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## SECTORAL CONVERGENCE IN OUTPUT PER WORKER BETWEEN PORTUGUESE REGIONS

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### ABSTRACT

The aim of this paper is to present a further contribution to the analysis of absolute convergence ( $\beta$  and  $\sigma$ ), associated with the neoclassical theory, and conditional, associated with endogenous growth theory, of the sectoral productivity at regional level. Presenting some empirical evidence of absolute convergence of productivity for each of the economic sectors and industries in each of the regions of mainland Portugal (NUTS II and NUTS III) in the period 1986 to 1994 and from 1995 to 1999. The finest spatial unit NUTS III is only considered for each of the economic sectors in the period 1995 to 1999. They are also presented empirical evidence of conditional convergence of productivity, but only 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. The main conclusions should be noted that the signs of convergence are stronger in the first period than in the second and that convergence is conditional, especially in industry and in all sectors.

**Keywords:** convergence; output; Portuguese regions

### 1. EMPIRICAL EVIDENCE OF ABSOLUTE CONVERGENCE, PANEL DATA

The purpose of this part of the work is to analyze the absolute convergence of output per worker (as a "proxy" of labor productivity), with the following equation ((1)Islam, 1995, based on the (2)Solow model, 1956):

$$\Delta \ln P_{it} = c + b \ln P_{i,t-1} + v_{it} \quad (1)$$

Table 1 presents the results of absolute convergence of output per worker, obtained in the panel estimations for each of the economic sectors and the sectors to the total level of NUTS II, from 1986 to 1994 (a total of 45 observations, corresponding to regions 5 and 9 years).

The convergence results obtained in the estimations carried out are statistically satisfactory to each of the economic sectors and all sectors of the NUTS II.

**Table 1:** Analysis of convergence in productivity for each economic sectors of the five NUTS II of Portugal, for the period 1986 to 1994

<b>Agriculture</b>											
Method	Const.	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.	T.C.	DW	R <sup>2</sup>	G.L.
Pooling	0.558 (1.200)						-0.063 (-1.163)	-0.065	1.851	0.034	38
LSDV		4.127* (4.119)	4.207* (4.116)	4.496* (4.121)	4.636* (4.159)	4.549* (4.091)	-0.514* (-4.108)	-0.722	2.202	0.352	34
GLS	0.357 (0.915)						-0.040 (-0.871)	-0.041	1.823	0.020	38
<b>Industry</b>											
Method	Const.	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.	T.C.	DW	R <sup>2</sup>	G.L.
Pooling	2.906* (2.538)						-0.292* (-2.525)	-0.345	1.625	0.144	38
LSDV		6.404* (4.345)	6.459* (4.344)	6.695* (4.341)	6.986* (4.369)	6.542* (4.334)	-0.667* (-4.344)	-1.100	1.679	0.359	34
GLS	3.260* (2.741)						-0.328* (-2.729)	-0.397	1.613	0.164	38
<b>Manufactured Industry</b>											
Method	Const.	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.	T.C.	DW	R <sup>2</sup>	G.L.
Pooling	1.806** (1.853)						-0.186** (-1.845)	-0.206	1.935	0.082	38
LSDV		6.625* (4.304)	6.669* (4.303)	6.941* (4.303)	6.903* (4.318)	6.626* (4.293)	-0.699* (-4.301)	-1.201	1.706	0.357	34

GLS	1.655** (1.753)						-0.171** (-1.745)	-0.188	1.946	0.074	38
<b>Services</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	5.405* (4.499)						-0.554* (-4.477)	-0.807	1.874	0.345	38
LSDV		7.193* (5.290)	7.169* (5.301)	7.313* (5.284)	7.153* (5.292)	7.273* (5.293)	-0.741* (-5.275)	-1.351	2.051	0.451	34
GLS	5.627* (4.626)						-0.577* (-4.604)	-0.860	1.886	0.358	38
<b>Services (without public sector)</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	5.865* (4.079)						-0.589* (-4.073)	-0.889	1.679	0.304	38
LSDV		6.526* (4.197)	6.523* (4.195)	6.635* (4.191)	6.506* (4.176)	6.561* (4.192)	-0.658* (-4.188)	-1.073	1.684	0.342	34
GLS	5.027* (3.656)						-0.505* (-3.649)	-0.703	1.682	0.260	38
<b>All sectors</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	3.166* (3.603)						-0.328* (-3.558)	-0.397	1.785	0.250	38
LSDV		6.080* (5.361)	6.030* (5.374)	6.308* (5.347)	6.202* (5.379)	6.193* (5.359)	-0.643* (-5.333)	-1.030	2.181	0.460	34
GLS	3.655* (3.916)						-0.379* (-3.874)	-0.476	1.815	0.283	38

**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.

Table 2 shows results also for each of the economic sectors and all sectors of the NUTS II of Portugal, but now for the period 1995 to 1999.

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

<b>Agriculture</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	-0.038 (-0.089)						0.005 (0.101)	0.005	2.113	0.001	18
LSDV		5.672* (2.662)	5.703* (2.653)	6.288* (2.674)	6.403* (2.657)	6.230* (2.692)	-0.673* (-2.666)	-1.118	2.048	0.423	14
GLS	-0.132 (-0.438)						0.015 (0.456)	0.015	1.867	0.011	18
<b>Industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	0.754** (1.991)						-0.073** (-1.880)	-0.076	2.194	0.164	18
LSDV		2.965* (2.328)	3.018* (2.335)	3.107* (2.330)	3.089* (2.308)	2.994* (2.348)	-0.306* (-2.297)	-0.365	2.377	0.397	14
GLS	0.640* (2.433)						-0.061* (-2.273)	-0.063	2.032	0.223	18
<b>Manufactured industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	1.426* (2.249)						-0.140* (-2.134)	-0.151	1.369	0.202	18
LSDV		2.697* (2.291)	2.761* (2.290)	2.834* (2.281)	2.808* (2.358)	2.742* (2.339)	-0.279* (-2.251)	-0.327	1.978	0.444	14
GLS	1.502* (2.245)						-0.148* (-2.135)	-0.160	1.429	0.202	18
<b>Sercices</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	-0.058 (-0.180)						0.011 (0.333)	0.011	2.282	0.006	18
LSDV		0.957 (1.365)	0.943 (1.355)	0.986 (1.379)	0.946 (1.369)	0.971 (1.375)	-0.093 (-1.299)	-0.098	2.929	0.212	14
GLS	-0.265 (-1.497)						0.032** (1.774)	0.031	1.955	0.149	18
<b>All sectors</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	-0.044 (-0.154)						0.009 (0.316)	0.009	1.803	0.006	18

LSDV		0.954 (1.383)	0.949 (1.380)	0.999 (1.392)	0.948 (1.356)	0.980 (1.398)	-0.095 (-1.316)	-0.100	2.714	0.365	14
GLS	0.014 (0.045)						0.003 (0.100)	0.003	1.925	0.001	18

Looking at the coefficient of convergence, we now find evidence of absolute convergence only for agriculture, industry and manufactured industry.

Are presented subsequently in Table 3 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 all sectors and sectors to the total level of NUTS III.

**Table 3:** 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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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

Table 4 presents the results for the absolute convergence of output per worker, in the estimations obtained for each of the manufactured industry of NUTS II, from 1986 to 1994.

The convergence results obtained are statistically satisfactory for all manufacturing industries of NUTS II.

**Table 4:** Analysis of convergence in productivity for each of the manufacturing industries at the five NUTS II of Portugal, for the period 1986 to 1994

Metals industry											
Method	Const.	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.	T.C.	DW	R <sup>2</sup>	G.L.
Pooling	0.190 (0.190)						-0.024 (-0.241)	-0.024	1.646	0.002	30
LSDV		2.171** (1.769)	2.143** (1.753)	2.161** (1.733)	2.752** (1.988)	---	-0.239** (-1.869)	-0.273	1.759	0.198	27
GLS	0.407 (0.394)						-0.046 (-0.445)	-0.047	1.650	0.007	30
Minerals industry											
Method	Const.	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.	T.C.	DW	R <sup>2</sup>	G.L.
Pooling	0.738 (0.903)						-0.085 (-0.989)	-0.089	1.935	0.025	38
LSDV		1.884* (2.051)	1.970* (2.112)	2.004* (2.104)	1.926* (2.042)	1.731** (1.930)	-0.208* (-2.129)	-0.233	2.172	0.189	34

GLS	0.967 (1.162)						-0.109 (-1.246)	-0.115	1.966	0.039	38
<b>Chemical industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	2.312** (1.992)						-0.225** (-1.984)	-0.255	2.017	0.104	34
LSDV		6.104* (3.750)	6.348* (3.778)	6.381* (3.774)	6.664* (3.778)	6.254* (3.777)	-0.621* (-3.769)	-0.970	1.959	0.325	30
GLS	2.038** (1.836)						-0.198** (-1.826)	-0.221	2.034	0.089	34
<b>Electric goods industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	0.781 (0.789)						-0.083 (-0.784)	-0.087	1.403	0.016	38
LSDV		3.634* (2.363)	3.552* (2.360)	3.673* (2.362)	3.636* (2.376)	3.429* (2.324)	-0.381* (-2.355)	-0.480	1.259	0.167	34
GLS	0.242 (0.285)						-0.025 (-0.279)	-0.025	1.438	0.002	38
<b>Transport equipments industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	4.460* (3.110)						-0.464* (-3.136)	-0.624	2.258	0.206	38
LSDV		8.061* (4.948)	8.526* (5.007)	8.614* (4.986)	8.696* (4.998)	8.077* (4.961)	-0.871* (-5.014)	-2.048	2.049	0.429	34
GLS	5.735* (3.780)						-0.596* (-3.807)	-0.906	2.159	0.276	38
<b>Food industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	0.314 (0.515)						-0.027 (-0.443)	-0.027	1.858	0.005	38
LSDV		2.841* (2.555)	2.777* (2.525)	2.899* (2.508)	2.617* (2.471)	2.593* (2.470)	-0.274* (-2.469)	-0.320	1.786	0.198	34
GLS	0.090 (0.166)						-0.005 (-0.085)	-0.005	1.851	0.001	38
<b>Textile industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	4.276* (4.639)						-0.462* (-4.645)	-0.620	1.836	0.388	34
LSDV		5.556* (4.288)	5.487* (4.276)	5.506* (4.272)	5.561* (4.253)	5.350* (4.431)	-0.595* (-4.298)	-0.904	1.816	0.431	30
GLS	3.212* (6.336)						-0.347* (-6.344)	-0.426	1.848	0.542	34
<b>Paper industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	2.625* (2.332)						-0.271* (-2.366)	-0.316	1.534	0.128	38
LSDV		3.703* (2.803)	3.847* (2.840)	3.837* (2.813)	3.684* (2.812)	3.521* (2.782)	-0.382* (-2.852)	-0.481	1.516	0.196	34
GLS	1.939** (1.888)						-0.201** (-1.924)	-0.224	1.556	0.089	38
<b>Severall industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	5.518* (4.004)						-0.605* (-4.004)	-0.929	2.121	0.297	38
LSDV		7.802* (5.036)	7.719* (5.022)	7.876* (5.033)	7.548* (5.023)	7.660* (5.018)	-0.847* (-5.032)	-1.877	2.024	0.428	34
GLS	6.053* (4.308)						-0.664* (-4.309)	-1.091	2.081	0.328	38

Table 5 shows results also for each of the manufacturing industries of the NUTS II of Portugal, but now for the period 1995 to 1999.

**Table 5:** Analysis of convergence in productivity for each of the manufacturing industries at the five NUTS II of Portugal, for the period 1995 to 1999

<b>Metals industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	1.108* (3.591)						-0.111* (-3.353)	-0.118	2.457	0.384	18
LSDV		1.476 (1.143)	1.496 (1.183)	1.503 (1.129)	1.451 (1.186)	1.459 (1.233)	-0.151 (-1.115)	-0.164	2.424	0.416	14

GLS	1.084* (7.366)						-0.108* (-6.866)	-0.114	2.176	0.724	18
<b>Minerals industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	-0.455 (-1.236)						0.052 (1.409)	0.051	1.601	0.099	18
LSDV		2.158* (2.222)	2.280* (2.265)	2.287* (2.227)	2.194* (2.248)	2.417* (2.306)	-0.221* (-2.192)	-0.250	1.359	0.567	14
GLS	-0.356 (-0.854)						0.042 (1.007)	0.041	1.628	0.053	18
<b>Chemical industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	1.236 (1.026)						-0.115 (-0.966)	-0.122	1.049	0.049	18
LSDV		5.320* (4.493)	5.281* (4.452)	5.447* (4.449)	5.858* (4.711)	5.072* (4.501)	-0.525* (-4.470)	-0.744	2.432	0.702	14
GLS	3.136* (2.532)						-0.302* (-2.477)	-0.360	1.174	0.254	18
<b>Electric goods industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	1.936 (1.289)						-0.196 (-1.271)	-0.218	1.945	0.082	18
LSDV		4.729 (1.504)	4.775 (1.507)	4.818 (1.490)	4.590 (1.463)	4.671 (1.519)	-0.482 (-1.488)	-0.658	2.038	0.342	14
GLS	2.075 (1.299)						-0.211 (-1.283)	-0.237	1.976	0.084	18
<b>Transport equipments industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	2.429* (2.264)						-0.237* (-2.179)	-0.270	1.837	0.209	18
LSDV		8.626* (10.922)	8.647* (10.973)	9.051* (10.924)	8.537* (10.917)	8.356* (10.866)	-0.867* (-10.811)	-2.017	2.000	0.896	14
GLS	3.507* (3.025)						-0.346* (-2.947)	-0.425	1.649	0.326	18
<b>Food industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	0.873 (1.619)						-0.082 (-1.453)	-0.086	2.921	0.105	18
LSDV		-0.516 (-0.300)	-0.521 (-0.308)	-0.532 (-0.304)	-0.425 (-0.259)	-0.435 (-0.268)	0.060 (0.341)	0.058	2.230	0.208	14
GLS	1.027* (4.163)						-0.098* (-3.800)	-0.103	2.251	0.445	18
<b>Textile industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	0.788** (2.048)						-0.080** (-1.882)	-0.083	1.902	0.165	18
LSDV		0.514 (0.261)	0.525 (0.270)	0.515 (0.262)	0.522 (0.272)	0.541 (0.301)	-0.051 (-0.239)	-0.052	1.919	0.167	14
GLS	0.802* (20.052)						-0.081* (-18.461)	-0.085	1.719	0.950	18
<b>Paper industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	0.735 (1.524)						-0.073 (-1.471)	-0.076	2.341	0.107	18
LSDV		5.201 (1.479)	5.454 (1.462)	5.410 (1.467)	5.053 (1.470)	4.970 (1.486)	-0.533 (-1.465)	-0.761	1.939	0.227	14
GLS	0.654* (3.329)						-0.064* (-3.198)	-0.066	2.185	0.362	18
<b>Severall industry</b>											
<b>Method</b>	<b>Const.</b>	<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>3</sub></b>	<b>D<sub>4</sub></b>	<b>D<sub>5</sub></b>	<b>Coef.</b>	<b>T.C.</b>	<b>DW</b>	<b>R<sup>2</sup></b>	<b>G.L.</b>
Pooling	-0.338 (-0.463)						0.042 (0.531)	0.041	2.651	0.015	18
LSDV		3.734** (1.949)	3.883** (1.962)	3.940** (1.966)	3.817** (1.967)	3.647** (1.934)	-0.402** (-1.930)	-0.514	2.905	0.303	14
GLS	-0.904* (-3.791)						0.102* (4.003)	0.097	1.922	0.471	18

## 2. 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 equation (1) 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) ((3) Sala-i-Martin, 1996).

Considering the results obtained and presented in Table 6 (for conditional convergence), compared with those presented in Table 2 (absolute convergence), it appears that only in industry and all sectors is that the coefficient of convergence improve.

**Table 6:** 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 <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.1	Coef.2	Coef.3	Coef.4	DW	R <sup>2</sup>	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 <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.1	Coef.2	Coef.3	Coef.5	DW	R <sup>2</sup>	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 <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.1	Coef.2	Coef.3	Coef.6	DW	R <sup>2</sup>	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 <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.1	Coef.2	Coef.3	Coef.7	DW	R <sup>2</sup>	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 <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Coef.1	Coef.2	Coef.3	Coef.4	Coef.5	Coef.7	DW	R <sup>2</sup>	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 and all sectors.

## 3. REFERENCES

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Alert! This author has published many duplicate versions of very similar papers with slightly different titles, but without an appropriate notice. This may apply to this contribution, too.

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