider other indicators (*HC* and *HC_1*). However, it should be noted that the impact of *HC_2* on inequality, although almost always not significant, is steadily positive when the inequality measure is the decile ratio, which attributes relatively more importance to the tails of the distribution, and thus to the role played to top earners relative to bottom ones. However, all our HC variables refer to 1999, since previous data were not available, so that definitive comments on their effects on inequality cannot be drawn.

As regards the effects produced by technological change, the innovation output indicator (strongly correlated with the input variable R&D) is steadily significant and positive, corroborating the idea that higher innovative intensity may entail more frequent skill—and therefore employment—adjustments and more segmented labor demand, thus leading to greater inequality. The labor market summary indicator (*LAB_MKT_PERF*) also assumes the hypothesized negative sign, confirming that inequality depends to a considerable extent on the functioning and efficiency of the labor market. Similarly, when the labor market is able to include young workers (*EMPL_15-24*) inequality decreases; however, the coefficients are not statistically significant in these baseline estimations. The demographic variable (*POP* > *65*) is not significant. Among the labor market institutional variables which are corrected at regional level, only *CENTR_adj* is steadily significant, and supports the expectation that a higher level of bargaining centralization favors less unequal income structures.

In a second OLS specification (columns (2) and (7)), we included the indicator of social protection benefits *WELF*, which is available at country level. Consistently with the literature predictions and our expectation, the *WELF* coefficient is significant and negative for both inequality measures. Its inclusion in the models slightly improves their explanatory power.

Considering the outcomes of the descriptive analysis, which highlighted strong country level differences in regional inequality levels (Figures 2 and 3), we also carried out specifications including country dummy variables (columns (3) and (8)). This also aimed at assessing if the variables used in the previous

TABLE 4

Determinants of Regional Income Inequality, Hoffmeister–2000 Database; Dependent Variable: MLD (×100)

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)	OLS (8)	OLS (9)	ML (S. Lag) (10)	ML (S. Error) (11)
DEV	0.75*	0.79*	1.38***	1.60***	2.15***	1.45***	1.41***	2.16***	1.50***	1.33***	1.42***
HC_2	8.65	10.70	–10.04	–8.44	–15.54	14.14*	9.59	–16.16	10.38*	8.61	9.87
INN	0.00	0.00	0.00	0.00	0.00	0.00	–0.00	0.00	0.00	–0.00	–0.00
LAB_MKT_PERF	0.17	0.07	–0.14	–0.03	0.27	0.20	0.41	0.26	0.43	0.38	0.42
EMPL_15-24	–20.24	–18.62	–4.42	–5.42	14.03	32.01	33.64	13.01	34.38	30.44	34.01
CENTR_adj	–2.64***	–2.46***	–9.93***	–11.79**	1.96	–2.23***	–1.84***	2.10	–1.30**	–1.76***	–1.82
WELF	–	–0.24	–	–	–	–	–	–	–0.45***	–	–
DEV^2	–	–	–	–0.10	–0.25*	–0.16*	–0.17*	–0.25	–0.21**	–0.16*	–0.16*
SELF_e	–	–	–	–	66.10*	46.02***	49.15***	66.80	51.30***	46.62***	49.18***
PART_e	–	–	–	–	–	–	15.46*	–1.46	27.71***	14.81**	15.59**
UK_d	–	–	–10.84	–14.06	8.82	–	–	9.15	–	–	–
Belgium_d	–	–	0.90	0.79	–0.03	–	–	–0.12	–	–	–
Finland_d	–	–	16.66**	19.70**	–5.21	–	–	–5.56	–	–	–
Germany_d	–	–	0.33	0.29	–0.80	–	–	–0.84	–	–	–
Greece_d	–	–	–0.59	–1.71	–3.76	–	–	–4.06	–	–	–
Hungary_d	–	–	–14.84*	–17.66**	3.66	–	–	3.61	–	–	–
Austria_d	–	–	–2.65	–2.53	–3.42	–	–	–3.53	–	–	–
Italy_d	–	–	–7.97	–10.22	–4.18	–	–	–4.37	–	–	–
Luxembourg_d	–	–	–4.20	–3.97	–4.69	–	–	–4.91	–	–	–
Poland_d	–	–	–12.48*	–14.76*	4.87	–	–	4.87	–	–	–
Slovenia_d	–	–	–17.55**	–20.36**	4.24	–	–	4.22	–	–	–
Spain_d	–	–	4.76	4.20	1.46	–	–	1.27	–	–	–
Constant	21.50***	26.34***	40.50***	45.28***	2.02	6.81*	4.26***	2.12	12.06***	3.89	4.11***
No. of observations	58	58	58	58	58	58	58	58	58	58	58
F	4.36***	4.08***	5.56***	5.23***	5.34***	9.36***	9.18***	4.95***	10.95***	–	–
Log likelihood	–	–	–	–	–	–	–	–	–	–134.48	–134.67
F (dummy variables)	–	–	4.40***	4.40***	1.68	–	–	1.40	–	–	–
R^2	0.34	0.36	0.72	0.72	0.70	0.60	0.63	0.74	0.70	–	–
Adjusted R^2	0.26	0.28	0.59	0.59	0.64	0.54	0.56	0.59	0.64	–	–
Sq. corr. (pseudo R^2)	–	–	–	–	–	–	–	–	–	0.64	0.63
ρ / λ	–	–	–	–	–	–	–	–	–	0.07	–0.03
Wald test ($\rho/\lambda = 0$)	–	–	–	–	–	–	–	–	–	0.41	0.03
Likel. R. test ($\rho/\lambda = 0$)	–	–	–	–	–	–	–	–	–	0.41	0.03
Lagr. M. test ($\rho/\lambda = 0$)	–	–	–	–	–	–	–	–	–	0.50	0.00

Notes: For full definition of the variables, see Table A2 in the appendix.
***Significant at 1%; **significant at 5%; *significant at 10%.

specification (in particular, *WELF*) already captured the national component of the variability of regional inequality. The outcomes suggest that the models with country effects (*WELF* was not included, in order to avoid collinearity with the dummies) have higher explanatory power compared with the previous ones, and the signs and significance of the other explanatory variables remain stable. This evidence means that the country dummies not only include the important information of *WELF*, but also introduce other unobserved country-specific features which influence regional inequality. The importance of country dummies for the specification is also confirmed by the F test for their joint significance.

Columns (4), (5), (9) and (10) list the estimates of the ML spatial and error models without imposing ex-ante any spatial structure, i.e. not including country dummies or the country level variable *WELF*. These ML regressions turned out to be very similar to the OLS estimates in terms of coefficient signs and significance. Comparison of the measures of overall explanatory power between OLS with country dummies and ML models indicate that the information included in the spatial pattern of income inequality is fully captured by the country dummies and other variables. In addition, the non-significance of coefficients ρ and λ in the ML estimates also suggest that the other regressors already account for the spatial pattern of inequality which is not closely related to national differences.

A final general comment on Table 3 regards the overall strong consistency of the outcomes obtained using the two inequality measures as dependent variables, the only exception being the significance levels of a few coefficients. This fits with the high levels of correlation of the two measures and also the findings of Li *et al.* (1998, p. 37).

Table 4 lists the models estimated using the MLD of the Hoffmeister dataset. Although comparison with the previous outcomes of Table 3 is difficult due to the many remarkable differences among the samples, we report regressions obtained considering the same explanatory variables as the OLS models of Table 3 in the first three columns of Table 4. Comparison reveals strong and interesting differences: only the negative impact of *CENTR_adj* is confirmed, whereas *DEV* is again positively associated with inequality, but the coefficient is steadily significant. Instead, the coefficient of *HC_2* is positive, and close to the 10% significance level only in the first two models; *INN*, *LAB_MKT_PERF* and *EMPL_15-24* are never statistically significant. So—not surprisingly considering especially the different geographies of the samples—the determinants of distributive patterns in the second one must be sought elsewhere, as the poor value of the adjusted R^2 also testifies. However, a first indication comes from the comparison of the three initial OLS models. The inclusion of *WELF* does not particularly improve the explanatory power of the model (column (2)), but this is not the case for the n − 1 country dummies (column (3)). Some of them—all the CEEC and Finland—enter the regression significantly and, most importantly, the country effects are jointly significant (see the F test): as a result, the adjusted R^2 more than doubles compared with the previous specification. This is clearly explained by the fact that the sample includes very different countries from various points of view, particularly transition countries. In the subsequent regressions, we show the results obtained by including other explanatory variables which were not significant (*squared DEV*) or not available (*SELF_e*) for the previous samples. Except for model 4, the coefficient of *squared DEV* enters the models with a negative and significant sign. This outcome, together with the steadily significant and positive coefficient of *DEV*, supports the existence of a quadratic relationship. However, the *DEV* threshold at which the relationship becomes negative is very high and only three well-known development outlier regions exceed this value (Brussels, Hamburg, London). This prevailing positive, although marginally decreasing, link corroborates our conjectures about the role of factor mobility on inequality in developed, service-specialized contexts. The variable *SELF_e* also enters regression 5 (and the following ones) positively and significantly, as we hypothesized, arguing that "extreme" earners—e.g. professionals on one hand and flexible workers on the other—are often self-employed.

Interesting information comes from comparison of regressions 5 and 6, which differ in the inclusion of country dummies. In model 5, the inclusion of *SELF_e* renders all the country dummies not significant (both singularly and jointly, as testified by the F test), and produces strong collinearity in the regression (the mean of variance inflation factors (VIF) is 74.31). If we drop these country effects (model 6), the value of adjusted R^2 decreases, although not drastically, and collinearity problems are also reduced (mean VIF = 2.39). These outcomes suggest that much of the national variability is captured by the variable *SELF_e*. Similar results are obtained by adding *PART_e* to the specification (model 7). The new variable holds a positive and significant coefficient, and further increases the adjusted R^2. If, in order to control the robustness of the previous results, we re-include the country dummies (model 8), they are again not significant, and further multicollinearity emerges (mean VIF = 78.97), which alters the whole specification. The explanatory power of the model again increases and reaches its highest value (adjusted R^2 0.64) when we also include *WELF* in model 9, where of course the country dummies are no longer considered. So, unsurprisingly since they also reveal important institutional features, *SELF_e*, *PART_e* and *WELF* can account for the very important existing national differences, and their use, instead of the 12 country dummies, allows important gains in terms of degrees of freedom of the regressions.

Spatial econometric models were also estimated according to the last specification, but without imposing any *a priori* spatial structure (in terms of country dummies or country level variables). Again the findings reveal the very great similarity of outcomes obtained by the OLS and ML approaches.

Other results are noteworthy in the final models estimated. The highest levels of human capital (tertiary education) show a predominantly positive impact on inequality (when it is positive and not significant at 10%, its significance is always only slightly higher than this level). This provides support to our expectations of a positive relationship. Another distinctive piece of evidence is that the importance of quantitative labor market features is replaced by qualitative aspects. The summary measure *LAB_MKT_PERF* is never significant but, beyond the status of the self-employed, the incidence of part-time employment also positively and significantly affects inequality. This positive impact suggests that this indicator may be a good explicit proxy for the strength of disadvantaged positions of low-wage workers, who also probably exert downward pressure on certain wages (Barro, 2000).

As at least partly expected considering the differences in our datasets and variables, the outcomes obtained in this section are diversified. Nonetheless, they in general corroborate our expectations and indicate that the bulk of regional income inequality levels may be identified in the quantitative and qualitative features of regional labor markets, together with institutional differences at national levels. Although this is only preliminary empirical evidence restricted to a limited set of measurable aspects, it does confirm the centrality of labor market policies and reforms, also in addressing inequality issues. This is a major concern for Europe, in view of the diversity in institutional arrangements and the extraordinary variability of performance and dynamics of regional labor markets.

4.3. *The Inequality–Growth Nexus in European Regions*

We present here a set of econometric specifications of regional growth in which GDP_i and $Ineq_i$ are always included as explanatory variables, and the other variables are considered to control for the sign and significance of the $Ineq_i$ coefficient. Growth rates were measured as an average percent GDP growth over a 10-year period (1995–2004) for Mahler and a 5-year period (2000–2004) for Hoffmeister. For each dataset we estimated OLS, IV-2SLS, ML spatial LAG and ML spatial ERROR models. As already mentioned, with respect to OLS, the IV-2SLS approach is preferable since it allows controlling for the existence of systematic relations between inequality and growth. As regards the spatial econometric models, consistently with a large existing literature (e.g. Paci and Pigliaru, 2002; Benito and Ezcurra, 2005; Moreno *et al.*, 2005) the spatially lagged dependent variable is always significant and positive in the ML spatial LAG models and, as already explained, this specification allows addressing the well-known problems of omitted variable bias in models with a spatial structure. For these reasons, and for the sake of brevity, we present IV-2SLS and spatial LAG models (the latter in the appendix), whereas the tables of OLS and spatial ERROR estimates are rendered available at http://www.unipg.it/~perugini/roiw.htm.

Tables 5 and A3 report results for the Mahler dataset using the Gini index as inequality measure. The 2SLS estimates[9] show that the usually employed variables (the convergence term measuring initial GDP and HC) generally have the expected signs; although with poor statistical significance, the employment rate in the primary and secondary sectors are negatively related to growth, whereas opposite evidence emerges for services. R&D appears in the models with a not significant sign. As regards geographic dummies, those for Italy and France proved to be the only permanently significant ones.

As regards the outcome of interest here, regional income inequality at the beginning of the period considered emerges as beneficial to subsequent regional per capita GDP growth, as witnessed by the significant positive sign of the corresponding coefficients, the levels of which hold quite steady. Compared with those of the OLS estimates, the coefficients of the IV-2SLS are always higher: thus, if a bias exists in the OLS, it does not cast doubts on the positive sign of the inequality/growth relationship. The ML spatial LAG estimates (Table A3) confirm the posi-

[9]The instruments for the inequality measure are listed at the bottom of the table, selected according to information supplied in the previous estimates, and enter the first-stage regressions significantly.

TABLE 5

Effects of Income Inequality on Regional % Growth 1995–2004, Mahler–1995 Database (IV-2SLS#)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (log)	–0.89**	–0.73**	–0.97**	–0.74**	–0.98**	–0.73**	–1.26**
GINI	11.94***	10.04***	10.22***	9.63***	9.68***	10.13***	9.96***
HC	–	7.26***	6.93***	7.33***	5.81***	7.26***	5.28***
ER_AGRI	–	–	–0.07	–	–	–	–0.07
ER_IND	–	–	–	0.00	–	–	–
ER_SERV	–	–	–	–	0.02	–	0.00
R_D	–	–	–	–	–	–0.00	0.00
D_Italy	–1.93***	0.90	0.90	0.94	0.66	0.89	0.63
D_France	–0.62***	1.37***	1.38***	1.38***	1.11**	1.36***	1.09*
Constant	9.72***	3.11	5.69	3.17	5.65	3.00	8.67
Observations	63	63	63	63	63	63	63
Adjusted R^2	0.53	0.67	0.67	0.67	0.67	0.66	0.66
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (log)	–0.49	–0.36	–0.63	–0.40	–0.76*	–0.37	–1.12*
90/10 ratio	0.65***	0.58***	0.59***	0.68***	0.56***	0.58***	0.58***
HC	–	8.31***	7.93***	8.58***	5.95**	8.30***	5.25*
ER_AGRI	–	–	–0.08	–	–	–	–0.08
ER_IND	–	–	–	0.02	–	–	–
ER_SERV	–	–	–	–	0.03	–	0.04
R_D	–	–	–	–	–	0.00	0.03
D_Italy	–1.91***	1.31*	1.32*	1.42*	0.90	1.31*	0.88
D_France	–0.51**	1.75***	1.78***	1.92***	1.33*	1.75***	1.31*
Constant	6.74	–0.72	2.35	1.38	3.39	–0.65	7.39
Observations	63	63	63	63	63	63	63
Adjusted R^2	0.38	0.56	0.56	0.51	0.51	0.55	0.56

Notes: For full definition of the variables, see Table A2 in the appendix.
***Significant at 1%; **significant at 5%; *significant at 10%.
#Instrumented: GINI and 90/10 ratio; instruments: LAB_MKT_PERF, CENTR_adj, EMPL 15-24.

tive sign of the *Ineq* coefficients; however, their significance is lower (but only in one case below the usual acceptance levels) and their size is reduced. Therefore, the inclusion of the spatially lagged dependent variable, which is always positive and strongly significant, allows accounting for the spatial structure of the data which is otherwise captured, at least partly, by our variable of interest. The spatial error models confirm the reduction in the size and significance of the coefficients of *Ineq*, but the spatial lag on the errors is poorly significant and the explanatory power of the models drops remarkably compared to the previous ones.

These outcomes are in general confirmed changing the inequality measure (90/10 percentile ratio) (Tables 5 and A4), with the difference that the levels of significance of the *Ineq* coefficients further decrease in the spatial models and in two cases exceed the 10% level. The same general structure of the outcomes and the positive inequality/growth relationship is confirmed in the short term (2000–2004) growth regressions estimated with the Hoffmeister database (Tables 6 and A5), using a third measure (MLD) of inequality. The coefficients are indeed all positive and significant in the 2SLS estimates, although their significance level decreases in the ML spatial lag estimates, again exceeding the 10% level in two cases. In the

TABLE 6

Effects of Income Inequality on Regional Growth (2000–2004), Hoffmeister–2000 Database (IV-2SLS#)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (log)	−1.08***	−1.09***	−1.97***	−1.09***	−0.97	−0.81*	−0.96
MLD	16.96***	15.83**	19.17***	15.55**	16.75***	14.78**	22.93***
HC	–	−0.16	−0.24	0.09	0.43	0.41	−1.83
ER_AGRI	–	–	−0.09*	–	–	–	−0.12**
ER_IND	–	–	–	0.02	–	–	–
ER_SERV	–	–	–	–	−0.00	–	−0.07
R_D	–	–	–	–	–	−0.26	−0.14
D_Hungary	2.18***	2.17***	1.70**	2.10***	2.19***	2.12***	1.66**
D_Italy	−3.16***	−3.10***	−3.20***	−3.13***	−3.12***	−3.22***	−3.54***
D_Slovenia	2.18**	2.13**	2.34**	1.98*	2.12*	2.12**	2.08*
D_Luxembourg	3.13***	3.10***	3.72***	3.11***	3.09**	2.95**	3.48***
Constant	11.84***	11.93***	20.69***	11.72***	10.72	9.47**	12.18
Observations	58	58	58	58	58	58	58
Adjusted R^2	0.53	0.53	0.51	0.53	0.51	0.55	0.46

Notes: For full definition of the variables, see Table A2 in the appendix.
***Significant at 1%;**significant at 5%; *significant at 10%.
#Instrumented: MLD (1995); instruments: LAB_MKT_PERF, CENTR_adj, EMPL 15-24, PART_t, SELF_e.

spatial error models which again have a more limited explanatory capacity, although never significant, the sign of MLD is inverted.

In summary, the data show a prevailing positive relationship between the initial level of income inequality and subsequent short- and medium-term economic growth. This outcome is common to different inequality measures but the significance and the strength of the relationship decreases for the spatial econometric models. In interpreting this result, as already emphasized, we must take into account that, due to the limitations of the data available, it was not possible to test the stability of this result by using panel data econometric approaches—proposed by recent literature as crucial in order to investigate the relationship properly. Therefore, further research efforts are required to test the robustness of the outcome obtained which is, however, a starting point in the analysis of the relationship at sub-national level.

Given this present state of the knowledge in this specific field, we may try to understand if the outcome of a positive link between inequality and growth at regional level may be explained in the light of the theoretical arguments proposed in Sections 2.2. and 2.3. In this attempt, we must bear in mind particularly that the positive relationship emerges from an empirical analysis which: (i) covers medium- and short-term periods; (ii) refers to sub-national level; and (iii) concerns developed economies. First, these factors may contribute to weakening the principal channel through which inequality should negatively affect growth—the double political economy stage mechanism first envisaged by Persson and Tabellini (1994). This is indeed clearly a long-term process since, in the short and medium terms, tax and transfer systems may be considered as given, so that its effects are at least reduced. More in general, all the effects induced by inequality—e.g. on investment decisions—typically generate their effects in the long term (see, e.g. Partridge, 1997; Forbes, 2000). Second, when the effects of inequality are studied at sub-national level, this "political economy" effect may be greatly weakened (Partridge, 1997, p. 1021; Panizza, 2002, p. 28), since most redistributive and tax policies are decided and implemented at national level, partly as an effect of their inefficiency in the presence of high factor mobility. As already discussed, the possibility of interregional mobility of capital and labor may weaken the ability of central and peripheral governmental bodies to undertake effective redistributive actions, since labor and capital have the opportunity to escape (or not settle in) contexts with more severe redistributive targets (Partridge, 1997; Panizza, 2002). As a result, growth rates will be low in the original region and high in the destination region, where incentives signaled by inequality are better (Partridge, 2006). In addition, regions with lower inequality may attract worse-off households in search of social protection, migrating from more unequal regional systems. As a consequence, average incomes may decrease in the former and increase in the latter, supporting a positive inequality–growth relationship (Partridge, 1997, p. 1030).

The fact that our analysis refers to developed countries also provides support for the evidence of a positive inequality–growth relationship (Brandolini and Rossi, 1997). For example, the growth-curbing "credit constraints" channel (Barro, 2000, p. 18) may be an important factor only in developing or poorer countries, but not so influential in developed contexts, where financial markets are usually available and functioning. Conversely, a positive link in developed countries may also be related to the above discussed SBTC effect, which generates labor market adjustments toward skill-intensive labor, a primary source of growth which, at least during the adjustment, may promote inequality (Partridge, 1997, pp. 1020, 1030). However, in this case, disentangling the direction of causality is quite complex.

Thus, deactivation of major growth-inhibiting factors may tip the balance in favor of growth-promoting factors, particularly the role of observed inequality as an incentive toward undertaking investments (in human and physical capital) or encouraging work efforts (Partridge, 1997, p. 1030). If economic agents consider the fiscal and social benefits system as given in the short term, and therefore disregard the political economy effects of nation-level inequality, the significant inequality level from which they draw information for micro-economic incentives is the regional one. This does supply closer and more visible evidence of potential investment/effort revenues obtained by agents operating in the same economic, social and institutional contexts, providing more contiguous examples of successful economic patterns.

5. Summary and Final Remarks

In this paper we provided an analysis on the determinants of regional income inequality in Europe and its effects on growth. We first reviewed the broad existing literature on these fields, and then considered the specific features, in particular those related to factor mobility, emerging when analysis is carried out at subnational levels. Our empirical analysis was carried out using two datasets of regional inequality for several European countries (Mahler, 2002; Hoffmeister, 2006a), derived from available data of the Luxembourg Income Study. Our descriptive analysis shows remarkable diversification of regional income inequality not only across Europe, but also within single countries. In addition, the spatial descriptive tools employed supply evidence of spatial patterns of inequality across the regions considered, which are not totally captured by national boundaries and thus institutional and structural diversities.

The econometric estimates on the determinants of regional inequality supply variegated outcomes. This is partly due to the difference in space and time coverage for the two datasets and to the availability of data on possible explanatory variables. In any case, although a univocal picture does not emerge, the results clearly highlight the crucial importance of: (i) national level factors, in particular related to institutional settings of the labor market and welfare state; and (ii) quantitative and qualitative regional labor market features. These results are of major political concern for Europe, in view of the considerable variability of performance and dynamic patterns of regional labor markets, and the ongoing debate about labor market and welfare state reforms in many member countries.

Our second empirical analysis was focused on the impact of inequality on regional growth. In general the results suggest that more regional inequality may promote higher regional growth in the short and medium term, although the significance and strength of the relationship decreases for the econometric models which take into account the spatial structure of the data. In interpreting these results we must bear in mind that our analysis is cross-sectional, and the recent literature on the topic has clearly stressed that the use of panel data approaches may produce opposite results. Therefore, further research efforts should be devoted to test the stability of the results obtained here, which would suggest the prevalence of growth-promoting over growth-inhibiting forces activated by inequality. If these findings were confirmed, they may be explained theoretically in the light of the three distinctive factors of our analysis (short- and medium-term, regional level, developed regions), which all may contribute toward weakening the main channels that justify a negative relationship. Deactivation of the major growth-inhibiting factors, due to the short period considered and to the consideration of developed context, and the various effects produced by higher factor mobility may indeed tip the balance in favor of growth-promoting factors, particularly the role of observed inequality as an incentive to undertaking investments (in human and physical capital) or to encourage work efforts. From this point of view, we also stress the importance of the (closer) regional level of observed inequality in supplying important information on which economic incentives and consequent behavior may be shaped.

If the existence of a positive inequality/growth link were confirmed in future researches, this would not mean that policy-makers interested in growth should necessarily promote inequality since, as emphasized by Forbes (2000) and supported by our interpretation, this positive relationship in the short term is not incompatible with a negative one in the long term. Similarly, a national-scale negative relationship may coexist with the regional positive one, at least partly due to higher factor mobility (Fallah and Partridge, 2006).

Our results, although they must be interpreted with caution, represent a starting point for further, more comprehensive and complex in-depth efforts, able to provide policy-makers with informative data on regional dynamics complementary to those already existing at broader or different geographical levels.

Appendix A

TABLE A1
Regions Considered in the Empirical Analysis

Mahler–1995 Database		Hoffmeister–2000 Database All NUTS1 level	
FRANCE (NUTS2)	*ITALY (NUTS2)*	*AUSTRIA*	*LUXEMBOURG*
Alsace	Abruzzo	Ostosterreich	
Aquitaine	Basilicata	Westosterreich	*SPAIN*
Auvergne	Calabria	Sudosterreich	Canarias (ES)
Basse-Normandie	Campania		Centro (ES)
Bourgogne	Emilia Romagna	*BELGIUM*	Este
Brittany	Friuli Venezia Giulia	Flanders	Noroeste
Centre	Lazio	Wallonia	Com. de Madrid
Cham.-Ardennes	Liguria	Brussels	Noreste
Corsica	Lombardia		Sur
Franche-Comté	Marche	*FINLAND*	
Haute-Normandie	Molise		*SWEDEN*
Ile-de-France	Piemonte	*GERMANY*	
Langeudoc-Roussillon	Abulia	Hamburg	*UNITED KINGDOM*
Limousin	Sardegna	Berlin	London
Lorraine	Sicilia	Hessen	South-East
Midi-Pyrénées	Trentino-Alto Adige	Bayern	Eastern
Nord-Pas-de-Calais	Toscana	Bremen	North-West
Pays-de-la-Loire	Umbria	Schleswig-Holstein	West Midlands
Picardie	Veneto	Niedersachsen	South West
Poitou-Charentes		Nordrhein-Westfalen	Yorkshire-
Provence-Alpes-Cote		Rheinl.-Pfalz-Saarland	Scotland
Rhone-Alpes		Baden-Wuttemberg	East Midlands
	UNITED KINGDOM	Meckl.-Vorpommern	Wales
*GERMANY (NUTS1)**	*(NUTS1)*	Brandenburg	North-East
Baden-Wurttemberg	East Anglia	Sachsen-Anhalt	
Bavaria	East Midlands	Sachsen	*ESTONIA*
Brandenburg-W.Pom.	Greater London	Thuingen	
Bremen	North		*HUNGARY*
Hamburg	Northern Ireland	*GREECE*	Kozep-Magyarorszag
Hesse	North-west	Kentriki-Ellada	Dunantul
Lower Saxony	Scotland	Voreia-Ellada	Alfold-es-Eszak
Mecklenburg	South-east	Nisia-Aigaiou.-Kriti	
N.Rhine-Westphalia	South-west	Attiki-(incl. Gr.Athens)	*POLAND*
Rhineland-Palatinate	Wales		Centralny
Saxony	West Midlands	*IRELAND*	Polnocno-Zachodni
Saxony-Anhalt	Yorkshire Humberside		Polnocny
Schleswig-Holstein		*ITALY*	Poludniowo-Zachodni
Thuringia		Isole	Wschodni
		Sud (IT)	Poludniowy
		Nord Ovest	
		Nord Est	*SLOVENIA*
		Centro (IT)	

Notes: *In Mahler database, East and West Berlin are considered separately, and were excluded from the analysis.

TABLE A2

List and Abbreviations of Variables Used in Econometric Estimates

Variable	Definition	Source	Group in Equations (1), (4), (5)*
GDP	GDP per inhabitant in PPP	Eurostat Regio	
DENS	Population density	Eurostat Regio	
ER_agri	Employment in agriculture and fisheries (A_B)/population aged 15–64	Eurostat Regio	
ER_industry	Employment in industry (C_F)/population aged 15–64	Eurostat Regio	
ER_mkt_serv	Employment in marketable services (G_K)/population aged 15–64	Eurostat Regio	
ER_other_serv	Employment in other services (L_P)/population aged 15–64	Eurostat Regio	
DEV	Level of economic development (first factor of PCA using GDP, DENS, ER_mkt_serv, ER_agri)		
ER	Employment/population aged 15–64	Eurostat Regio	
FER	Female employment/female population aged 15–64	Eurostat Regio	
UR	Unemployed/labor force	Eurostat Regio	
LONG_ur	Unemployed >12 months/labor force	Eurostat Regio	ECON
SELF_e	Self-employment/total employment	Eurostat Regio	
PART_t	Part-time employment/total employment	Eurostat Regio	
LAB_MKT_PERF	Labor market performance (first factor of PCA using ER, FER, UR, LONG_ur)		
EMPL (age)	Employment in age classes (15–24; 25–34; 35–44; 45–54; 55–64, over 65)/total employment	Eurostat Regio	
R_D	Total (business enterprise sector) intramural R&D expenditure as % of GDP	Eurostat Regio	
INN	Patent applications to EPO per million inhabitants	Eurostat Regio	
HC	Population with at least upper secondary education—levels 3–6 (ISCED 1997)/population aged 15 years and over	Eurostat Regio	
HC1	Upper secondary and post-secondary non-tertiary education—levels 3–4 (ISCED 1997)/population aged 15 years and over	Eurostat Regio	
HC2	Tertiary education—levels 5–6 (ISCED 1997)/population aged 15 years and over	Eurostat Regio	
POP > 65	Share of population aged 65 years and more	Eurostat Regio	DEMO
UNION_adj[#]	Union density (% of unionized workers on total) * share of dependent employment	OECD Employment Outlook 2004 and Eurostat	
CENTR_adj[§]	Indicator of bargaining centralization (range 1–5) * share of dependent employment	OECD Employment Outlook 2004 and Eurostat	INST
COORD_adj[§]	Indicator of bargaining coordination (range 1–5) * share of dependent employment	OECD Employment Outlook 2004 and Eurostat	
WELF	Expenditure in social protection benefits as a % of GDP	Eurostat	

Notes: *ECON: economic/structural variables; DEMO: demographic variables; INST: institutional variables.

[#]Only available for 1990 and 2000, so average values were used for Mahler–1995 database. Not available for Estonia and Slovenia, to which average for other Central and Eastern European (CEE) countries was attributed.

[§]Not available for Estonia, Slovenia, Luxembourg and Greece. Average values of the corresponding groups (CEE and EU-15, respectively) were assigned to these countries.

TABLE A3

Effects of Income Inequality (Gini) on Regional % Growth 1995–2004, Mahler–1995 Database (ML Spatial LAG)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (log)	–0.40	–0.43	–0.62*	–0.30	–0.61	–0.42	–0.82*
GINI	3.01*	3.64**	3.79**	2.17	3.66**	3.64**	3.81**
HC	–	5.82***	5.53***	5.40***	4.98**	5.83***	4.56**
ER_AGRI	–	–	–0.05	–	–	–	–0.06
ER_IND	–	–	–	–0.02*	–	–	–
ER_SERV	–	–	–	–	0.01*	–	0.02*
R_D	–	–	–	–	–	0.00	–0.00
D_Italy	–0.98***	1.01*	1.01*	0.89*	0.86	1.00*	0.84
D_France	–0.35**	1.15***	1.16***	1.00**	1.00**	1.15***	0.99**
Constant	5.30*	1.62	3.64	1.26	3.42	1.52	5.76
ρ	0.50***	0.34***	0.35***	0.39***	0.32**	0.34***	0.32**
Observations	63	63	63	63	63	63	63
Sq. cor. (pseudo R^2)	0.73	0.77	0.77	0.78	0.77	0.77	0.77

Notes: ***Significant at 1%; **significant at 5%; *significant at 10%.

TABLE A4

Effects of Income Inequality (90/10 ratio) on % Regional Growth (1995–2004), Mahler–1995 Database (ML Spatial LAG)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (log)	–0.30	–0.29	–0.46	–0.19	–0.49*	–0.28	–0.71*
90/10 ratio	0.28*	0.11	0.24*	0.02	0.29*	0.21*	0.22*
HC	–	5.74***	5.46***	5.14***	4.80**	5.75***	4.38**
ER_AGRI	–	–	–0.05	–	–	–	–0.05
ER_IND	–	–	–	–0.03**	–	–	–
ER_SERV	–	–	–	–	0.01	–	0.02
R_D	–	–	–	–	–	–0.00	0.01
D_Italy	–0.84***	1.13**	1.13**	0.93*	0.97	1.13**	0.95
D_France	–0.31*	1.18***	1.19***	0.94**	1.01**	1.18***	1.00**
Constant	4.56	0.57	2.48	0.83	2.58	0.53	4.94
ρ	0.56***	0.41***	0.42***	0.46***	0.39***	0.41***	0.39***
Observations	63	63	63	63	63	63	63
Sq. cor. (pseudo R^2)	0.73	0.77	0.77	0.78	0.77	0.77	0.77

Notes: ***Significant at 1%; **significant at 5%; *significant at 10%.

TABLE A5

Effects of Income Inequality on % Regional Growth (2000–2004), Hoffmeister–2000 Database (ML Spatial Lag)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (log)	–0.66**	–0.65**	–1.27***	–0.64**	–1.25*	–0.36	–1.32**
MLD	4.52*	4.50*	5.23**	3.83*	3.01	3.77*	2.82
HC	–	–0.03	–0.45	–0.00	–1.06	0.26	–0.97
ER_AGRI	–	–	–0.06*	–	–	–	–0.04
ER_IND	–	–	–	–0.02	–	–	–
ER_SERV	–	–	–	–	0.03	–	0.03
R_D	–	–	–	–	–	–0.29*	–0.33**
D_Hungary	1.44***	1.44***	1.10*	1.48***	1.37**	1.41***	1.09*
D_Italy	–2.13***	–2.14***	–2.25***	–2.09***	–2.08***	–2.30***	–2.35***
D_Slovenia	2.20***	2.20***	2.27***	2.32***	2.34***	2.19***	2.37***
D_Luxembourg	2.39***	2.38***	2.72***	2.31***	2.57***	2.24***	2.65***
Constant	8.17**	8.17**	14.67**	8.33**	13.58**	5.50	14.98**
ρ	0.37***	0.37***	0.36***	0.38***	0.36***	0.36***	0.34***
Observations	58	58	58	58	58	58	58
Sq. cor. (pseudo R^2)	0.69	0.69	0.70	0.69	0.69	0.70	0.72

Notes: ***Significant at 1%; **significant at 5%; *significant at 10%.

References

Acemoglu, D., "Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality," *Quarterly Journal of Economics*, 113(4), 1055–90, 1998.

Aghion, P., E. Caroli, and C. Garcia-Penalosa, "Inequality and Economic Growth: The Perspective of the New Growth Theories," *Journal of Economic Literature*, 37(4), 1615–60, 1999.

Albarrán, P., R. Carrasco, and M. Martínez-Granado, "Inequality for Wage Earners and Self-Employed: Evidence from Panel Data," *DFAEII Working Papers 200702*, University of the Basque Country, Department of Foundations of Economic Analysis II, 2007.

Alesina, A. and D. Rodrik, "Distributive Politics and Economic Growth," *Quarterly Journal of Economics*, 109(2), 465–90, 1994.

Anselin, L., *Spatial Econometrics: Methods and Models*, Kluwer Academic Publishers, Dordrecht/Boston/London, 1988.

———, *Spatial Econometrics*, Bruton College, University of Texas at Dallas, mimeo, 1999.

Arrow, K. J., "The Trade-off between Growth and Equity," in H. I. Greenfield *et al.* (eds), *Theory for Economic Efficiency: Essays in Honour of Abba P. Lerner*, MIT Press, Cambridge, MA, 1–11, 1979.

Atkinson, A. B., L. Rainwater, and T. M. Smeeding, *Income Distribution in OECD Countries. Evidence from the Luxembourg Income Study*, OECD, Paris, 1995.

Atkinson, A. B. and A. Brandolini, "From Earnings Dispersion to Income Inequality," in F. Farina and E. Savaglio (eds), *Inequality and Economic Integration*, Routledge, London, 35–62, 2006.

Atzeni, S., B. Dettori, and S. Usai, "L'Econometria per le Indagini Territoriali," *Quaderni di Lavoro CRENoS*, 1, 2004.

Banerjee, A. J. and E. Duflo, "Inequality and Growth: What Can the Data Say?" *Journal of Economic Growth*, 8(3), 267–99, 2003.

Barro, R. J., "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth*, 112(1), 5–32, 2000.

Bénabou, R., "Inequality and Growth," in B. S. Bernanke, and J. J. Rotemberg (eds), *NBER Macroeconomics Annual 1996*, MIT Press, Cambridge and London, 11–73, 1996a.

———, "Heterogeneity, Stratification, and Growth: Macroeconomic Implications of Community Structure and School Finance," *American Economic Review*, 86(3), 584–609, 1996b.

Benito, J. M. and R. Ezcurra, "Spatial Disparities in Productivity and Industry Mix: The Case of the European Regions," *European Urban and Regional Studies*, 12(2), 177–94, 2005.

Berman, E., J. Bound, and Z. Griliches, "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers," *The Quarterly Journal of Economics*, 109(2), 367–97, 1994.

Bertola, G., "Factor Shares and Savings in Endogenous Growth," *American Economic Review*, 83(5), 1184–98, 1993.

———, "Macroeconomics of Distribution and Growth," in A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution*, Elsevier Science, North-Holland, 477–540, 2000.

Bishop, J. A., J. P. Fromby, and P. D. Thistle, "Explaining Interstate Variation in Income Inequality," *Review of Economic and Statistics*, 74(3), 553–7, 1991.

Blanchflower, D. G. and M. J. Slaughter, "The Causes and Consequences of Changing Income Inequality," in A. Fishlow and K. Parker (eds), *Growing Apart: The Causes and Consequences of Global Wage Inequality*, Council on Foreign Relation Press, Washington DC, 67–94, 1999.

Blau, F. and L. Kahn, "International Differences in Male Wage Inequality: Institutions Versus Market Forces," *Journal of Political Economy*, 104(4), 791–837, 1996.

Borjas, G. J. and V. A. Ramey, "Time-Series Evidence on the Sources of Trends in Wage Inequality," *American Economic Review*, 84(2), 10–16, 1994.

Borjas, G. J., R. Freeman, and L. Katz, "On the Labor Market Effects of Immigration and Trade," in G. J. Borjas and R. B. Freeman (eds), *Immigration and the Work Force*, University of Chicago Press, Chicago, 213–44, 1992.

Bradbury, K. L., "The Changing Fortune of American Families in the 1980s," *New England Economic Review*, July/August, 25–40, 1990.

Brandolini, A. and N. Rossi, "Income Distribution and Growth in Industrial Countries," in V. Tanzi and C. Ke-young (eds), *Income Distribution and High-Quality Growth*, MIT Press, Cambridge, MA, 69–105, 1997.

Burniaux, J., F. Padrini, and N. Brandt, "Labour Market Performance, Income Inequality and Poverty in OECD Countries," *OECD Economic Department Working Papers*, 500, 2006.

Cannari, L. and G. D'Alessio, "La Distribuzione del Reddito e Della Ricchezza Nelle Regioni Italiane," *Temi di Studio della Banca d'Italia*, 482, Banca d'Italia, Roma, 2003.

Card, D., "The Effect of Unions on Wage Inequality in the U.S. Labor Market," *Industrial and Labor Relations Review*, 54(2), 296–315, 2001.

Card, D., T. Lemieux, and W. C. Riddell, "Unionization and Wage Inequality: A Comparative Study of the US, UK, and Canada," *NBER Working Paper*, W9473, 2003.

Castles, E. and D. Mitchell, "Identifying Welfare State Regimes: The Links between Politics, Instruments and Outcomes," *Governance*, 5(1), 1–26, 1992.

Davis, S. J., "Cross-Country Patterns of Change in Relative Wages," in O. Blanchard and S. Fisher (eds), *NBER Macroeconomics Annual 1992*, MIT Press, Cambridge, MA, 239–92, 1992.

Deininger, K. and L. Squire, "A New Data Set Measuring Income Inequality," *World Bank Economic Review*, 10(3), 565–91, 1996.

———, "New Ways of Looking at Old Issues: Inequality and Growth," *Journal of Development Economics*, 57(2), 259–87, 1998.

Di Nardo, J., N. Fortin, and T. Lemieux, "Labor Market Institutions and the Distribution of Wages, 1973–1992: A Semiparametric Approach," *Econometrica*, 64(5), 1001–4, 1996.

Dollar, D. and A. Kraay, "Trade, Growth, and Poverty," *Economic Journal*, 114(493), F22–F49, 2004.

Ederveen, S., R. Nahuis, and A. Parikh, "Labour Mobility and Regional Disparities: The Role of Female Labour Participation," *Journal of Population Economics*, 20(4), 895–913, 2007.

Edin, P. and B. Holmlund, "The Swedish Wage Structure: The Rise and Fall of Solidarity Wage Policy?" in R. B. Freeman and L. F. Katz (eds), *Differences and Changes in Wage Structures*, University of Chicago Press, Chicago, 1995.

Erickson, C. and A. Ichino, "Wage Differentials in Italy: Market Forces, Institutions and Inflation," in R. B. Freeman and L. F. Katz (eds), *Differences and Changes in Wage Structures*, University of Chicago Press, Chicago, 268–305, 1995.

Esping-Andersen, G., *The Three Worlds of Welfare Capitalism*, Princeton University Press, 1990.

Fallah, B. and M. D. Partridge, "The Elusive Inequality-Economic Growth Relationship: Are There Differences between Cities and the Countryside?" *The Annals of Regional Science*, 41(2), 375–400, 2006.

Falter, J., "Self-Employment and Earning Inequality," *Journal of Income Distribution*, 16(2), 106–27, 2007.

Forbes, K. J., "A Reassessment of the Relationship between Inequality and Growth," *American Economic Review*, 90(4), 869–87, 2000.

Forster, M., D. Jesuit, and T. Smeeding, "Regional Poverty and Income Inequality in Central and Eastern Europe: Evidence from the Luxembourg Income Study," *LIS Working Paper*, 342, 2002.

Fortin, N. and T. Lemieux, "Institutional Change and Rising Wage Dispersion," *American Economic Review*, 86(2), 240–5, 1996.

———, "Institutional Changes and Rising Wage Inequality: Is There a Linkage?" *Journal of Economic Perspectives*, 11(2), 75–96, 1997.

Freeman, R. B. and L. Katz, "Rising Wage Inequality: The United States vs. Other Advanced Countries," in R. B. Freeman (ed.), *Working Under Different Rules*, Russell Sage Foundation, New York, 29–62, 1994.

Frank, M. W., "Inequality and Growth in the United States: Evidence from a New State-level Panel of Income Inequality Measures," *Economic Inquiry*, doi:10.1111/j.1465-7295.2008.00122.x, 2008.

Fujita, M., P. Krugman, and A. J. Venables, *The Spatial Economy*, MIT Press, Cambridge, MA, 1999.

Galbraith, J. and E. Garcilazo, "Pay Inequality in Europe 1995-2000: Convergence Between Countries and Stability Inside," *European Journal of Comparative Economics*, 2(2), 139–75, 2005.

Galor, O. and D. Tsiddon, "Technological Progress, Mobility and Economic Growth," *American Economic Review*, 87(3), 368–82, 1997.

Galor, O. and J. Zeira, "Income Distribution and Macroeconomics," *Review of Economic Studies*, 60(1), 35–52, 1993.

Garcia-Penalosa, C., "The Paradox of Education or the Good Side of Inequality," *Oxford Economic Papers*, 47(2), 265–85, 1995.

Goerlich, F. J. and M. Mas, "Inequality in Spain 1973–91: Contribution to a Regional Database," *Review of Income and Wealth*, 47(3), 361–78, 2001.

Gottschalk, P., "Changes in Inequality of Family Incomes in Seven Industrial Countries," *American Economic Review*, 83(2), 136–42, 1993.

Greenwood, J. and B. Jovanovic, "Financial Development, Growth, and the Distribution of Income," *Journal of Political Economy*, 98(4), 942–63, 1990.

Gustafsson, B. and M. Johansson, "In Search of Smoking Guns: What Makes Income Inequality Vary over Time in Different Countries?" *American Sociological Review*, 64(4), 585–605, 1999.

Hoffmeister, O., "Inequality of Personal Income in the Enlarged EU: The Role of the Welfare States, Regional Cohesion Policies and Economic Integration," *LIS Working Paper*, 440, 2006a.

———, "Inequality of Incomes on Both Sides of the Odra: The Contribution of the Regional Dimension," *LIS Working Paper*, 439, 2006b.

Holsch, K. and M. Kraus, "European Schemes of Social Assistance: An Empirical Analysis of Set-ups and Distributive Impacts," *LIS Working Paper*, 312, 2002.
Jenkins, S. P., "Accounting for Income Inequality Trends: Decomposition Analyses for the U.K., 1971–1986," *Economica*, 62, 29–63, 1995.
Jesuit, D., L. Rainwater, and T. Smeeding, "Regional Poverty Within Rich Countries," *LIS Working Paper*, 318, 2002.
Jesuit, D. and V. A. Mahler, "Fiscal Redistribution in the Developed Countries: New Insights from the Luxembourg Income Study," *Socio-Economic Review*, 4(3), 483–511, 2006.
Kahn, L. M., "Wage Inequality, Collective Bargaining, and Relative Employment from 1985 to 1994: Evidence from Fifteen OECD Countries," *Review of Economics and Statistics*, 82(4), 564–79, 2000.
Kaldor, N., "A Model of Economic Growth," *Economic Journal*, 67, 591–624, 1957.
Kim, K. S., "Income Distribution and Poverty: An Interregional Comparison," *World Development*, 25(11), 1909–24, 1997.
Koeniger, W., M. Leonardi, and L. Nunziata, "Labour Market Institutions and Wage Inequality," *IZA Discussion Paper*, 1291, 2004.
Korpi, W. and J. Palme, "The Paradox of Redistribution and Strategies of Equality: Welfare State Institutions, Inequality, and Poverty in the Western Countries," *American Sociological Review*, 63(5), 611–87, 1998.
Kuznets, S., "Economic Growth and Income Inequality," *American Economic Review*, 45(1), 1–28, 1955.
Li, H. and H. Zou, "Income Inequality is Not Harmful for Growth: Theory and Evidence," *Review of Development Economics*, 2(3), 318–34, 1998.
Li, H., L. Squire, and H. Zou, "Explaining International and Intertemporal Variations in Income Inequality," *The Economic Journal*, 108(446), 26–43, 1998.
Litchfield, J. A., "Inequality: Methods and Tools," *World Bank PovertyNet*, http://www.worldbank.org/poverty, 1999.
Machin, S. J., "The Decline of Labour Market Institutions and the Rise in Wage Inequality in Britain," *European Economic Review, Papers and Proceedings*, 41(3–5), 647–58, 1997.
Mahler, V. A., "Exploring the Subnational Dimension of Income Inequality: An Analysis of the Relationship Between Inequality and Electoral Turnout in the Developed Countries," *International Studies Quarterly*, 46(1), 117–42, 2002.
Manacorda, M., "Can the Scala Mobile Explain the Fall and Rise of Earnings Inequality in Italy: A Semiparametric Analysis, 1977–93," *Journal of Labor Economics*, 22(3), 585–614, 2004.
Mauro, P., "Corruption, Country Risk, and Growth," *Quarterly Journal of Economics*, 110(3), 681–712, 1995.
McManus, P., "Married Women's Work Trajectories and Income Inequality in Germany, Great Britain and the United States," Paper presented at the Annual Meeting of the American Sociological Association, TBA, New York, August 11, 2007.
Meager, N., G. Court, and J. Moralee, *Self-employment and the Distribution of Income*, The Institute of Manpower Studies, Brighton, 1994.
———, "Self-employment and the Distribution of Income," in J. Hills (ed.), *New Inequalities*, Cambridge University Press, Cambridge, 208–35, 1996.
Monastiriotis, V., "Inter- and Intra-Regional Wage Inequalities in the UK: An Examination of the Sources of UK Wage Inequalities and their Evolution," *ERSA Conference Papers*, 2000.
Moreno, R., R. Paci, and S. Usai, "Geographical and Sectoral Clusters of Innovation in Europe," *The Annals of Regional Science*, 39(4), 715–39, 2005.
North, D. C., "Institutional Competition," *Economic History from Econ WPA*, 9411, 1994.
OECD, *OECD Employment Outlook 2004*, OECD, Paris, 2004.
Okun, A. M., *Equality and Efficiency: The Big Trade Off*, Brookings Institution, Washington DC, 1975.
Paci, R. and F. Pigliaru, "Technological Diffusion, Spatial Spillovers and Regional Convergence in Europe," in J. R. Cuadrado and M. Parellada (eds), *The European Monetary Union and Regional Convergence*, Springer, Berlin, 273–92, 2002.
Panizza, U., "Income Inequality and Economic Growth: Evidence from American Data," *Journal of Economic Growth*, 7(1), 25–41, 2002.
Parker, S. C., "The Distribution of Self-employment Income in the U.K., 1976-1991," *Economic Journal*, 107, 455–66, 1997.
———, "The Inequality of Employment and Self-employment Incomes: A Decomposition Analysis for the U.K.," *Review of Income and Wealth*, 45(2), 236–74, 1999.
Partridge, M. D., "Is Inequality Harmful for Growth? Comment," *American Economic Review*, 87(5), 1019–31, 1997.
———, "Does Income Distribution Affect US State Economic Growth?" *Journal of Regional Science*, 45(2), 363–94, 2005.

———, "The Relationship between Inequality and Labor Market Performance: Evidence from U.S. States," *Journal of Labour Research*, 27(1), 1–20, 2006.
Partridge, M. D., D. S. Rickman, and W. Levernier, "Trends in US Income Inequality: Evidences from a Panel of States," *The Quarterly Review of Economics and Finance*, 36(1), 17–37, 1996.
Perotti, R., "Growth, Income Distribution, and Democracy: What the Data Say," *Journal of Economic Growth*, 1(2), 149–87, 1996.
Persson, T. and G. Tabellini, "Is Inequality Harmful for Growth?" *American Economic Review*, 84(3), 600–21, 1994.
Pisati, M., "Tools for Spatial Data Analysis," *Stata Technical Bulletin*, 60, 21–37, 2001.
Rainwater, L., T. M. Smeeding, and J. Coder, "Child Poverty Across States, Nations and Continents," in K. Vleminckx and T. M. Smeeding (eds), *Child Well-Being, Child Poverty and Child Policy in Modern Nations: What Do We Know?* The Policy Press, Bristol, 2001.
Richardson, D. J., "Income Inequality and Trade: How We Think, What We Conclude," *Journal of Economic Perspectives*, 9(3), 33–55, 1995.
Robbins, D., "Evidence on Trade and Wages in the Developing World," *OECD Technical Paper*, 119, Paris, 1996.
Robinson, S., "A Note on the U-hypothesis Relating Income Inequality and Economic Development," *American Economic Review*, 66(3), 437–40, 1976.
Runciman, W. G., *Relative Deprivation and Social Justice*, Routledge and Kegan Paul/Penguin Books, London, 1966.
Saint-Paul, G. and T. Verdier, "Education, Democracy and Growth," *Journal of Development Economics*, 42(2), 399–407, 1993.
Silverman, B. W., *Density Estimations for Statistics and Data Analysis*, Chapman and Hall, New York, 1986.
Slottje, D. J. and B. Raj, "Income Inequality and Poverty Empirics: New Tools and Perspectives," in D. J. Slottje and B. Raj (eds), *Income, Inequality, Poverty, and Economic Welfare*, Physica-Verlag, 3–11, 1998.
Stier, H. and N. Lewin-Epstein, "Women's Part-Time Employment and Gender Inequality in the Family," *Journal of Family Issues*, 21(3), 390–410, 2000.
Stiglitz, J., "The Distribution of Income and Wealth Among Individuals," *Econometrica*, 37(3), 382–97, 1969.
Sukiassyan, G., "Inequality and Growth: What Does the Transition Economy Data Say?" *Journal of Comparative Economics*, 35(1), 35–56, 2007.
Tanninen, H., "Income Inequality, Government Expenditures and Growth," *Applied Economics*, 31(9), 1109–17, 1999.
Topel, R. H., "Regional Labor Markets and the Determinants of Wage Inequality," *American Economic Review*, 84(2), 17–22, 1994.
Tullock, G., *The Economics of Income Redistribution*, 2nd edition, Kluwer, Boston, MA, 1997.
Wildasin, D. E., "Comment on Douglass C. North, 'Institutional Competition'," in H. Siebert (ed.), *Locational Competition in the World Economy*, J.C.B. Mohr, Tubingen, 38–44, 1995.
———, "Factor Mobility and Redistributive Policy: Local and International Perspectives," in P. B. Sorensen (ed.), *Public Finance in a Changing World*, Macmillan, London, 151–92, 1998.
———, "Factor Mobility and Fiscal Policy in the EU: Policy Issues and Analytical Approaches," *Economic Policy*, 15(31), 337–78, 2000.
———, "Fiscal Competition in Space and Time," *Journal of Public Economics*, 87(11), 2571–88, 2003.
———, "Fiscal Competition," in B. R. Weingast and D. Wittman (eds), *The Oxford Handbook of Political Economy*, Oxford University Press, 502–20, 2006.
Wood, A., "How Trade Hurts Unskilled Workers," *Journal of Economic Perspectives*, 9(3), 57–80, 1995.
Wu, X., J. M. Perloff, and A. Golan, "Effects of Government Policies on Urban and Rural Income Inequality," *The Review of Income and Wealth*, 52(2), 213–35, 2006.