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APPLICATION OF KEYNESIAN AND CONVERGENCE THEORIES IN PORTUGAL. AN ALTERNATIVE APPROACH

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ABSTRACT

This work aims to test the Verdoorn Law, with the alternative specifications of (1)Kaldor (1966), for five Portuguese regions (NUTS II) from 1986 to 1994. It is intended to test, even in this work, the alternative interpretation of (2)Rowthorn (1975) of the Verdoorn's Law for the same regions and periods. The results of this work will be complemented with estimates of these relationships to other sectors of the economy than the industry (agriculture and services sectors) and for the total economy of each region. The aim of this paper is, also, to present a further contribution to the analysis of absolute convergence, associated with the neoclassical theory, of the sectoral productivity at regional level.

Keywords: polarization; convergence; Portuguese regions; linear models; panel data.

1. INTRODUCTION

The polarization process is mainly based in the very known Verdoorn law. (3)Verdoorn (1949) was the first author to reveal the importance of the positive relationship between the growth of labor productivity and output growth, arguing that the causality is from output to productivity, thus assuming that labor productivity is endogenous. An important finding of the empirical relationship is the elasticity of labor productivity with respect to output that according to Verdoorn is approximately 0.45 on average, external limits between 0.41 and 0.57. This author also found that the relationship between productivity growth and output growth reflects a kind of production technology and the existence of increasing returns to scale, which contradicts the hypothesis of neoclassical constant returns to scale, or decreasing, and absolute convergence Regional.

The purpose of this the work is, yet, to analyze the absolute convergence of output per worker (as a "proxy" of labor productivity), with the equation of (4)Islam (1995), based on the (5)Solow model (1956).

2. DESCRIPTION OF THE MODELS

The models of the keynesian and convergence theories are developed in several works like (6-7)Martinho (2011a and 2011b).

3. DATA ANALYSIS

Considering the variables on the models referred previously and the availability of statistical information, we used the following data disaggregated at regional level. Annual data for the periods 1986 to 1994 corresponding to the five regions of mainland Portugal (NUTS II), for the different economic sectors and the total economy of these regions. These data were obtained from Eurostat (Eurostat Regio of Statistics 2000).

4. EMPIRICAL EVIDENCE OF THE VERDOORN'S LAW

The results in Table 1, obtained in the estimations carried out with the equations of Verdoorn, Kaldor and Rowthorn for each of the sectors of the economy and for the total economy of each of the five regions considered, to state the following.

The industry is the sector that has the biggest increasing returns to scale, followed by agriculture and service sector. Services without the public sector present values for the income scale unacceptable and manufacturing presents surprisingly very low values, reflecting a more intensive use of labor.

It should be noted, finally, for this set of results the following: Verdoorn's equation is the most satisfactory in terms of statistical significance of the coefficient obtained and the degree of explanation in the various estimations. There is, therefore, that productivity is endogenous and generated by the growth of regional and sectoral output.

Table 1: Analysis of economies of scale through the equation Verdoorn, Kaldor and Rowthorn, for each of the economic sectors and the five NUTS II of Portugal, for the period 1986 to 1994

Agriculture						
	Constant	Coefficient	DW	R²	G.L.	E.E. (1/(1-b))
Verdoorn $p_i = a + bq_i$	0.042* (5.925)	0.878* (12.527)	1.696	0.805	38	8.197
Kaldor $e_i = c + dq_i$	-0.042* (-5.925)	0.123** (1.750)	1.696	0.075	38	
Rowthorn1 $p_i = \lambda_1 + \varepsilon_1 e_i$	-0.010 (-0.616)	-0.621** (-1.904)	1.568	0.087	38	
Rowthorn2 $q_i = \lambda_2 + \varepsilon_2 e_i$	-0.010 (-0.616)	0.379 (1.160)	1.568	0.034	38	
Industry						
	Constant	Coefficient	DW	R²	G.L.	E.E. (1/(1-b))
Verdoorn	-12.725* (-4.222)	0.992* (8.299)	2.001	0.587	37	125.000
Kaldor	12.725* (4.222)	0.008 (0.064)	2.001	0.869	37	
Rowthorn1	15.346* (9.052)	-0.449* (-3.214)	1.889	0.326	37	
Rowthorn2	15.346* (9.052)	0.551* (3.940)	1.889	0.776	37	
Manufactured Industry						
	Constant	Coefficient	DW	R²	G.L.	E.E. (1/(1-b))
Verdoorn	8.296* (4.306)	0.319* (2.240)	1.679	0.139	37	1.468
Kaldor	-8.296* (-4.306)	0.681* (4.777)	1.679	0.887	37	
Rowthorn1	12.522* (12.537)	-0.240* (-2.834)	1.842	0.269	37	
Rowthorn2	12.522* (12.537)	0.760* (8.993)	1.842	0.891	37	
Services						
	Constant	Coefficient	DW	R²	G.L.	E.E. (1/(1-b))
Verdoorn	-0.045* (-3.253)	0.802* (6.239)	1.728	0.506	38	5.051
Kaldor	0.045* (3.253)	0.198 (1.544)	1.728	0.059	38	
Rowthorn1	0.071* (4.728)	-0.694* (-3.607)	1.817	0.255	38	
Rowthorn2	0.071* (4.728)	0.306 (1.592)	1.817	0.063	38	
Services (without public sector)						
	Constant	Coefficient	DW	R²	G.L.	E.E. (1/(1-b))
Verdoorn	-0.074* (-4.250)	1.020* (7.695)	1.786	0.609	38	---
Kaldor	0.074* (4.250)	-0.020 (-0.149)	1.786	0.001	38	
Rowthorn1	0.076* (4.350)	-0.903* (-4.736)	1.847	0.371	38	
Rowthorn2	0.076* (4.350)	0.097 (0.509)	1.847	0.007	38	
All Sectors						
	Constant	Coefficient	DW	R²	G.L.	E.E. (1/(1-b))
Verdoorn	-0.020* (-2.090)	0.907* (8.367)	1.595	0.648	38	10.753
Kaldor	0.020* (2.090)	0.093 (0.856)	1.595	0.019	38	
Rowthorn1	0.056* (6.043)	-0.648* (-2.670)	2.336	0.255	32	
Rowthorn2	0.056* (6.043)	0.352 (1.453)	2.336	0.225	32	

Note: * Coefficient statistically significant at 5%, ** Coefficient statistically significant at 10%, GL, Degrees of freedom; EE, Economies of scale.

5. EMPIRICAL EVIDENCE OF ABSOLUTE CONVERGENCE, PANEL DATA

Table 2 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 2: Analysis of convergence in productivity for each economic sectors of the five NUTS II of Portugal, for the period 1986 to 1994

Agriculture											
Method	Const.	D ₁	D ₂	D ₃	D ₄	D ₅	Coef.	T.C.	DW	R ²	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
Industry											
Method	Const.	D ₁	D ₂	D ₃	D ₄	D ₅	Coef.	T.C.	DW	R ²	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
Manufactured Industry											
Method	Const.	D ₁	D ₂	D ₃	D ₄	D ₅	Coef.	T.C.	DW	R ²	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
Services											
Method	Const.	D ₁	D ₂	D ₃	D ₄	D ₅	Coef.	T.C.	DW	R ²	G.L.
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
Services (without public sector)											
Method	Const.	D ₁	D ₂	D ₃	D ₄	D ₅	Coef.	T.C.	DW	R ²	G.L.
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
All sectors											
Method	Const.	D ₁	D ₂	D ₃	D ₄	D ₅	Coef.	T.C.	DW	R ²	G.L.
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.

6. FINAL CONCLUSIONS

In the estimates made for each of the economic sectors, with the Verdoorn law, it appears that the industry is the largest that has increasing returns to scale, followed by agriculture and service sector.

On the other hand, we find some signs of convergence, analyzing the results of the estimations with the models of the neoclassical theory.

So, we can say for this period that we find some signs of convergence, specifically in the industry, but are not strong enough to avoid the disparities between the Portuguese regions, although the results for the manufactured industry are more consistent as expected.

7. REFERENCES

1. N. Kaldor. Causes of the Slow Rate of Economics of the UK. An Inaugural Lecture. Cambridge: Cambridge University Press, 1966.
2. R.E. Rowthorn. What Remains of Kaldor Laws? *Economic Journal*, 85, 10-19 (1975).
3. P.J. Verdoorn. Fattori che Regolano lo Sviluppo Della Produttività del Lavoro. *L'Industria*, 1, 3-10 (1949).
4. N. Islam. Growth Empirics : A Panel Data Approach. *Quarterly Journal of Economics*, 110, 1127-1170 (1995).
5. R. Solow. A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics* (1956).
6. V.J.P.D. Martinho. The Verdoorn law in the Portuguese regions: a panel data analysis. MPRA Paper 32186, University Library of Munich, Germany (2011a).
7. V.J.P.D. Martinho. Sectoral convergence in output per worker between Portuguese regions. MPRA Paper 32269, University Library of Munich, Germany (2011b).