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Preprint

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Suggested Citation: Martinho, Vítor João Pereira Domingues (2012) : What the Keynesian theory said about Portugal?, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

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WHAT THE KEYNESIAN THEORY SAID ABOUT PORTUGAL?

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ABSTRACT

With this work it is intended to analyze the contributions of the Keynesian theory to the explanation of the regional evolution in Portugal. Considering the Keynesian models in different perspectives and taking into account the Verdoorn (1949) relationship it is did data and econometric analysis for the Portuguese economy in the period from 1995 to 1999. There are not many or none works based in the Keynesian theory and in the Verdoorn relationship for Portugal, namely at regional level. On the other hand the models based in this theory are regularly used to explain the regional economic growth in many countries. So, it is thought that analyze the economic Portuguese context with this theory is an important contribution to the economic theory and to the Portuguese understanding. As main conclusion it can be said that the Keynesian theory show for Portugal, in this period, regional and sectoral divergence.

Keywords: Keynesian theory; Verdoorn law; Portuguese regions.

1. INTRODUCTION

The models of the Keynesian theory usually use the Verdoorn (1949) relationship to help in the explanation of the spatial growth. This relationship say that the productivity growth is endogenous and is dependent of the output growth, with a relation of more or less 0,5. Later Kaldor (1966 and 1967) rediscovered this relationship and Rowthorn (1975 and 1979) presented an alternative interpretation of the Verdoorn law. Kaldor confirmed for the United Kingdom that the productivity growth is endogenous and dependent of the output growth

showing to be able to capture scales economies and learning by doing concepts. Rowthorn gives another interpretation of this law, ignoring the idea of increasing returns to scale.

Recently, Bernat (1996), Fingleton and McCombie (1998) and Fingleton (1999) presented an improvement in the models with the Verdoorn relationship introducing variables to capture the spatial effects and autocorrelation influences.

There is not a known work about the applications of the Verdoorn law in the Portuguese regions, than those developed by the author. Because that this study is so important to the scientific theory and to the Portuguese understanding. The period considered correspond to the phase of implementation in Portugal of the second Community Framework Support and correspond at more or less ten years of Portugal within the European Union.

Many applications of this law were made in many other countries, for example Mata et al. (2006) made an interpretation of the Verdoorn relationship in the sectoral gross domestic product, productivity and employment of the Brazilian economy. They find strong evidences of this relationship in the several sectors of the economic context in the Brazil. Yet for the Brazilian economy, Neto and Teixeira (2004a) investigated the growth with restrictions in the payment balance, as consequence of the liberalization process, from the nineties, based on the Thirlwall law, where the Verdoorn law has a primordial importance, because help to explain the circular and cumulative process defended by Thirlwall (1999). In another work, the same authors Neto and Teixeira (2004b) showed, also, the importance the Verdoorn law in the explanation of the growth processes, in the Brazilian economic context. In this study Neto and Teixeira explained the Brazilian economic globalization and the investments in the Brazil. A sectoral analysis, for the Brazilian fruit sector, from 1990 to 2004, was made by Ferreira et al. (2008) and evidenced, again, the pertinence of the Verdoorn relationship in the Brazil. In this case is a surprising and an interesting conclusion, because this law evidence increasing returns to scale and the agricultural sector is expected to have constant returns to scale. Nevertheless, actually, because the modernization of the agriculture, in many studies, it is found increasing scales economies.

Kosfeld and Dreger (2005) analyze the Verdoorn law in German regions for the period 1992-2000. They found evidences which spatial autocorrelation may bias the conclusions. So, introduce variables in the models to capture spatial effects is fundamental to avoid obtain results incorrect. The spatial autocorrelation is a statistical infraction and actually there are many econometric tools to test and prevent these erroneous procedures which induce us to conclusions not adjusted with the contexts studied.

Arisoy (2008) evaluated the three laws of Kaldor, where the Verdoorn law is an important ingredient for the second Kaldor law, for the Turkey economy from 1963 to 2005 and the empirical results indicate that the models explain a part of the Turkey economic evolution.

For China, Rima (2010) demonstrate that the success of this country is because the increasing returns to scale well explained by Kaldor, Verdoorn and others. The exports are an important engine to the China development, as predicted by the Keynesian theorists who indicate the external demand as the most important factor to the growth of the countries, namely for tradable goods, as those from the industry and in some cases from the modern agricultural sectors and others.

For the Italian context, Fazio et al. (2011) tested the Verdoorn relationship at regional and firm (manufacturing) level. They found strong evidences of increasing returns to scale in both levels. These conclusions confirm, again, the application of this law to the modern economy in different parts of the worlds, namely, in the developed countries. Ofria (2009) studied, also, for different sectors and regions the adjustment of the Verdoorn law, for the period 1951-2006, and confirmed the power of this law in the explanation of the sectoral and regional growth. Gambacorta (2004) concluded for the industrial sector in Italy that the Verdoorn relationship runs better when it is considered the capital.

Interesting and coherent with the theory conclusions were found for the Greek regions by Alexiadis (2006). This author found that the Verdoorn relationship explain the evolution of the regions in Greece, namely that with spatial effects. More one time the spatial effects being determinant in the explanation of the regional evolution and development. Apergis and Zikos (2003) tested this relationship with time series data from the Greek manufacturing, during the period 1960-1995, and with some modifications in the usual model used. They concluded about the presence of increasing returns to scale, confirming, in this way, the presence of the Verdoorn law.

2. ALTERNATIVE MODELS

There are many specifications of the Verdoorn law, but one of the most known is that built by Kaldor (1966) and usually named as the second law of Kaldor:

$$p_{it} = a + bq_{it}, \quad \text{Verdoorn law} \quad (1)$$

where p_i and q_i are the growth rates of labor productivity and output, respectively.

For the Portuguese, regions and sectors, Martinho and Soukiazis (2005) and Martinho (2011a) developed an alternative equation of Verdoorn with panel data. They added new variables in the original equation to capture the effects of the capital, of the transport costs and of the concentration phenomenon. The capital is because when it is considered the Cobb-Douglas production function, this variable as an important role, namely if the capital is not constant as assumed in the Verdoorn original equation. The cost transportation and the concentration phenomenon come from the new economic geography models which consider the need of taking into account agglomeration variables, when it is wanted to analyze spatial information, like regional data. The equation is the following:

$$p_{it} = a_0 + a_1 q_{it} + a_2 (C_{it} / Q_{it}) + a_3 (F_{it} / Q_{ikt}) + a_4 (E_{it} / E_{nt}), \text{ increased Verdoorn equation (2)}$$

where (C_i/Q_i) is the ratio of gross formation of capital fixed/output (proxy to the capital), (F_i/Q_{ikt}) is the ratio of the flow of goods/output (proxy to the transport costs) and (E_i/E_n) is to capture concentration phenomenon, considering E the employment. Indexes i and n represent each of the regions and the national total, respectively. The indexes k and t represents the total industry and the period of time, respectively.

In another perspective Bernat (1996), Fingleton and McCombie (1998) and Fingleton (1999) built Verdoorn equations considering spatial effects and the possibility of spatial autocorrelation. As it said before sometimes the Verdoorn relationship runs better when it is considered the possibility of spatial correlation. An equation more or less similar with those built by these authors, is the following:

$$p_{it} = \rho W_{ij} p_{it} + \gamma q_{it} + \varepsilon_{it}, \text{ Verdoorn's equation with spatial effects (3)}$$

where W is the matrix of distances across regions, ρ is the autoregressive spatial coefficient (of the spatial lag component, with the dependent variable lagged between the spatial unities, for example regions) and ε is the error term (of the spatial error component, with, $\varepsilon = \lambda W\varepsilon + \xi$). The indices i, j and t, represent the regions being studied, the neighbouring regions and the period of time respectively.

In this work it will be only used the equation 1 to analyze the increasing returns to scale in the

Portuguese economy using data for the period considered and for the all Portuguese regions, including island regions.

3. DATA ANALYSIS

Following it will be analyzed data for the growth rate of the productivity and for the growth rate of the output, during the period 1995-1999, considering the sectors of the 7 NUTs II and the 30 NUTs III. The data were obtained from the INE (Statistics Portugal).

In the figures 1, 3, 5, 7 and 9 (annex 1) it is showed that the Norte and Lisboa e Vale do Tejo NUTs II are the two Portuguese regions with more output (gross value added at constant prices), namely the last region. In these two regions the metropolitan NUTs III (Grande Porto e Grande Lisboa) are the spatial unities with more output. The major contribution to the gross value added come from the services, followed by the industry and after appear the agriculture.

From the figures 2, 4, 6, 8 and 10 (annex 1) it can be seen that the agriculture has the less productivity. The productivity in this sector increases from the Portuguese north to the south, maybe because the dimensions of the farms which are bigger in the south of the country. On the other hand, the productivity in services is more regular and in many times is bigger than in the industry. The industry show from 1995 to 1999 having some peaks of productivity in the Douro, Trás-os-Montes e Alto Douro and in the Alentejo, maybe because the reduced importance of these sectors in these regions.

Observing the figures 11, 12, 13 and 14 it is important to emphasize that the values of the growth rate average of the output and of the productivity have an evolution very similar between the several regions (NUTs III). To stress, also, the negative values for these growth rates in the agriculture and some regularity of these values in the services sectors.

4. EMPIRICAL EVIDENCE

The results presented in the table 1 are very similar with those found by Martinho (2011b), where was not considered the Portuguese island regions, Açores and Madeira. The Verdoorn coefficient for the agriculture is unusually high, maybe because the growth rates of the output and of the productivity are negative, what means there is a close relationship between the two variables, but is a negative correlation.

Industry has a high value for the coefficient of Verdoorn, sign of increasing returns to scale as expected, taking into account the referred by the Keynesian theorists, as Kaldor, Thirlwall and others.

On the other hand the results from the different econometric panel method (static and dynamic) are very similar, indication of robustness of the estimations.

Table 1. Results from the Verdoorn equation for the Portuguese NUTs III sectors, during the period 1995-1999

	Const. ¹	Coef. ²	F/Wald(mod.) ³	F(Fe_OLS) ⁴	Corr(u_i) ⁵	F(Re_OLS) ⁶	Hausman ⁷	R ² ⁸	N.O. ⁹	N.I. ¹⁰
Total regional										
FE ¹¹	-0.013* (-3.970)	0.814* (11.430)	130.670*	0.590	-0.180	-----	-----	0.765	120	-----
RE ¹²	-0.011* (-4.250)	0.771* (14.220)	202.090*	-----	-----	0.000	0.880	0.765	120	-----
OLS	-0.011* (-4.250)	0.771* (14.220)	202.090*	-----	-----	-----	-----	0.628	120	-----
DPD ¹³	-0.008 (-1.640)	0.782* (7.650)	76.440*	-----	-----	-----	-----	-----	60	5
Agriculture										
FE ¹¹	0.020* (4.910)	1.074* (32.620)	1064.160*	1.210	-0.163	-----	-----	0.923	120	-----
RE ¹²	0.018* (4.460)	1.044* (32.720)	1070.400*	-----	-----	0.000	13.960*	0.923	120	-----
OLS	0.018* (4.460)	1.044* (32.720)	1070.400*	-----	-----	-----	-----	0.900	120	-----
DPD ¹³	0.037* (8.050)	1.132* (32.530)	1160.420*	-----	-----	-----	-----	-----	60	5
Industry										
FE ¹¹	-0.019* (-4.860)	0.803* (14.110)	198.990*	1.200	0.190	-----	-----	0.775	120	-----
RE ¹²	-0.021* (-5.250)	0.856* (16.880)	284.810*	-----	-----	0.180	4.100	0.775	120	-----
OLS	-0.021* (-5.440)	0.860* (16.930)	286.660*	-----	-----	-----	-----	0.706	120	-----
DPD ¹³	-0.014 (-2.500)	0.646* (6.910)	75.220*	-----	-----	-----	-----	-----	60	5
Services										
FE ¹¹	-0.011* (-2.260)	0.604* (7.060)	49.790*	0.860	-0.348	-----	-----	0.359	120	-----
RE ¹²	-0.004 (-0.970)	0.472* (6.760)	45.740*	-----	-----	0.000	7.080*	0.359	120	-----
OLS	-0.004 (-0.970)	0.472* (6.760)	45.740*	-----	-----	-----	-----	-----	120	-----
DPD ¹³	-0.027* (-3.590)	0.838* (7.600)	59.150*	-----	-----	-----	-----	-----	60	5

Note: 1, Constant; 2, Coefficient; 3, Test F for fixed effects model and test Wald for random effects and dynamic panel data models; 4, Test F for fixed effects or OLS (Ho is OLS); 5, Correlation between errors and regressors in fixed effects; 6, Test F for random effects or OLS (Ho is OLS); 7, Hausman test (Ho is GLS); 8, R square; 9, Number of observations; 10, Number of instruments; 11, Fixed effects model; 12, Random effects model; 13, Dynamic panel data model; *, Statically significant at 5%.

In the table 2, the results, in this case for the Portuguese NUTs II, including Açores and Madeira, are similar with the results obtained in Martinho (2011a) and have some similarities with those found before for the Portuguese NUTs III. Again, agriculture having a not expected value for the coefficient. The coefficient for the services is higher than that found for the Portuguese regions NUTs III, sign of the importance of more fine analysis when we work with regional information, because taking into account the theory is not expected find large increasing returns to scale in this sector.

Table 2. Results from the Verdoorn equation for the Portuguese NUTs II sectors, during the period 1995-1999

	Const. ¹	Coef. ²	F/Wald(mod.) ³	F(Fe_OLS) ⁴	Corr(u_i) ⁵	F(Re_OLS) ⁶	Hausman ⁷	R ² ⁸	N.O. ⁹	N.I. ¹⁰
Total regional										
FE ¹¹	-0.005 (-0.500)	0.659* (2.970)	8.810*	0.300	0.524	-----	-----	0.958	28	-----
RE ¹²	-0.012 (-1.480)	0.807* (4.940)	24.400*	-----	-----	0.000	0.960	0.958	28	-----
OLS	-0.012 (-1.480)	0.807* (4.940)	24.400*	-----	-----	-----	-----	0.464	28	-----
DPD ¹³	0.005 (0.240)	0.640 (1.930)	8.320*	-----	-----	-----	-----	-----	14	5
Agriculture										
FE ¹¹	0.012 (1.310)	1.046* (8.030)	64.460*	2.000	-0.311	-----	-----	0.763	28	-----
RE ¹²	0.010 (0.860)	0.963* (7.960)	63.350*	-----	-----	0.680	2.960	0.763	28	-----
OLS	0.009 (0.930)	0.920* (7.460)	55.580*	-----	-----	-----	-----	0.669	28	-----
DPD ¹³	0.020 (1.630)	1.106* (6.320)	43.400*	-----	-----	-----	-----	-----	14	5
Industry										
FE ¹¹	-0.011 (-1.320)	0.732* (5.230)	27.360*	0.150	0.084	-----	-----	0.905	28	-----
RE ¹²	-0.012 (-1.630)	0.742* (6.680)	44.620*	-----	-----	0.000	0.010	0.905	28	-----
OLS	-0.012 (-1.630)	0.742* (6.680)	44.620*	-----	-----	-----	-----	0.618	28	-----
DPD ¹³	-0.005 (-0.410)	0.659* (3.760)	14.570*	-----	-----	-----	-----	-----	14	5
Services										
FE ¹¹	-0.013 (-1.460)	0.738* (4.470)	19.960*	0.360	-0.183	-----	-----	0.500	28	-----
RE ¹²	-0.011 (-1.430)	0.697* (4.990)	24.940*	-----	-----	0.000	0.220	0.500	28	-----
OLS	-0.011 (-1.430)	0.697* (4.990)	24.940*	-----	-----	-----	-----	0.470	28	-----
DPD ¹³	-0.016 (-0.860)	0.840* (3.140)	17.000*	-----	-----	-----	-----	-----	14	5

Note: 1, Constant; 2, Coefficient; 3, Test F for fixed effects model and test Wald for random effects and dynamic panel data models; 4, Test F for fixed effects or OLS (Ho is OLS); 5, Correlation between errors and regressors in fixed effects; 6, Test F for random effects or OLS (Ho is OLS); 7, Hausman test (Ho is GLS); 8, R square; 9, Number of observations; 10, Number of instruments; 11, Fixed effects model; 12, Random effects model; 13, Dynamic panel data model; *, Statically significant at 5%.

In this work it is not made estimations considering the Verdoorn equation with spatial effects, because it is considered the two island Portuguese regions and this fact will bias the results when is taking into account spatial effects, where the spatial distances have primordial importance. But the results found by Martinho (2011c), with cross-section data and for NUTs III, show some signs of spatial autocorrelation in the agriculture (spatial error) and in the services (spatial lag).

Analyzing the volatility of the data, it is found stationary, as showed in the table 3 presented following. These results allow us to conclude about the robustness of the information presented before.

Table 3. Tests of the stationary with the Fisher-type unit root-test based on Philips-Perron tests, for the variables used in the Verdoorn equation (NUTs III)

Total regional		
	p ^a	q ^a
Inverse ¹	151.986*	686.609*
Inverse ²	-3.928*	-14.957*
Inverse ³	5.497*	-32.378*
Agriculture		
	p ^a	q ^a
Inverse ¹	197.582*	313.007*
Inverse ²	-5.529*	-8.269*
Inverse ³	-8.195*	-14.538*
Industry		
	p ^a	q ^a
Inverse ¹	398.740*	564.005*
Inverse ²	-8.651*	-12.055*
Inverse ³	-17.594*	-26.326*
Services		
	p ^a	q ^a
Inverse ¹	147.556*	582.113*
Inverse ²	-2.120*	-14.245*
Inverse ³	-4.091*	-28.581*

¹ Inverse chi-squared (P); ² Inverse normal (Z); ³ Inverse logit t (L*); ^a ADF regression with one lag; ^b ADF regression with two lags; * Statistically significant at 5%.

The robustness of the data for the NUTs II, as presented below, is not so high, nevertheless the signs are not too weak. In any case, as referred before the analysis more fine, when we study regional questions, are preferred.

Table 4. Tests of the stationary with the Fisher-type unit root-test based on Philips-Perron tests, for the variables used in the Verdoorn equation (NUTs II)

Total regional		
	p ^a	q ^b
Inverse ¹	14.651	45.554*
Inverse ²	-0.315	-1.881*
Inverse ³	-0.316	-3.535*
Agriculture		
	p ^a	q ^a
Inverse ¹	61.730*	90.005*
Inverse ²	-4.675*	-4.446*
Inverse ³	-6.023*	-8.372*
Industry		
	p ^b	q ^a
Inverse ¹	39.133*	138.630*
Inverse ²	-0.538	-5.581*
Inverse ³	-2.096*	-13.539*
Services		
	p ^a	q ^a
Inverse ¹	39.733*	237.952*
Inverse ²	-3.328*	-12.443*
Inverse ³	-3.736*	-27.168*

¹ Inverse chi-squared (P); ² Inverse normal (Z); ³ Inverse logit t (L*); ^a ADF regression with one lag; ^b ADF regression with two lags; * Statistically significant at 5%.

5. CONCLUSIONS

All the models, considering the Verdoorn relationship, show to the Portuguese economy, during the period 1995-1999, strong signs of increasing returns to scale. This is an interesting conclusion, because means that Portugal in this period experimented a process of divergence. Considering that Portugal is a country with strong asymmetries between the littoral and the interior, among the north and the south, between the urban areas and the rural zones, and among the metropolitan cities, like Oporto and Lisbon, and the other cities, having the

Portuguese regions, in this period, processes with increasing returns to scale is an evidence which was needed public policies to reverse this situation.

More preoccupant is the situation if we think that in this period we speak about ten years after Portugal join to the European Union (in that time named European Economic Community) and after receiving several European financial supports to converge and develop.

Another preoccupation is because in this period Portugal received financial supports from the European Union, within the second Community Support Framework, that occurred from 1994 to 1999.

So, the Portuguese problems seem to come from long time and is important to find regional policies to avoid these situations and prevent regional imbalances, with desertification in same zones and congestion in other areas.

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Annex 1

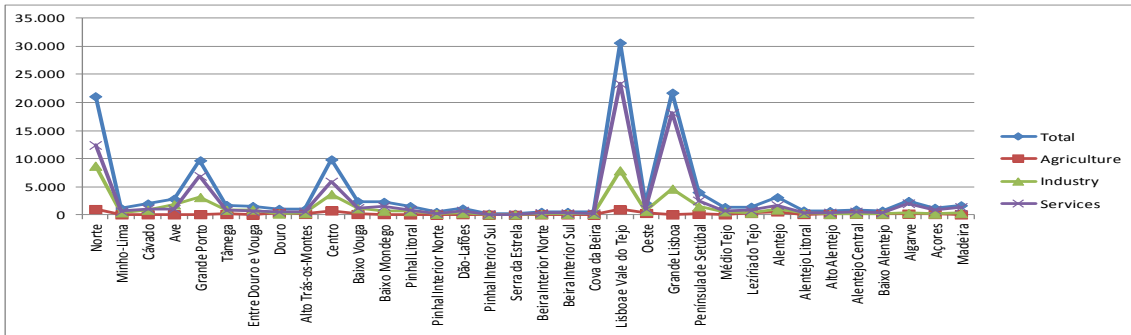


Figure 1. Sectoral output, in million euros, in the Portuguese regions (1995)

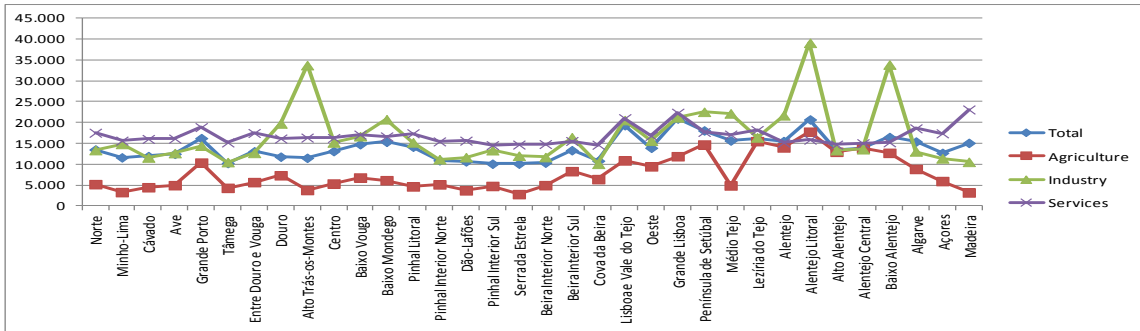


Figure 2. Sectoral productivity, in euros, in the Portuguese regions (1995)

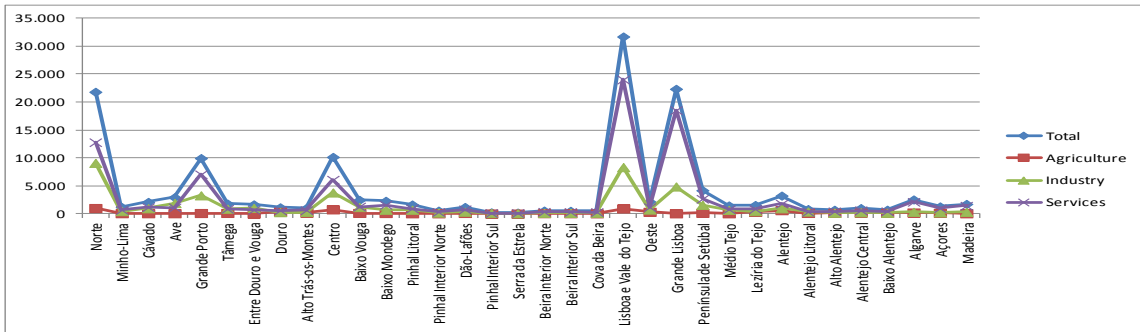


Figure 3. Sectoral output, in million euros, in the Portuguese regions (1996)

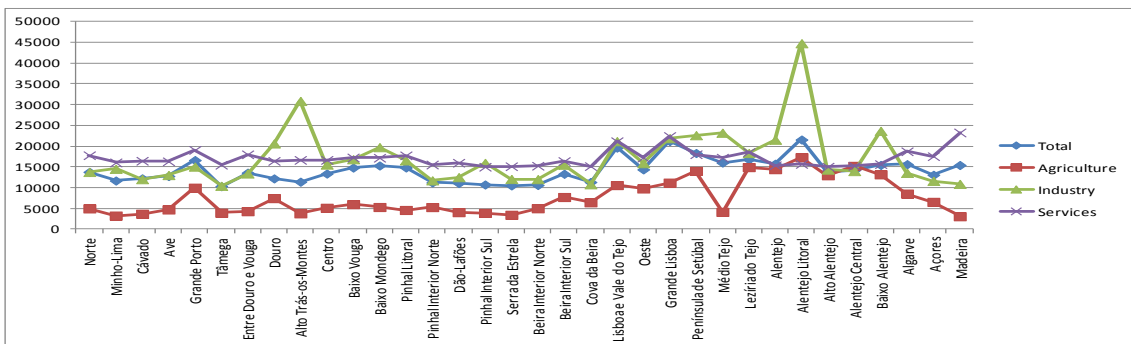


Figure 4. Sectoral productivity, in euros, in the Portuguese regions (1996)

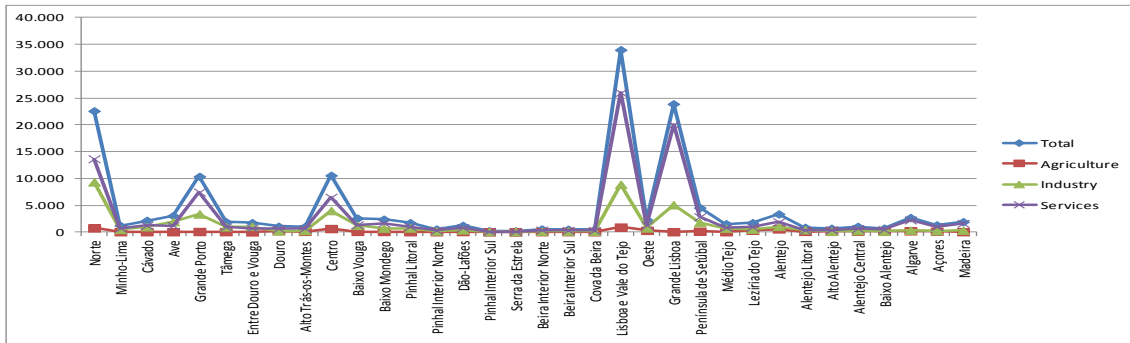


Figure 5. Sectoral output, in million euros, in the Portuguese regions (1997)

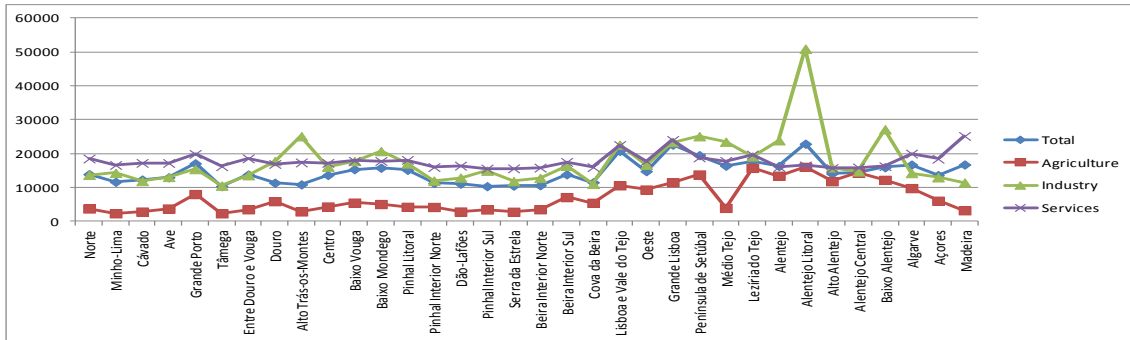


Figure 6. Sectoral productivity, in euros, in the Portuguese regions (1997)

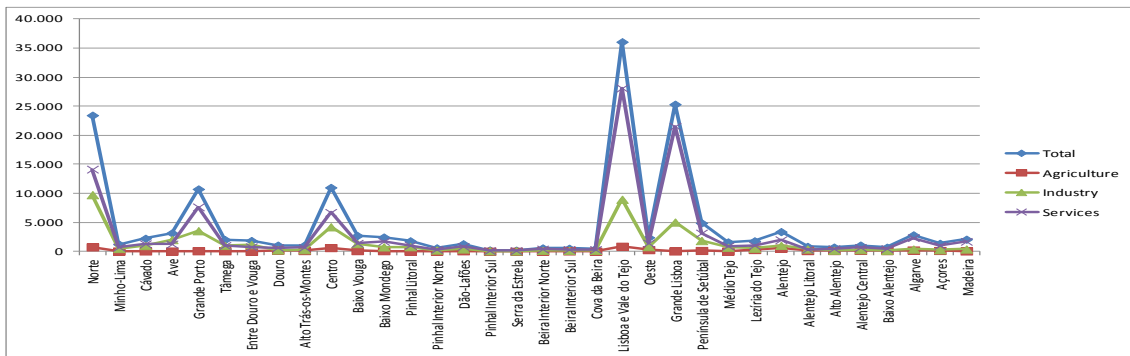


Figure 7. Sectoral output, in million euros, in the Portuguese regions (1998)

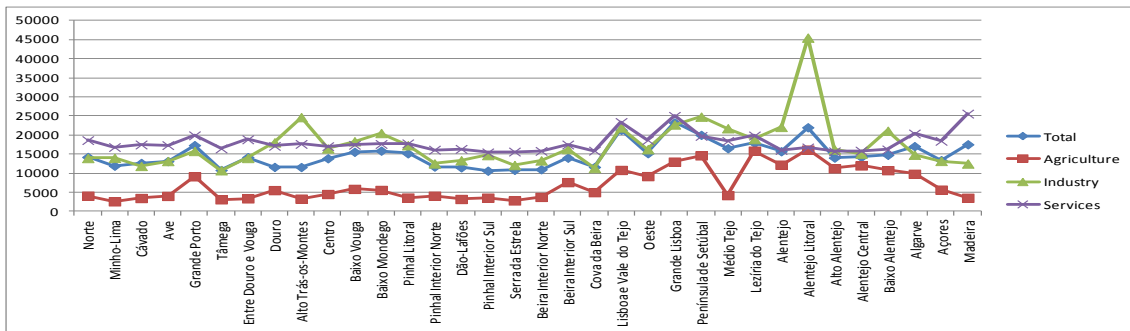


Figure 8. Sectoral productivity, in euros, in the Portuguese regions (1998)

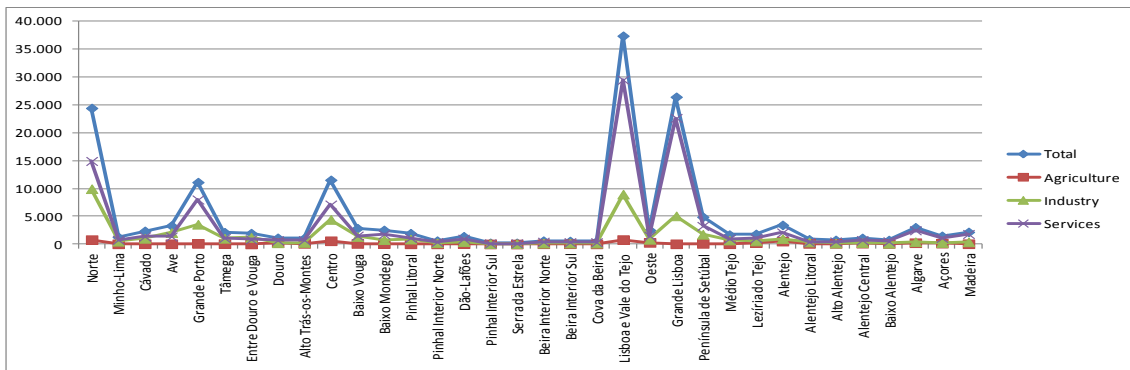


Figure 9. Sectoral output, in million euros, in the Portuguese regions (1999)

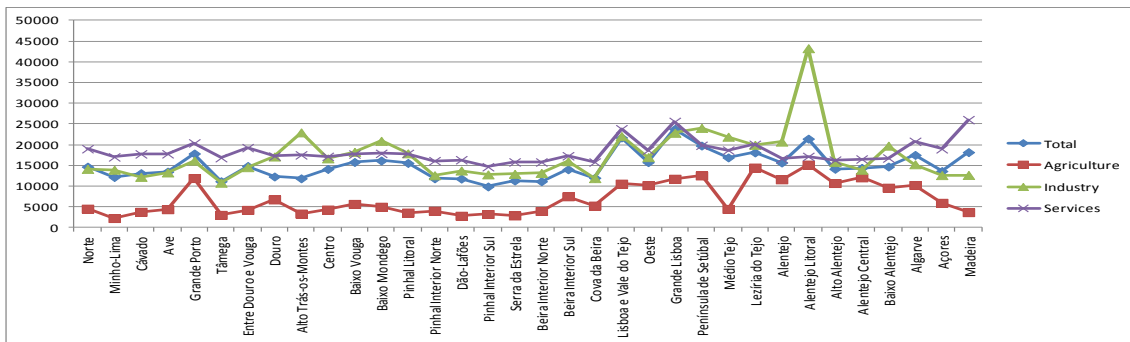


Figure 10. Sectoral productivity, in euros, in the Portuguese regions (1999)

Annex 2

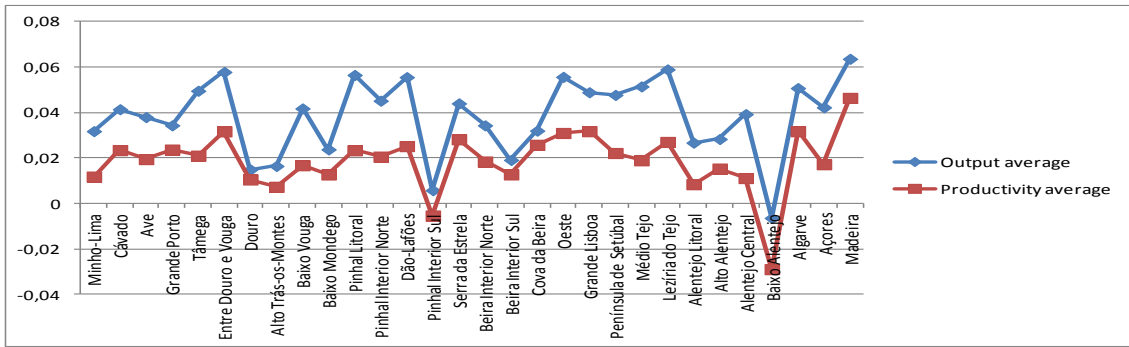


Figure 11. Growth rate of the output and productivity average for the total regional economy (NUTS III)

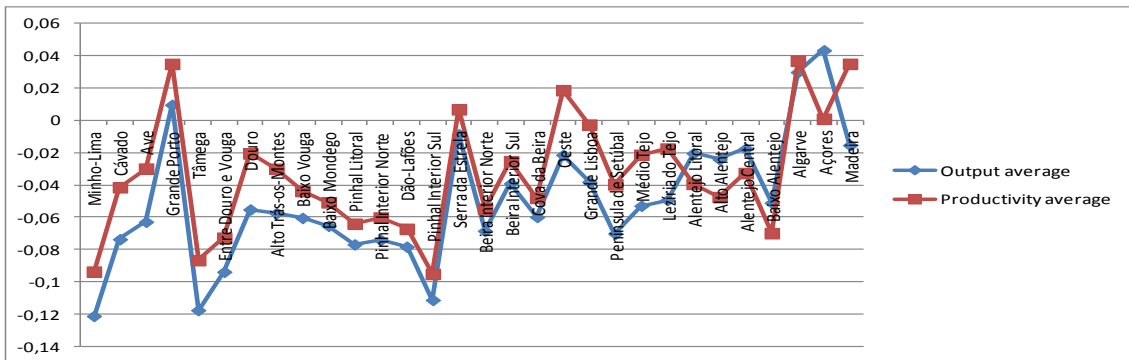


Figure 12. Growth rate of the output and productivity average for the agriculture (NUTS III)

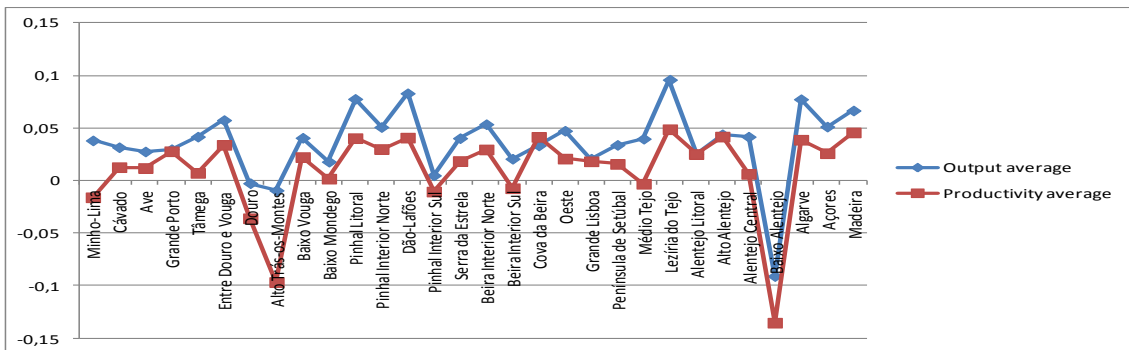


Figure 13. Growth rate of the output and productivity average for the industry (NUTS III)

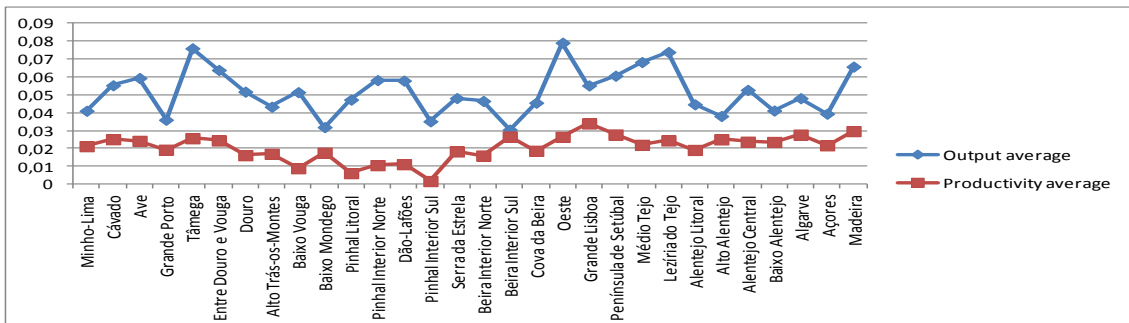


Figure 14. Growth rate of the output and productivity average for the services (NUTS III)