MPRA
Munich Personal RePEc Archive

The Keynesian and the convergence theories in the Portuguese manufactured industry

Martinho, Vítor João Pereira Domingues

Escola Superior Agrária, Instituto Politécnico de Viseu

2011

Online at https://mpra.ub.uni-muenchen.de/33371/
MPRA Paper No. 33371, posted 15 Sep 2011 01:30 UTC

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.

THE KEYNESIAN AND THE CONVERGENCE THEORIES IN THE PORTUGUESE MANUFACTURED INDUSTRY

Vitor João Pereira Domingues Martinho

Unidade de I&D do Instituto Politécnico de Viseu
Av. Cor. José Maria Vale de Andrade
Campus Politécnico
3504 - 510 Viseu
(PORTUGAL)
e-mail: vdmartinho@esav.ipv.pt

ABSTRACT

This work aims to test the Verdoorn Law, with the alternative specifications of (1)Kaldor (1966), for the five Portuguese regions (NUTS II), from 1986 to 1994. It is intended to test, yet in this work, the alternative interpretation of (2)Rowthorn (1975) about the Verdoorn's Law for the same regions and period. The results of this study are about each one of the manufactured industries operating in the Portuguese regions. 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 manufactured industry productivity at regional level and for the period from 1986 to 1994.

Keywords: Verdoorn law; convergence theories; panel data; manufactured industries; Portuguese regions.

1. INTRODUCTION

Kaldor rediscovered the Verdoorn law in 1966 and since then this law has been tested in several ways, using specifications, samples and different periods (3)(Martinho, 2011a). However, the conclusions drawn differ, some of them rejecting the Law of Verdoorn and other supporting its validity. (4)Kaldor (1966, 1967) in his attempt to explain the causes of the low rate of growth in the UK, reconsidering and empirically investigating Verdoorn's Law, found that there is a strong positive relationship between the growth of labor productivity (p) and output (q), i.e. p = f (q). Or alternatively between employment growth (e) and the growth of output, ie, e = f (q).

Another interpretation of Verdoorn's Law, as an alternative to the Kaldor, is presented by (5)Rowthorn (1975, 1979). Rowthorn argues that the most appropriate specification of Verdoorn's Law is the ratio of growth of output (q) and the growth of labor productivity (p) with employment growth (e), i.e., q = f (e) and p = f (e), respectively (as noted above, the exogenous variable in this case is employment). On the other hand, Rowthorn believes that the empirical work of Kaldor (1966) for the period 1953-54 to 1963-64 and the (6)Cripps and Tarling (1973) for the period 1951 to 1965 that confirm Kaldor's Law, not can be accepted since they are based on small samples of countries, where extreme cases end up like Japan have great influence on overall results.

(7)Islam (1995) developed a model about the convergence issues, for panel data, based on the (8)Solow model, (1956).

2. ALTERNATIVE SPECIFICATIONS OF VERDOORN'S LAW

The hypothesis of increasing returns to scale in industry was initially tested by Kaldor (1966) using the following relations:

$p_i = a + bq_i$, Verdoorn law (1)

$e_i = c + dq_i$, Kaldor law (2)

where pi, qi and ei are the growth rates of labor productivity, output and employment in the industrial sector in the economy i.

On the other hand, the mathematical form of Rowthorn specification is as follows:

$p_i = \lambda_1 + \varepsilon_1 e_i$, firts equation of Rowthorn (3)

$q_i = \lambda_2 + \varepsilon_2 e_i$, second equation of Rowthorn (4)

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.

where $\lambda_1 = \lambda_2$ e $\varepsilon_2 = (1+\varepsilon_1)$, because $p_i=q_i-e_i$. In other words, $q_i - e_i = \lambda_1 + \varepsilon_1 e_i$, $q_i = \lambda_1 + e_i + \varepsilon_1 e_i$, so, $q_i = \lambda_1 + (1+\varepsilon_1)e_i$.

Rowthorn estimated these equations for the same OECD countries considered by Kaldor (1966), with the exception of Japan, and for the same period and found that ε_2 was not statistically different from unity and therefore ε_1 was not statistically different from zero. This author thus confirmed the hypothesis of constant returns to scale in manufacturing in the developed countries of the OECD. (9)Thirlwall (1980) criticized these results, considering that the Rowthorn interpretation of Verdoorn's Law is static, since it assumes that the Verdoorn coefficient depends solely on the partial elasticity of output with respect to employment.

3. CONVERGENCE MODEL

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 Islam (1995), based on the Solow model, 1956):

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

4. DATA ANALYSIS

Considering the variables on the models presented previously and the availability of statistical information, we used the following data disaggregated at regional level. Annual data for the period 1986 to 1994, corresponding to the five regions of mainland Portugal (NUTS II), and for the several manufactured industries in those regions. These data were obtained from Eurostat (Eurostat Regio of Statistics 2000).

5. 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 manufacturing industries, enable us to present the conclusions referred following.

Manufacturing industries that have, respectively, higher increasing returns to scale are the industry of transport equipment (5.525), the food industry (4.274), industrial minerals (3.906), the metal industry (3.257), the several industry (2.222), the textile industry (1.770), the chemical industry (1.718) and industry equipment and electrical goods (presents unacceptable values). The paper industry has excessively high values. Note that, as expected, the transportation equipment industry and the food industry have the best economies of scale (they are modernized industries) and the textile industry has the lowest economies of scale (industry still very traditional, labor intensive, and in small units).

Also in Table 1 presents the results of an estimation carried out with 9 manufacturing industries disaggregated and together (with 405 observations). By analyzing these data it appears that were obtained respectively for the coefficients of the four equations, the following elasticities: 0.608, 0.392, -0.275 and 0.725. Therefore, values that do not indicate very strong increasing returns to scale, as in previous estimates, but are close to those obtained by Verdoorn and Kaldor.

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

Metal Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn $p_i = a + bq_i$	-4.019* (-2.502)	0.693* (9.915)	1.955	0.898	29	3.257
Kaldor $e_i = c + dq_i$	4.019* (2.502)	0.307* (4.385)	1.955	0.788	29	
Rowthorn1 $p_i = \lambda_1 + \varepsilon_1 e_i$	-12.019 (-0.549)	0.357 (1.284)	1.798	0.730	29	
Rowthorn2 $q_i = \lambda_2 + \varepsilon_2 e_i$	-12.019 (-0.549)	1.357* (4.879)	1.798	0.751	29	
Mineral Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	-0.056* (-4.296)	0.744* (4.545)	1.978	0.352	38	3.906
Kaldor	0.056* (4.296)	0.256 (1.566)	1.978	0.061	38	

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.

Rowthorn1	-0.023 (-0.685)	-0.898* (-9.503)	2.352	0.704	38	
Rowthorn2	-0.023 (-0.685)	0.102 (1.075)	2.352	0.030	38	
Chemical Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	0.002 (0.127)	0.418* (6.502)	1.825	0.554	34	1.718
Kaldor	-0.002 (-0.127)	0.582* (9.052)	1.825	0.707	34	
Rowthorn1	9.413* (9.884)	0.109 (0.999)	1.857	0.235	33	
Rowthorn2	9.413* (9.884)	1.109* (10.182)	1.857	0.868	33	
Electrical Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	0.004 (0.208)	-0.126 (-1.274)	1.762	0.128	32	---
Kaldor	-0.004 (-0.208)	1.126* (11.418)	1.762	0.796	32	
Rowthorn1	0.019 (1.379)	-0.287* (-4.593)	1.659	0.452	32	
Rowthorn2	0.019 (1.379)	0.713* (11.404)	1.659	0.795	32	
Transport Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	-0.055* (-2.595)	0.819* (5.644)	2.006	0.456	38	5.525
Kaldor	0.055* (2.595)	0.181 (1.251)	2.006	0.040	38	
Rowthorn1	-0.001 (-0.029)	-0.628* (-3.938)	2.120	0.436	32	
Rowthorn2	-0.001 (-0.029)	0.372* (2.336)	2.120	0.156	32	
Food Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	0.006 (0.692)	0.766* (6.497)	2.191	0.526	38	4.274
Kaldor	-0.006 (-0.692)	0.234** (1.984)	2.191	0.094	38	
Rowthorn1	0.048* (2.591)	-0.679* (-4.266)	1.704	0.324	38	
Rowthorn2	0.048* (2.591)	0.321* (2.018)	1.704	0.097	38	
Textile Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	-0.008 (-0.466)	0.435* (3.557)	2.117	0.271	34	1.770
Kaldor	0.008 (0.466)	0.565* (4.626)	2.117	0.386	34	
Rowthorn1	0.002 (0.064)	-0.303* (-2.311)	1.937	0.136	34	
Rowthorn2	0.002 (0.064)	0.697* (5.318)	1.937	0.454	34	
Paper Industry						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	-0.062* (-3.981)	1.114* (12.172)	1.837	0.796	38	∞
Kaldor	0.062* (3.981)	-0.114 (-1.249)	1.837	0.039	38	
Rowthorn1	0.028 (1.377)	-1.053* (-4.134)	1.637	0.310	38	
Rowthorn2	0.028 (1.377)	-0.053 (-0.208)	1.637	0.001	38	
Several Industry						

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.

	Constant	Coefficient	DW	R^2	G.L.	E.E. (1/(1-b))
Verdoorn	-1.212 (-0.756)	0.550* (8.168)	2.185	0.529	37	2.222
Kaldor	1.212 (0.756)	0.450* (6.693)	2.185	0.983	37	
Rowthorn1	8.483* (24.757)	0.069 (1.878)	2.034	0.175	37	
Rowthorn2	8.483* (24.757)	1.069* (29.070)	2.034	0.975	37	
9 Manufactured Industry Together						
	Constant	**Coefficient**	**DW**	**R^2**	**G.L.**	**E.E. (1/(1-b))**
Verdoorn	-0.030* (-6.413)	0.608* (19.101)	1.831	0.516	342	2.551
Kaldor	0.030* (6.413)	0.392* (12.335)	1.831	0.308	342	
Rowthorn1	-0.003 (-0.257)	-0.275* (-4.377)	1.968	0.053	342	
Rowthorn2	-0.003 (-0.257)	0.725* (11.526)	1.968	0.280	342	

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

6. EMPIRICAL EVIDENCE OF ABSOLUTE CONVERGENCE, PANEL DATA

Table 2 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 (10)(Martinho, 2011b).

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

Table 2: 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_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**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_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**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
Chemical industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
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
Electric goods industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**

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.

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
Transport equipments industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
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
Food industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
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
Textile industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
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
Paper industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
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
Several industry											
Method	**Const.**	**D_1**	**D_2**	**D_3**	**D_4**	**D_5**	**Coef.**	**T.C.**	**DW**	**R^2**	**G.L.**
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

7. CONCLUSIONS

At the level of estimates made for manufactured industries, it appears that those with, respectively, higher dynamics are the transport equipment industry, food industry, minerals industrial, metals industry, the several industries, the textile industry, chemical industry and equipment and electrical goods industry. The paper industry has excessively high values.

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.

The signs of absolute convergence are different from one manufactured industries to another, but there is a curious results for the equipment transport industry, because present strong evidence of absolute convergence and we know that this industry is a dynamic sector.

So, we can that the strong increasing returns to scale in the same industries (like the transport equipment industry) are not enough to avoid the convergence of this industries.

8. 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. 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).
4. N. Kaldor. Strategic factors in economic development. Cornell University, Itaca, 1967.
5. R.E. Rowthorn. A note on Verdoorn´s Law. Economic Journal, Vol. 89, pp: 131-133 (1979).
6. T.F. Cripps and R.J. Tarling. Growth in advanced capitalist economies: 1950-1970. University of Cambridge, Department of Applied Economics, Occasional Paper 40, 1973.
7. N. Islam. Growth Empirics : A Panel Data Approach. Quarterly Journal of Economics, 110, 1127-1170 (1995).
8. R. Solow. A Contribution to the Theory of Economic Growth. Quarterly Journal of Economics (1956).
9. A.P. Thirlwall. Regional Problems are “Balance-of-Payments” Problems. Regional Studies, Vol. 14, 419-425 (1980).
10. V.J.P.D. Martinho. Sectoral convergence in output per worker between Portuguese regions. MPRA Paper 32269, University Library of Munich, Germany (2011b).