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APPLICATION OF CONVERGENCE THEORIES AND NEW ECONOMIC GEOGRAPHY IN PORTUGAL. DIFFERENCES AND SIMILARITIES

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ABSTRACT

The aim of this paper is to present a further contribution, with panel data, to the analysis of absolute convergence, associated with the neoclassical theory, and conditional, associated with endogenous growth theory, of the sectoral productivity at regional level (NUTs III, from 1995 to 1999). They are also presented empirical evidence of conditional convergence of productivity, for each of the economic sectors of the NUTS II of Portugal, from 1995 to 1999. The structural variables used in the analysis of conditional convergence is the ratio of capital/output, the flow of goods/output and location ratio. With this work we try, also, to analyse the agglomeration process in the Portuguese regions, using the New Economic Geography models.

Keywords: convergence; new economic geography; Portuguese regions.

1. INTRODUCTION

Although the agglomeration process have appeared more associated with economic geography, it is however noted that it is based, as the polarization, the earlier ideas of (1)Myrdal (1957) and (2)Hirschman (1958), pioneers of the processes of regional growth with characteristics cumulative. The work developed at the level of economic geography, traditional and recent attempt to explain the location of economic activities based on spatial factors. The liberal economic policies, international economic integration and technological progress have created, however, new challenges that promote agglomeration (3)(Jovanovic, 2000). So, have been developed new tools for economic geography, such as increasing returns, productive linkages, the multiple equilibria (with the centripetal forces in favor of agglomeration and centrifugal against agglomeration) and imperfect competition. These contributions have allowed some innovations in modeling the processes of agglomeration, which has become treatable by economists, a large number of issues. In particular the inclusion of increasing returns in the analytical models, which led to the call of increasing returns revolution in economics (4)(Fujita et al., 2000). (5-7)Krugman (1994, 1995 and 1998) has been the central figure in these developments. (8)Fujita (1988), (9)Fujita et al. (1996) and (10)Venables (1996), in turn, have been leaders in the development and exploration of the implications of economic models of location, based on increasing returns. These developments have helped to explain the clustering and "clustering" of companies and industries.

There are many authors who have dedicated themselves to issues of convergence, with very different theoretical assumptions, trying to investigate how these issues or do not explain the regional differences. For example, the authors associated with the Neoclassical theory, as (11)Solow (1956), consider that the tendency is, for the labor mobility, to alleviate, in the medium and long term, the regional disparities. This, because these authors consider the mobility of factors as a function of wages and the supply of resources as exogenous. Thus, what determines the mobility factor is their compensation. In another context, it appears that the current trend of several economic theories is to consider that the labor mobility accentuates regional disparities. Even writers in the line of neoclassical theory, as (12)Barro and Sala-i-Martin (1991), associated with endogenous growth theory, now admit that the mobility of labor reacts to processes of convergence and reduce regional disparities, but only if some conditions are met. That is, left to disappear the idea of absolute convergence for the same "steady state" of neoclassical influence, to a perspective of conditional convergence for differents "steady states".

2. THE MODELS

The models of the convergence and new economic geography are developed in several works like (13-14)Martinho (2011a and 2011b).

3. DATA ANALYSIS

Considering the variables on the models, referred previously, and the availability of statistical information, we used data for the period from 1995 to 1999, disaggregated at regional level, obtained from the INE (National Accounts 2003).

4. EMPIRICAL EVIDENCE OF ABSOLUTE CONVERGENCE WITH PANEL DATA

Are presented subsequently in Table 1 the results of the absolute convergence of output per worker, obtained in the panel estimations for each of the sectors and all sectors, now at the level of NUTS III during the period 1995 to 1999.

The results of convergence are statistically satisfactory for all sectors and for the total economy of the NUTS III.

Table 1: Analysis of convergence in productivity for each of the economic sectors at the level of NUTS III of Portugal, for the period 1995 to 1999

Agriculture						
Method	**Const.**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
Pooling	0.017 (0.086)	-0.003 (-0.146)	-0.003	2.348	0.000	110
LSDV		-0.938* (-9.041)	-2.781	2.279	0.529	83
GLS	-0.219* (-3.633)	0.024* (3.443)	0.024	1.315	0.097	110
Industry						
Method	**Const.**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
Pooling	0.770* (4.200)	-0.076* (-4.017)	-0.079	1.899	0.128	110
LSDV		-0.511* (-7.784)	-0.715	2.555	0.608	83
GLS	0.875* (4.154)	-0.086* (-3.994)	-0.090	2.062	0.127	110
Services						
Method	**Const.**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
Pooling	0.258 (1.599)	-0.022 (-1.314)	-0.022	1.955	0.016	110
LSDV		-0.166* (-5.790)	-0.182	2.665	0.382	83
GLS	0.089 (0.632)	-0.004 (-0.303)	-0.004	1.868	0.001	110
All sectors						
Method	**Const.**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
"Pooling"	0.094 (0.833)	-0.005 (-0.445)	-0.005	2.234	0.002	110
LSDV		-0.156* (-3.419)	-0.170	2.664	0.311	83
GLS	0.079 (0.750)	-0.004 (-0.337)	-0.004	2.169	0.001	110

Note: Const. Constant; Coef., Coefficient, TC, annual rate of convergence; * Coefficient statistically significant at 5%, ** Coefficient statistically significant at 10%, GL, Degrees of freedom; LSDV, method of fixed effects with variables dummies; D1 ... D5, five variables dummies corresponding to five different regions, GLS, random effects method.

5. EMPIRICAL EVIDENCE OF CONDITIONAL CONVERGENCE WITH PANEL DATA

This part of the work aims to analyze the conditional convergence of labor productivity sectors (using as a "proxy" output per worker) between the different NUTS II of Portugal, from 1995 to 1999.

Given these limitations and the availability of data, it was estimated in this part of the work the equation of convergence introducing some structural variables, namely, the ratio of gross fixed capital/output (such as "proxy" for the accumulation of capital/output), the flow ratio of goods/output (as a "proxy" for transport costs) and the location quotient (calculated as the ratio between the number of regional employees in a given sector and the number of national employees in this sector on the ratio between the number regional employment and the number of national employees) ((15) Sala-i-Martin, 1996).

Table 2: Analysis of conditional convergence in productivity for each of the sectors at NUTS II of Portugal, for the period 1995 to 1999

Agriculture													
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.1**	**Coef.2**	**Coef.3**	**Coef.4**	**DW**	**R^2**	**G.L.**
Pooling	0.114 (0.247)						-0.020 (-0.392)	0.388 (0.592)	0.062 (1.267)	-0.062 (-1.160)	2.527	0.136	15
LSDV		5.711* (2.333)	5.856* (2.385)	6.275* (2.299)	6.580* (2.383)	6.517* (2.431)	-0.649* (-2.248)	-0.134 (-0.134)	-0.132 (-0.437)	-0.102 (-0.189)	2.202	0.469	11
GLS	-0.020 (-0.221)						-0.004 (-0.416)	0.284 (1.419)	0.059* (4.744)	-0.053* (-4.163)	2.512	0.797	15
Industry													
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.1**	**Coef.2**	**Coef.3**	**Coef.5**	**DW**	**R^2**	**G.L.**
Pooling	3.698* (4.911)						-0.336* (-5.055)	0.269* (3.229)	-0.125* (-3.888)	-0.297* (-3.850)	2.506	0.711	15
LSDV		4.486* (6.153)	4.386* (6.700)	4.435* (7.033)	4.335* (6.967)	4.111* (6.977)	-0.421* (-6.615)	0.530* (6.222)	0.018 (0.412)	-0.397 (-0.854)	2.840	0.907	11
GLS	3.646* (4.990)						-0.332* (-5.144)	0.279* (3.397)	-0.123* (-3.899)	-0.290* (-3.828)	2.597	0.719	15

Manufactured industry													
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.1**	**Coef.2**	**Coef.3**	**Coef.6**	**DW**	**R^2**	**G.L.**
Pooling	0.468 (0.690)						-0.053 (-0.870)	0.285* (4.502)	0.013 (0.359)	0.010 (0.167)	2.177	0.804	15
LSDV		2.850** (2.065)	2.461** (2.081)	2.068** (2.067)	1.851** (2.022)	1.738* (2.172)	-0.123 (-1.772)	0.296* (5.185)	-0.097 (-1.448)	-1.119 (-1.787)	1.770	0.923	11
GLS	0.513 (0.729)						-0.057 (-0.906)	0.289* (4.539)	0.009 (0.252)	0.008 (0.123)	2.169	0.800	15
Services													
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.1**	**Coef.2**	**Coef.3**	**Coef.7**	**DW**	**R^2**	**G.L.**
Pooling	0.472 (1.209)						-0.046 (-1.110)	-0.118 (-1.653)	-0.013 (-1.401)	0.081** (2.071)	2.367	0.268	15
LSDV		1.774 (1.329)	1.831 (1.331)	2.140 (1.324)	1.955 (1.344)	2.217 (1.345)	-0.109 (-1.160)	-0.137 (-1.400)	-0.075 (-1.380)	-0.698 (-1.024)	2.393	0.399	11
GLS	0.238 (0.790)						-0.022 (-0.718)	-0.079 (-0.967)	-0.008 (-1.338)	0.060* (2.126)	1.653	0.613	15

All sectors															
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.1**	**Coef.2**	**Coef.3**	**Coef.4**	**Coef.5**	**Coef.7**	**DW**	**R^2**	**G.L.**
Pooling	0.938 (0.910)						-0.077 (-1.04)	-0.152 (-0.88)	-0.011 (-0.71)	-0.029 (-0.28)	-0.057 (-0.20)	0.005 (0.009)	2.738	0.458	13
LSDV		-0.797 (-0.67)	-0.645 (-0.54)	-0.545 (-0.41)	-0.521 (-0.42)	-0.263 (-0.20)	0.011 (0.130)	-0.483* (-2.72)	-0.155* (-2.79)	0.085 (0.802)	0.465 (1.279)	0.344 (0.590)	2.591	0.792	9
GLS	1.018 (0.976)						-0.088 (-1.16)	-0.182 (-1.14)	-1.034 (-1.03)	-0.026 (-0.26)	-0.050 (-0.17)	0.023 (0.043)	2.676	0.854	13

Note: Const. Constant; Coef1., Coefficient of convergence; Coef.2, Coefficient of the ratio capital/output; Coef.3, Coefficient of the ratio of flow goods/output; Coef.4, Coefficient of the location quotient for agriculture; Coef.5, Coefficient of industry location quotient; Coef.6, Coefficient of the location quotient for manufacturing; Coef.7, Coefficient quotient location of services; * Coefficient statistically significant at 5%, ** statistically significant coefficient 10%; GL, Degrees of freedom; LSDV, Method of variables with fixed effects dummies; D1 ... D5, five variables dummies corresponding to five different regions.

Therefore, the data used and the results obtained in the estimations made, if we have conditional convergence, that will be in industry.

6. EMPIRICAL EVIDENCE OF THE NEW ECONOMIC GEOGRAPHY

According to Table 3, with the results obtained in the estimations for the period 1995 to 1999, although the estimation results with the model equation of Thomas (with agricultural employment as a force anti-agglomeration) are more satisfying, considering the parameter values μ less than unity as would be expected in view of economic theory. Note that when considering the stock of housing as centrifugal force, although the results show evidence of greater economies of scale (as noted by the data analysis, because the close relationship between this variable and nominal wages) are statistically less satisfactory. There is also that $\sigma/(\sigma-1)$ values are always higher than unity, is confirmed also for this period the existence of increasing returns to scale, although with a moderate size, given the value $\sigma(1-\mu)$, i.e. 1.830, in the model Thomas. Since as noted above, when $\sigma(1-\mu)>1$ increasing returns to scale are sufficiently weak or the fraction of the manufactured goods sector is sufficiently low and the range of possible equilibria depends on the costs of transportation. Should be noted that the parameter τ is not statistical significance in Krugman model and present a very low value in the model of Thomas, a sign that transportation costs have left the already small importance that had in the previous period, which is understandable given the improvements in infrastructure that have been check in Portugal, mainly through the structural supports that have come to our country after the appointed time our entry into EEC (European Economic Community), within a set of programs financed by various funds, including Cohesion Fund, among others.

Table 3: Results of estimations of the models of Krugman, Thomas and Fujita et al., in temporal differences, for the period 1995-1999, with panel data (the level of NUTS III)

Krugman Model in differences

$$\Delta \log(w_{it}) = \sigma^{-1}\left[\begin{array}{l}\log(\sum_j Y_{jt} w_{jt}^{\frac{\sigma-1}{\mu}} e^{-\tau(\sigma-1)d_{ij}}) - \\ \log(\sum_j Y_{jt-1} w_{jt-1}^{\frac{\sigma-1}{\mu}} e^{-\tau(\sigma-1)d_{ij}})\end{array}\right] + \Delta v_{it}$$

Parameters and R^2	**Values obtained**
σ	7.399** (1.914)

μ	1.158* (15.579)
τ	0.003 (0.218)
R^2	0.199
DW	2.576
SEE	0.023
Nº observations	112
$\sigma/(\sigma-1)$	1.156

Thomas Model in differences (with agricultural workers to the H)

$$\Delta \log(w_{it}) = \sigma^{-1}\left[\begin{array}{l}\log(\sum_j Y_{jt}^{\frac{\sigma(\mu-1)+1}{\mu}} H_{jt}^{\frac{(1-\mu)(\sigma-1)}{\mu}} w_{jt}^{\frac{\sigma-1}{\mu}} e^{-\tau(\sigma-1)d_{ij}}) - \\ \log(\sum_j Y_{jt-1}^{\frac{\sigma(\mu-1)+1}{\mu}} H_{jt-1}^{\frac{(1-\mu)(\sigma-1)}{\mu}} w_{jt-1}^{\frac{\sigma-1}{\mu}} e^{-\tau(\sigma-1)d_{ij}})\end{array}\right] + \Delta\eta_{it}$$

Parameters and R^2	**Values obtained**
σ	18.668* (3.329)
μ	0.902* (106.881)
τ	0.061* (2.383)
R^2	0.201
DW	2.483
SEE	0.023
Nº observations	112
$\sigma/(\sigma-1)$	1.057
$\sigma(1-\mu)$	1.830

Thomas Model in differences (with housing stock to the H)

$$\Delta \log(w_{it}) = \sigma^{-1}\left[\begin{array}{l}\log(\sum_j Y_{jt}^{\frac{\sigma(\mu-1)+1}{\mu}} H_{jt}^{\frac{(1-\mu)(\sigma-1)}{\mu}} w_{jt}^{\frac{\sigma-1}{\mu}} e^{-\tau(\sigma-1)d_{ij}}) - \\ \log(\sum_j Y_{jt-1}^{\frac{\sigma(\mu-1)+1}{\mu}} H_{jt-1}^{\frac{(1-\mu)(\sigma-1)}{\mu}} w_{jt-1}^{\frac{\sigma-1}{\mu}} e^{-\tau(\sigma-1)d_{ij}})\end{array}\right] + \Delta\eta_{it}$$

Parameters and R^2	**Values obtained**
σ	11.770 (1.205)
μ	1.221* (8.993)
τ	0.003 (0.314)
R^2	0.173
DW	2.535
SEE	0.024
Nº observations	112

Fujita et al. Model in differences

$$\Delta \log(w_{it}) = \sigma^{-1}\left[\begin{array}{l}\log(\sum_j Y_{jt} w_{jt}^{\frac{\sigma-1}{\mu}} T_{ijt}^{-(\sigma-1)}) - \\ \log(\sum_j Y_{jt-1} w_{jt-1}^{\frac{\sigma-1}{\mu}} T_{ijt-1}^{-(\sigma-1)})\end{array}\right] + \Delta\psi_{it}$$

Parameters and R^2	**Values obtained**

σ	5.482* (4.399)
μ	1.159* (14.741)
R^2	0.177
DW	2.594
SEE	0.023
Nº observations	112
$\sigma/(\sigma-1)$	1.223

Note: Figures in brackets represent the t-statistic. * Coefficients significant to 5%. ** Coefficients significant acct for 10%.

7. CONCLUSIONS

The convergence theory is not clear about the regional tendency in Portugal, so the conclusions about the regional convergence are not consistent.

In light of what has been said above, we can conclude the existence of agglomeration processes in Portugal (around Lisboa e Vale do Tejo) in the period 1995 to 1999, given the transport costs are low and it was shown by $\sigma/(\sigma-1)$ and the $\sigma(1-\mu)$ values obtained in the estimations made with the reduced forms of the models presented above, there are increasing returns to scale in manufacturing in the Portuguese regions. This is because, according to the New Economic Geography, in a situation with low transport costs and increasing returns to scale, productive linkages can create a circular logic of agglomeration, with links "backward" and "forward". What makes the producers are located close to their suppliers (the forces of supply) and consumers (demand forces) and vice versa. The driver of the process is the difference in real wages, i.e., locations that, for some reason, have higher real wages attract more workers (which are also potential consumers), calls "forward" which, in turn, attract more companies to meet the requirements of demand, calls "backward." With a greater concentration of companies in the same location, the products are shifted to lower distances, saving on transport costs and, as such, prices may be lower, nominal wages may be higher and so on. On the other hand, when certain factors are real estate (land), they act as centrifugal forces that oppose the centripetal forces of agglomeration. The result of the interaction between these two forces, traces the evolution of the spatial structure of the economy.

So, we can conclude which with different ways, the two theories find the same conclusions, in other words, we have regional divergence, in this period, for Portugal.

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