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Portugal in the EU: the Perspective of Convergence

Tese de Mestrado

Âmbitos (2000):
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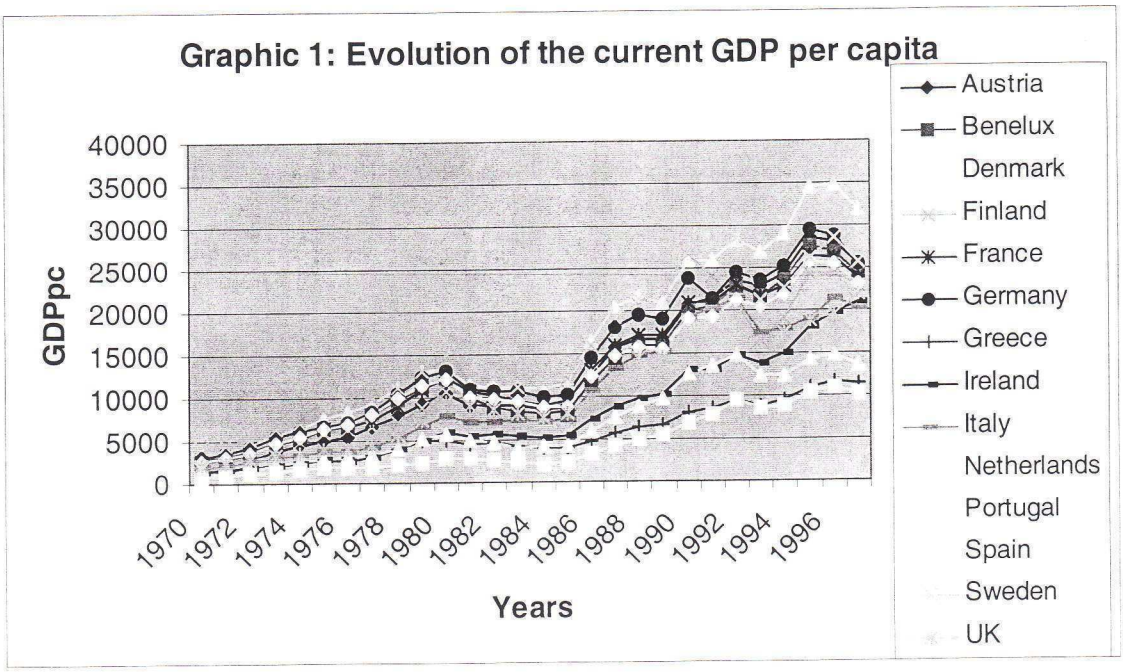
3. Testing Convergence - Own Estimations

Portugal belongs to the European Regional Block since the year of 1986. Because of that, I will consider here two things: the evolution of the GDP per capita of each state-member of today's European Union (EU) from 1970 to 1997 and afterwards some estimations using the test of Hénin and Le Pen (1995).

At this point, it's important to visualise the evolution of the current GDP per capita of each of the state-members of the today's EU to observe the behaviour of the Portuguese GDP per capita relatively to the one of the other countries. The best why to show that evolution is through a graphic.

Graphic 1: Evolution of the current GDP per capita



From the Graphic 1 it's possible to identify that the Portuguese current GDP per capita is relatively lower than the others. In 1970 most of the values were around smaller amounts but after a certain moment Portugal lost the track, in such a way that in the beginning of the eighties, its GDP per capita didn't grown much while the one of the others (especially of the centre of Europe) grown faster, enlarging the differences (divergence). Is after 1986, the year of the Portuguese adhesion) that the variable became more dynamic, growing faster, at the same time as searched a lower divergence. Perhaps because of the inherited start, Portugal isn't still verifying convergence.

A result that will now be checked by the formula of Hénin and Le Pen (1995), the selected test for its efficiency and simplicity, as well as for its fitness into my objectives:

$$\ln(y_{in}) - \ln(y_{i0}) = a - b.\ln(y_{i0}) + \varepsilon_{in} \qquad \text{(B.2)}$$

Existing convergence when -b is negative and $(1-b)^2 / R^2 < 1$, just by using a t-student's test. For that reason, there will be β-convergence if -b is negative and σ-Convergence if the variance of yit is decreasing with time. Knowing that $(1-b)^2 / R^2 < 1 \Leftrightarrow (1-b)^2 < R^2 \Leftrightarrow 1-b < R \Leftrightarrow b > 1-R$, then the null hypothesis of the t-student is H0: b=1-R.

Econometric Estimation 1: Hénin and Le Pen test for **Austria, Benelux, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and United Kingdom**.

Since Portugal entered in the regional block in 1986, three estimations will follow: one considering the whole period and others to divide that period in two.

Econometric Estimation 1.1: under the period of 1970-1997

Dependent Variable: LOG (G?)-LOG (G? -70)				
Method: Pooled Least Squares				
Date: 08/29/00 Time: 19:07				
Sample: 1970 1997				
Included observations: 28				
Total panel (balanced) observations 392				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.129482	0.003109	41.65143	0.0000
LOG (G? -70)	-0.013019	0.000343	-37.99597	0.0000
R-squared	0.787315	Mean dependent var		0.011843
Adjusted R-squared	0.786769	S.D. dependent var		0.011999
S.E. of regression	0.005541	Sum squared resid		0.011973
Log likelihood	2381.419	F-statistic		1443.694
Durbin-Watson stat	0.103497	Prob (F-statistic)		0.000000

Source: Own estimations using data from the Chelem CEP II

A negative b-coefficient is favourable to accepting convergence and, bigger that b, bigger the chances of convergence among the countries. The b is considered significantly different from zero because, even though is –0,013019, the t-student definitely rejects the null hypothesis.

The R^2 statistic measures the success of the regression in predicting the values of the dependent variable for being the fraction of the variance of the dependent variable explained by the independent variables. To understand if there is σ-Convergence we need to see if $(1-b)^2 / R^2 < 1$ or if b>1-R. The R-squared is almost 79% and b isn't superior to (1-0,8873077). The t-student tests the hypothesis of H0: b=(1-R) is significantly negative, so we seem to reject the existence of σ-Convergence inside the European Union until the year of 1997. The same is reflected in the F-statistic test and its probability and the standard

errors of the regression are very small so the statistic noise shows a considerably good estimation of the results (see graph 2 in the annexes).

After balancing results, the most we can say is that the convergence has probably begun but that it's yet a weak tendency and not a reality.

Econometric Estimation 1.2: under the period of 1970-1985

Dependent Variable: LOG (G?)-LOG (G? -70)				
Method: Pooled Least Squares				
Date: 09/14/00 Time: 00:31				
Sample: 1970 1985				
Included observations: 16				
Total panel (balanced) observations 224				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.179611	0.004505	39.86743	0.0000
LOG (G? -70)	-0.019040	0.000526	-36.16940	0.0000
R-squared	0.854923	Mean dependent var		0.017133
Adjusted R-squared	0.854270	S.D. dependent var		0.013447
S.E. of regression	0.005133	Sum squared resid		0.005850
Log likelihood	1411.709	F-statistic		1308.226
Durbin-Watson stat	0.143786	Prob (F-statistic)		0.000000

Source: Own estimations using data from the Chelem CEP II

Econometric Estimation 1.3: under the period of 1986-1997

Dependent Variable: LOG(G?)-LOG(G?-70)				
Method: Pooled Least Squares				
Date: 09/14/00 Time: 00:41				
Sample: 1986 1997				
Included observations: 12				
Total panel (balanced) observations 168				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.062430	0.001462	42.69778	0.0000
LOG(G?-70)	-0.005939	0.000150	-39.46463	0.0000
R-squared	0.903682	Mean dependent var		0.004790
Adjusted R-squared	0.903102	S.D. dependent var		0.002839
S.E. of regression	0.000884	Sum squared resid		0.000130
F-statistic	1557.457	Durbin-Watson stat		0.228987
Prob(F-statistic)	0.000000			

Source: Own estimations using data from the Chelem CEP II

According to these other two estimations, the results did not change. The b continues significantly different from zero because of the rejection of the null hypothesis made by the t-student test. The R^2 continues high (0,855 and 0,904, respectively in the econometric estimation 1.2 and 1.3). The σ-convergence hypothesis isn't still accepted. The distinction of the two periods doesn't change the things much, unless according to the this estimation.

The following estimations only consider the period 1970-1997.

Econometric Estimation 2: Hénin and Le Pen test for **Benelux, France, Germany, Italy, Netherlands and Portugal**, under the period of 1970-1997.

Dependent Variable: LOG (G?)-LOG (G? -70)				
Method: Pooled Least Squares				
Date: 08/29/00 Time: 22:19				
Sample: 1970 1997				
Included observations: 28				
Total panel (balanced) observations 168				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.138582	0.005444	25.45611	0.0000
LOG (G? -70)	-0.013989	0.000599	-23.34695	0.0000
R-squared	0.766552	Mean dependent var		0.012014
Adjusted R-squared	0.765146	S.D. dependent var		0.013301
S.E. of regression	0.006446	Sum squared resid		0.006897
Log likelihood	894.5187	F-statistic		545.0803
Durbin-Watson stat	0.098196	Prob (F-statistic)		0.000000

Source: Own estimations using data from the Chelem CEP II

According to the results of this new estimation, the coefficient b has a considerably equal value, that is also negative but small. About the b>1-R, b>0,12447 isn't true. The t-student test rejects a bit less the null hypothesis but not sufficiently. For the same reasons as before, there are not reasons to believe in effective convergence even though it seems to be a tendency.

Econometric Estimation 3: Hénin and Le Pen test for **Spain and Portugal**, under the period of 1970-1997.

Dependent Variable: LOG (G?)-LOG (G? -70)				
Method: GLS (Cross Section Weights)				
Date: 08/29/00 Time: 22:28				
Sample: 1970 1997				
Included observations: 28				
Total panel (balanced) observations 56				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.195688	0.010288	19.02047	0.0000
LOG (G? -70)	-0.020719	0.001216	-17.03874	0.0000
Weighted Statistics				
R-squared	0.830910	Mean dependent var		0.023593
Adjusted R-squared	0.827779	S.D. dependent var		0.019429
S.E. of regression	0.008063	Sum squared resid		0.003511
Log likelihood	201.4697	F-statistic		265.3564
Durbin-Watson stat	0.152695	Prob (F-statistic)		0.000000
Unweighted Statistics				
R-squared	0.839966	Mean dependent var		0.023303
Adjusted R-squared	0.837002	S.D. dependent var		0.019975
S.E. of regression	0.008064	Sum squared resid		0.003512
Durbin-Watson stat	0.153093			

Source: Own estimations using data from the Chelem CEP II

When Portugal and Spain are compared the result of the test reaches a result that shows a bit bigger negative b than in the other estimations, as well as a closer possibility of σ-Convergence. By differentiating some statistics in weighted and unweighted, the program itself seems to wants to detail the study on the matter. The t-student rejects less the null hypothesis. Yet, the hypothesis of non-convergence between Spain and Portugal can't still be rejected, unless using as variable the current GDP per capita.

The same test was applied to other groups of countries or even tested bilateral convergence. In neither of those cases was achieved σ-Convergence and despite the negative value of the b, its small value can't reject the hypothesis of non b-convergence of the GDP per capita.