REGIONAL GROWTH IN PORTUGAL: ASSESSING THE CONTRIBUTION OF EARNINGS AND EDUCATION INEQUALITY

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Abstract: Regional economic growth in Portugal has mainly been studied from the perspective of convergence with data ending by the early 2000's. The country as a whole has stopped converging to the output levels of the richest European countries by this period and has also become one of the most unequal EU member-states in terms of income distribution in the meantime. It is thus important to analyze the growth performance at the regional level in a more recent period, 1995-2007, emphasizing regional disparities in inequality as explanatory factors. This study examines the relationship between inequality and regional growth in Portugal at NUTS III level exploring the explanatory power of earnings and education inequality measures computed with data from the *Quadros de Pessoal* database. The results point to a positive relationship between initial inequality and regional growth, stronger for education than for earnings inequality, but with earnings inequality measures revealing a higher explanatory power. Moreover, there is evidence that it is inequality at the top end of the distribution that is relevant to explain regional growth, a result that reinforces the higher propensities to save of the richer and the incentives mechanisms of transmission from inequality to growth. Additionally, the evidence on the existence of convergence among Portuguese NUTS III regions during the period under analysis is mixed. These findings are robust to the introduction of most additional control variables and the consideration of alternative measures of earnings and education inequality.

Key words: regional growth, Portugal, earnings inequality, education inequality

Introduction

Portugal joined the European Union in 1986 expecting, among other things, to converge to the income levels of its partner countries. These expectations were fulfilled until around the year 2000 but since then the Portuguese economy has become almost stagnant, with an average annual growth rate of real GDP per capita between the years 2000 and 2007 of 0.53%, less than a third of the EU-27 average growth rate and around a third of the EU-15 average growth rate[2]. Relative to the EU-27, real GDP per capita in Portugal is still only around 60% of the average and in the year 2007 it was even slightly

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[2] Authors' computations based on GDP at 2000 prices and population data from Eurostat.

less than the figure registered in 1995. At the regional level the picture is not much different: between the years 2000 and 2007, twenty eight of the thirty Portuguese NUTS III regions registered a sharp decline in the respective average annual real GDP per capita growth rate[3], relative to the preceding 5 years period (1995-2000). For the seven Portuguese NUTS[4] II regions, with the exception of the performance of *Madeira* that went from around 70% of the EU-27 real GDP per capita regional average in 1996 to approximately 100% in 2007, almost all the other regions remained in more or less the same position in the year 2007 relative to 1996[5].

Portugal has also become one of the most unequal EU member states in terms of income distribution in the meantime. According to the European Commission reports on the social situation in the EU (EC, 2008; EC, 2009; EC, 2010), in the year 2004 Portugal was the most unequal EU-25 member-state, presenting a Gini coefficient for the income distribution of 38% and an income quintile share ratio (S80/S20) of 6.9[6]. In 2006, Portugal registered the same value for the Gini coefficient and a S80/S20 ratio of 6.8[7] and in 2007 the numbers were, respectively, 37% and 6.5[8]. Thus, despite the slight improvement in its relative position, Portugal is still one of the worst performers in terms of inequality in the income distribution within the EU. Several studies focusing on the analyses of either income or earnings distributions in the Portuguese economy also present evidence that there was an increase in inequality during the 1990's and the first years of the new millennium (Rodrigues, 2007; Budria, 2007), although this increase was not evenly distributed throughout the period.

The analysis of the relationship between inequality and economic growth has received a great deal of attention over the years resulting in a large body of theoretical and empirical literature on the subject. At the theoretical level, four views on the relationship between inequality and growth are typically identified (Aghion, Caroli, & García-Peñalosa, 1999; Barro, 2000). The first view, named by Aghion et al. (1999) as "traditional theories", postulates that inequality is good for growth due to its beneficial effects on savings, investment and incentives, with redistribution distorting incentives to save and work. The second view, the fiscal or political economy approach, argues that

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[3] Authors' computations based on information from the Regional Accounts published by INE (www.ine.pt).

[4] Nomenclature of Territorial Units for Statistics (NUTS) established by Eurostat.

[5] *Açores (The Azores)* also improved its position relative to the EU-27 regional average from 1996 to 2007 but this improvement was less impressive than that of *Madeira*: it moved from around 60% to more or less 70% of the EU-27 regional average.

[6] See EC (2008), p. 125. The S80/S20 income quintile share ratio corresponds to the ratio between the total income of the member state received by the top (highest income) 20% of the population and that received by the bottom (lowest income) 20% of the population.

[7] See EC (2009), p. 119. The most unequal country in this year was Latvia with a Gini coefficient of 39% (the EU-27 average was 30%) and a S80/S20 ratio of 7.9 (the EU-27 average was 4.8).

[8] See EC (2010), p. 276. The most unequal country in this year was Romania with a Gini coefficient of 39% (the EU-27 average was 31%) and a S80/S20 ratio of 7.8 (the EU-27 average was 5.0).

greater inequality increases public support for redistribution, which leads to higher tax rates on capital accumulation and slower growth of the overall economy. The third view, called the credit markets imperfection approach suggests that barriers to financial markets access when, for instance, insufficient collateral leads some borrowers to forgo high-return projects, constitutes an impediment to capital accumulation and innovation so that higher inequality impedes growth. Finally, the political instability approach, the fourth view, defends that inequality amplifies the risks of social and political crisis with the inherent instability reducing investment and growth. In a recent survey of the literature on inequality and growth from the perspective of industrialized countries, García-Peñalosa (2008) argues that both the sign and the direction of causation depend on the source of growth under consideration, technological change, capital accumulation and changes in the labour supply. An example is the work of Galor and Moav (2004) that reconcile the opposing effects of inequality on growth by taking into account different stages of development and the emergence of human capital accumulation as the prime engine of growth, replacing physical capital accumulation. In the early stages of development physical capital accumulation is the most important driver of economic growth. Since rich individuals have a higher propensity to save, inequality is beneficial for growth. As human capital becomes the prime engine of economic growth, large inequalities, by aggravating the negative impact of credit constraints on human capital accumulation, become detrimental to growth (Hoeller, Joumard, Pisu, & Bloch, 2012).

Recent empirical studies have also failed to reach a consensus on the sign of the effect of inequality upon growth, arriving at varied and sometimes conflicting results. The general picture from cross-country studies of the impact of inequality on economic growth is that initial inequality reduces future growth. The message from panel data studies is however not clear. For instance, among the panel studies that consider wider samples of countries with both developing and developed countries, Forbes (2000) detects a positive relationship that persists across different samples, variables definitions, and model specifications but not the length of period under consideration; Barro (2000) uncovers a negative relationship for poor countries, a positive relationship for rich countries, and an insignificant one for the whole sample; Banerjee and Duflo (2003) present evidence that it is a change in any direction, not the initial level of inequality, that leads to slower future growth; and Voitchovsky (2005), using data on inequality for industrialized countries, concludes that top-end inequality positively influences growth while the influence of bottom-end inequality is negative. In face of the mixed evidence provided by empirical studies, Dominicis, Florax, and De Groot (2008) apply meta-analysis to a set of 22 studies, that give a total of 254 estimates for the coefficient of the inequality measure, with the results showing that the variation in the estimates of the income inequality–growth relation are systematically associated with differences in estimation methods, sample coverage and data quality.

Regional economic growth in Portugal has mainly been studied from the perspective of convergence with data ending by the early 2000s[9], but the country as a whole has stopped converging to the output levels of the richest European countries by this period and performs quite badly in terms of income distribution, as pointed out in the previous paragraphs. It is thus important and relevant in terms of redistributive regional policy to investigate what has happened in terms of growth at the regional level in Portugal in a more recent period, 1995-2007, emphasizing regional disparities in inequality as explanatory factors. Although the empirical literature on the relationship between inequality and growth is well established the empirical studies on this nexus for the Portuguese economy are rather limited. To the best of our knowledge such an analysis has been performed only by Simões, Andrade, and Duarte (2013) and Andrade, Duarte, and Simões (2014). This study extends the existing literature by adopting a regional perspective, following Dominicis et al. (2008) suggestion that empirical studies on the relationship between inequality and growth should focus on using single-country data at the regional level. This is because the inability of recent empirical studies to reach a consensus is rooted in data quality problems, sample coverage variations and the use of different estimation methods that can be mitigated, at least the first two, by taking a regional perspective of a specific country. This work main goal is therefore to examine the relationship between inequality and regional growth in Portugal at NUTS III level, exploring the explanatory power of earnings and education inequality measures computed with data from the *Quadros de Pessoal* database, filling in this way a gap in the literature on (regional) growth in Portugal. The paper also contributes more generally to the empirical literature on the relationship between inequality and growth since this mostly utilizes country level data and does not analyze the sensitivity of the results to the use of income vs. education inequality measures.

Empirical model and results

In order to assess the contribution of earnings and education inequality for growth in the 30 Portuguese NUTS III regions[10] over the period 1995-2007, we estimate what is known in the inequality-growth empirical literature as a reduced-form equation (Perotti, 1996) where output growth is regressed on a measure of initial inequality, initial output and a set of other explanatory variables considered to be relevant growth determinants for the units (regions) under analysis[11].

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[9] See Braga (2004), Dias and Silva (2004), Soukiazis and Antunes (2006), Soukiazis and Proença (2008).

[10] Portugal is composed of 30 NUTS III regions: Minho-Lima, Cávado, Ave, Grande Porto, Tâmega, Entre Douro e Vouga, Douro, Alto Trás-os-Montes, Baixo Vouga, Baixo Mondego, Pinhal Litoral, Pinhal Interior Norte, Dão-Lafões, Pinhal Interior Sul, Serra da Estrela, Beira Interior Norte, Beira Interior Sul, Cova da Beira, Oeste, Médio Tejo, Grande Lisboa, Península de Setúbal, Alentejo Litoral, Alto Alentejo, Alentejo Central, Baixo Alentejo, Lezíria do Tejo, Algarve, Açores, and Madeira.

[11] These regressions can thus also be classified as "Barro" or *ad hoc* growth regressions from the perspective that they include inequality as a regressor along another set of independent variables

We estimate the impact of inequality on growth using a variation of the following cross-regional econometric specification:

$$Growth\_RGDPC_{i,2007-1995} = cons\tan t + \beta \ln RGDPC_{i,1995} + INEQ_{i,1993}\gamma + X_{i,1995}\delta + \varepsilon_i \tag{1}$$

where $Growth\_RGDPC_{i,2007-1995}$ is the annual average growth rate of real GDP per capita in the Portuguese NUTS III region i between 1995 and 2007; $lnRGDPC_{1995}$ is the natural logarithm of initial real GDP per capita that controls for the presence of convergence among the regions, with β predicted to be negative (Barro & Sala-i-Martin, 1991); $INEQ_{1993}$ is a vector of initial inequality measures that might include, simultaneously, measures of earnings and education inequality, introduced with 2-year lags to address possible endogeneity, with no a priori predicted sign for the respective estimated coefficients depending; X is a parsimonious vector of additional control variables that are assumed to influence regional growth, which might include the initial average number of years of education of the workforce (educational attainment) included in *Quadros de Pessoal* database, the regional productive structure measured as the regional employment share in agriculture, manufacturing or the services sectors, and regional dummies, specifically a dummy for the interior or landlocked regions (with coastal regions as the omitted group); and ε is the disturbance term, all measured for NUTS III region *i*. By estimating a cross-section model where the dependent variable is income growth measured during a long period of time we are identifying a long-run effect of inequality on economic growth, which some authors defend as the appropriate time frame to analyze growth influences (Forbes, 2000; Rodríguez-Pose & Tselios, 2010) in order to overcome business cycle effects.

The choice of the additional explanatory variables that compose the vector X was determined by theoretical predictions, the convenience of a parsimonious specification and the availability of regional data for the Portuguese NUTS III regions. Human capital, measured in many empirical growth studies by educational attainment, is expected to influence positively regional growth performance not only due to its role as an ordinary input into production but also as a major input in the production of new ideas (Sianesi & van Reenen, 2003). The influence of the sectoral composition of regional economic activity has also been considered a relevant regional growth determinant in previous studies (Ezcurra, 2007). Although investment ratios have been found to be one of the more robust growth determinants (Sala-i-Martin, 1997) this series is not available at NUTS III level for Portugal. Future research should also include a variable that proxies for the funds Portuguese regions received from the EU during the period under analysis.

Table 1 presents the results of estimating equation (1) using Ordinary Least Squares (OLS). Regressions 1-6 consider only the impact of earnings inequality on regional

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that are believed to influence economic growth, based on the predictions of relevant theoretical growth models. See Barro and Sala-i-Martin (2004).

growth using the Gini coefficient as the earnings inequality measure. The estimated coefficient on initial real per capita GDP is negative as expected but not significant, which confirms the absence of convergence among the Portuguese regions, similar to what has happened at the national level between Portugal and the other EU member states. As far as earnings inequality is concerned, the results point to a positive influence of initial inequality on subsequent regional economic growth since the estimated coefficient on the initial (lagged 2 periods) Gini coefficient of earnings is positive and significant. This result is robust to the introduction of additional control variables[12] (except in regressions 3 and 4 when considering, respectively, the employment shares in agriculture and manufacturing), supporting the view of the classical theories of inequality and growth that higher inequality favors growth due to a higher propensity to save of the rich relative to the poor that leads to higher capital accumulation and thus growth and also since it is good for incentives. As for the additional control variables, apart from the estimated coefficient on the employment share in agriculture, positive and statistically significant, a somewhat puzzling sign, all the other estimated coefficients of the additional control variables are not statistically significant. The estimated coefficient on educational attainment, measured as the average number of years of schooling of the workforce included in *Quadros de Pessoal* database although positive as expected, based on the predictions of both exogenous and endogenous growth model, is not statistically significant.

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[12] Introduced one at a time due to the limited number of observations.

Table 1. Results of the estimation with earnings inequality only

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.0463	0.048	-0.0145	0.0612	0.046	0.0756
	(0.0501)	(0.0593)	(0.0512)	(0.0545)	(0.0594)	(0.0561)
lnRGDPC	-0.0038	-0.0041	0.0029	-0.0046	-0.0037	-0.0070
	(0.0054)	(0.0072)	(0.0056)	(0.0056)	(0.0066)	(0.0059)
Gini earnings	0.0504	0.0493	0.0299	0.0327	0.0504	0.0577
	(0.0246)[a]	(0.0317)[c]	(0.0330)	(0.0350)	(0.0249)[a]	(0.0218)[a]
Educational attainment		0.0002				
		(0.0021)				
Employment share in agriculture			0.0187			
			(0.011)[c]			
Employment share in manufacturing				-0.0132		
				(0.0106)		
Employment share in services				-0.0001		
				(0.0128)		
Dummy Interior						-0.0030
						(0.0031)
R-squared	0.1577	0.1580	0.2067	0.2440	0.1577	0.1785
AIC	-204.22	-202.23	-204.01	-203.46	-202.22	-202.96
BIC	-200.01	-196.62	-198.41	-197.86	-196.61	-197.36
Observations	30	30	30	30	30	30

Notes: heteroscedasticity-consistent standard errors in parentheses. [a], [b], and [c] indicates significance at the 1%, 5% and 10% level, respectively.
Source of data: own calculations.

Regressions 7-12 in Table 2 estimate separately the impact of education inequality on regional economic growth. Again, in all regressions the estimated coefficient on initial real per capita GDP is negative as expected and this time statistically significant (except in regressions 9-11, when considering as additional control variables the regional productive structure measures) indicating this time the existence of convergence among regions. The estimated coefficient on initial education inequality (lagged 2 periods) is positive and statistically significant, except in regressions 8-10 when considering as additional control variables educational attainment and the regional productive structure measures, respectively, the agriculture and the manufacturing employment shares, and higher than for the earnings inequality Gini, again confirming the classical theories predictions according to which inequality creates an incentive to invest more in human capital in order to get higher returns and belong to the wealthier groups of society. This also means that in the Portuguese regions the level of human capital might be high enough in the sense that there is not the risk of falling in a low human capital investment trap in the presence of borrowing constraints. The estimated coefficient on educational attainment is now negative, although not significant, when many growth models show that a higher level of human capital leads to higher income levels and even higher income growth rates since it facilitates the absorption of technologies developed in technologically more advanced countries/regions as well as accelerating discovery or invention (Sianesi & van Reenen, 2003). Apart from the estimated coefficient on the

employment share in agriculture, again positive and statistically significant, all the other estimated coefficients of the additional control variables are not statistically significant.

In regression 13 we estimate the combined impact of earnings and education inequality. When we consider both inequality measures as regressors, the estimated coefficients on the Gini coefficient of earnings and on the Gini coefficient of education are not statistically significant. Contrary to the results of some other previous studies (Castelló-Climent & Doménech, 2002) the consideration of the education inequality measure does not improve the results. In fact, based on the information from the R-squared and AIC and BIC information criteria (see regressions 1 and 7), earnings inequality has a higher explanatory power indicating that this is the relevant inequality measure to explain regional growth in Portugal during the period under analysis.

Finally, in regression 14 we estimate our regional growth regression considering as the sole explanatory variable the initial Gini coefficient of earnings since none of the other variables were significant (except for the employment share in agriculture). The estimated coefficient remains positive and statistically significant as expected[13] but the magnitude of the impact remains small.

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[13] We also run regressions 1 and 14 adding the square of the Gini coefficient as a regressor to test for a non-linear relationship between inequality and growth. The estimated coefficient although negative was not statistically significant.

Table 2. Results of the estimation with education inequality only and joint with earnings inequality

	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Constant	0.0962	0.096	0.0063	0.0920	0.0817	0.1197	0.0588	0.0114
	(0.0471)[a]	(0.0488)[a]	(0.0590)	(0.046)[a]	(0.0573)	(0.0581)[a]	(0.0621)	(0.0045)[a]
lnRGDPC	-0.0111	-0.0110	-0.0005	-0.0087	-0.0094	-0.0138	-0.0058	
	(0.0054)[a]	(0.0056)[a]	(0.0068)	(0.0057)	(0.0066)	(0.0065)[a]	(0.0074)	
Gini earnings							0.0391	0.055
							(0.0380)	(0.0210)[a]
Gini education	0.1012	0.1031	0.0600	0.0521	0.1078	0.1086	0.0327	
	(0.0451)[a]	(0.0725)	(0.0504)	(0.0644)	(0.0460)[a]	(0.0466)[a]	(0.0605)	
Educational attainment		-0.0001						
		(0.0028)						
Employment share in agriculture			0.0208					
			(0.0086)[a]					
Employment share in manufacturing				-0.0147				
				(0.0098)				
Employment share in services					-0.0048			
					(0.0134)			
Dummy Interior						-0.002		
						(0.0034)		
R-squared	0.1343	0.1344	0.2037	0.1735	0.1375	0.1436	0.1614	0.1444
AIC	-203.39	-201.4	-203.9	-202.78	-201.50	-201.72	-202.35	-205.74
BIC	-199.19	-195.79	-198.29	-197.18	-195.9	-196.11	-196.74	-202.94
Observations	30	30	30	30	30	30	30	30

Notes: heteroscedasticity-consistent standard errors in parentheses. [a], [b], and [c] indicates significance at the 1%, 5% and 10% level, respectively.
Source of data: own calculations.

In Table 3 we examine the sensitivity of our results to the inequality measure used to assess earnings and education inequality across the Portuguese NUTS III regions. Most empirical studies on the relationship between inequality and growth use the Gini coefficient as the proxy for inequality. However, the Gini coefficient is quite sensitive to changes in the middle of the distribution, so we use Theil's first measure and Atkinson's index[14] as alternative inequality measures, since these are more sensible to changes in the bottom and the top of the distribution, respectively. Additionally, the Gini, Theil and Atkinson's are aggregate measures of distribution, but the relationship between inequality and economic growth might depend on inequality in different groups of the distribution (top vs. bottom). This issue has been addressed in empirical studies by using alternative measures of inequality, e.g. the share or ratios of certain quintiles or percentiles, and comparing the results with the ones from the estimations that consider the aggregate measure, arriving at some important differences in some cases (Barro, 2000; Voitchovsky, 2005). We thus also investigate the explanatory power of the ratios between percentiles 90% and 50% (P90/P50) and between percentiles 50% and 10%

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[14] With the coefficient of risk aversion to inequality equal to 0.5.

(P50/P10) that provide information on the impact of inequality in different parts of the distribution, top and bottom, respectively.

Regressions 1-4 present the results for the alternative earnings inequality measures. The results do not come significantly altered by considering the alternative measures of earnings inequality[15], although in regression 3 that considers the ratio P90/P50 the R-squared is higher than when we consider the Gini coefficient, an indication that it is higher inequality at the top of the distribution that drives faster growth. Additionally, in regression 4, that considers the ratio P50/P10, the estimated coefficient on this variable is not statistically significant.

Regressions 5-8 present the results for the alternative education inequality measures. Again, the results do not come significantly altered by considering the alternative measures of education inequality[16]. The only exception concerns the results when using the ratio P90/P50 of the distribution of education, which presents a higher explanatory power indicating, in accordance with the results for the earnings inequality measures, that inequality in education at the top of the distribution is the relevant measure to explain regional growth, a result that reinforces the higher propensities to save of the richer and the incentives mechanisms of transmission from inequality to growth.

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[15] The results also do not change when we introduce the additional control variables with the alternative inequality measures. These results can be obtained from the authors upon request.
[16] The results also do not change when we introduce the additional control variables with the alternative inequality measures. These results can be obtained from the authors upon request.

Table 3. Results of the estimation with alternative inequality measures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.0531	0.0535	0.0486	0.0759	0.0977	0.0915	0.0720	0.1214
	(0.0492)	(0.0494)	(0.0531)	(0.0494)	(0.0458)[a]	(0.0465)[a]	(0.0535)	(0.0631)[a]
lnRGDPC	-0.0039	-0.004	-0.0044	-0.0049	-0.0101	-0.0094	-0.0070	-0.0100
	(0.0054)	(0.0054)	(0.0055)	(0.0058)	(0.0052)[a]	(0.0052)[b]	(0.0057)	(0.0063)
Atkinson earnings	0.1229							
	(0.0550)[a]							
Theil earnings		0.0597						
		(0.0289)[a]						
P90/P50 earnings			0.0080					
			(0.0039)[a]					
P50/P10 earnings				-0.0139				
				(0.0125)				
Atkinson education					0.2514			
					(0.1322)[b]			
Theil education						0.1247		
						(0.0652)[b]		
P90/P50 education							0.0055	
							(0.0023)[a]	
P50/P10 education								-0.0101
								(0.0116)
R-squared	0.1463	0.1400	0.1624	0.0871	0.1388	0.1320	0.1836	0.0869
AIC	-203.81	-203.59	-204.38	-201.80	-203.55	-203.31	-205.15	-201.79
BIC	-199.61	-199.39	-200.18	-197.6	-199.35	-199.11	-200.95	-197.59
Observations	30	30	30	30	30	30	30	30

Notes: heteroscedasticity-consistent standard errors in parentheses. [a], [b], and [c] indicates significance at the 1%, 5% and 10% level, respectively.
Source of data: own calculations.

Using either the earnings or the education alternative inequality measures, apart from the results with the P90/P50 ratios, the Gini coefficient presents a higher explanatory power, based on the information from the R-squared and the AIC and BIC information criteria.

Conclusions

This study investigated the contribution of earnings and education inequality for growth in the 30 Portuguese NUTS III regions over the period 1995-2007, by estimating a cross sectional reduced-form specification where output growth is regressed on a measure of initial inequality, initial output and a set of other explanatory variables considered to be relevant regional growth determinants.

The results point to a positive relationship between initial inequality and regional growth, stronger for education than for earnings inequality, but with earnings inequality measures revealing a higher explanatory power. Moreover, the ratio P90/P50 for the earnings and the education distribution of education presents a higher explanatory power

indicating that inequality at the top of the distribution is the relevant measure to explain regional growth, a result that reinforces the higher propensities to save of the richer and the incentives mechanisms of transmission from inequality to growth. Additionally, the evidence on the existence of convergence among Portuguese NUTS III regions during the period 1995-2007 is mixed. These findings are robust to the introduction of most additional control variables and the consideration of alternative measures of earnings and education inequality.

The mechanisms that seem to explain the relationship between inequality and growth in the Portuguese NUTS III regions are those proposed by the classical theories on the subject: inequality is good for growth since richer individuals have higher marginal propensities to save, thus leading to higher capital accumulation, and because it creates an incentive to belong to the wealthiest classes of society leading to higher working effort, both resulting in faster growth. Nevertheless we should be cautious when interpreting this evidence since we were not able to test for specific transmission mechanisms that might explain the relationship between inequality and regional growth. The same applies to policy recommendations based on the results from our cross-sectional reduced-form equations.

As far as the policy implications of these results are concerned, we do not recommend policies aimed at maintaining or increasing regional inequality in Portugal since these might lead to a situation where inequality reaches a much too high level in the sense that it discourages higher working efforts or leads to social instability[17]. The identification of such thresholds for the changing influence of inequality requires a more detailed analysis. Moreover, our results indicate that the positive relationship between inequality and regional growth is most likely due to inequality at the top end of the (earnings or education) distribution and so policies aimed at raising the incomes and levels of education of the poorest are still in order. In any case, the impact of inequality on regional growth is small therefore policies aimed at inequality might not be a priority.

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[17] Additionally, Portugal has a quite high poverty rate. Almost 20% of the Portuguese population is considered poor.

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