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Portugal in the EU: the Perspective of Convergence

Tese de Mestrado

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and consumption didn't grow. Oil prices were also lower. The exchange rate evolution was also favourable.

Portugal started a golden road in 94. That recuperation remained strong evidence until the end of the nineties, for more that structural changes and real convergence seemed yet far from the optimum. Portugal is now part of the European Union (EU), after overcoming the nominal criteria of the Stability Pact. But the last years' analysis showed a dark perspective of a slower growth and the end of a successive convergence process.

3.2 A Gravitational Equation to Better Understand the Portuguese Trade Fluxes

Since Portugal is geographically peripheral to the centre of Europe, has distance played an important role in the country's trade evolution? It's exactly that that this paper will try to answer by analysing an estimation based on the model of Bergstrand.

Having in mind what was written about the Bergstrand model, this paper is going to present the model thought best to define the Portuguese fluxes of external exchanges. The model will adopt the following nomenclature:

- i is Portugal
- j is for the other state-members (Austria, Benelux, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Spain, Sweden and United Kingdom)
- Yi and Yj (GDP constant with prices of 1990)
- yi and yj (GDP per capita based on constant GDP, prices of 1990, for countries i and j)
- Eij (real exchange rate for the value of the money of the country i in terms of one unity of the money of country j, prices of 1990)
- Gij (geographic distance between the capital of the country i and the capitals of the countries jj)
- Fij (dummy variable for a possible common frontier between i and j)

The chosen model is therefore:

$$X_{ij} = \psi_0 Y_i^{\psi_1} Y_j^{\psi_2} y_i^{\psi_3} y_j^{\psi_4} E_{ij}^{\psi_5} G_{ij}^{\psi_6} F_{ij}^{\psi_7} \qquad \text{(H.1)}$$

The choice of the interval in which the equation will be estimated is limited to the hypothesis in the Bergstrand model. As seen before, the model will consider that exists the same technology for all countries.

Distance is not an easy variable since authors define it differently. This paper follow the studies of Baldwin (1994) and Festoc (1996), the ones that defend the use of direct distances between capitals instead of the shorter navigable distance between the principal ports and economic centres of those same countries as Wang and Winters (1991), avoiding like this the many complications resulting from the second definition. So, the indicator of economic distance expresses the number of Km that separate the Portuguese capital (Lisbon) from the capitals of the other countries.

About the data, this paper uses the data from the Chelem CEPII for the values, all expressed in millions of dollars. The real exchange rate also comes from the base Chelem but was re-estimated so that the coins would all be in function of the Portuguese coin. The analysis will be done using the interval 1970-1997.

Finally, the equation will be formalised using panel data, this because, according to more recent studies, gives multiple observations about each individual because follows an interval of individuals through time.

Since we can't use the formula directly as it is, we'll apply to it logarithms in the following way:

$$Log(X_{ij}) = \psi_0 + \psi_1 \log(Y_i) + \psi_2 \log(Y_j) + \psi_3 \log(y_i) + \psi_4 \log(y_j) + \\ + \psi_5 \log(E_{ij}) + \psi_6 \log(G_{ij}) + \psi_7 \log(F_{ij}) + e_{ij} \qquad \text{(H.2)}$$

The eij is the error term. The coefficients give us the elasticities of exports in terms of the other variables.

Before interpreting the following estimation, just one last remark about the selection of the variables. The GDP and the GDP per capita were considered preferable with constant values instead of current for also using exchange rates. Instead of using variables such the nominal exchange rates and the price Indexes, this model uses real exchange rates so that the problems of multicolinearity may be avoided as Festoc (1996) advise us to do.

Using my own estimations, I present here an estimation made under the period of 1997. Afterwards I will divide that period in two to realise if after the Portuguese adhesion to the European Regional Block the results changed relatively to the ones verified in 1970/85.

Econometric Estimation 4: **Gravitational Model with pooled data**

Econometric Estimation 4.1: under the period of 1970-1997

Dependent Variable: LOG (XIJ?)				
Method: Pooled Least Squares				
Date: 08/31/00 Time: 02:45				
Sample: 1970 1997				
Included observations: 28				
Total panel (balanced) observations 364				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-39.55807	1.965214	-20.12914	0.0000
LOG(GDPI?)	2.803984	1.139057	2.461671	0.0143
LOG(GDPJ?)	0.756759	0.029947	25.26978	0.0000
LOG(GDPPCI?)	0.225205	1.286792	0.175013	0.8612
LOG(GDPPCJ?)	0.875518	0.113645	7.703987	0.0000
LOG(GIJ?)	-0.807318	0.117123	-6.892893	0.0000
LOG(FIJ?)	-0.656446	0.261884	-2.506624	0.0126
LOG(EIJ?)	-0.560531	0.155622	-3.601863	0.0004
R-squared	0.907226	Mean dependent var		5.119996
Adjusted R-squared	0.905402	S.D. dependent var		1.584162
S.E. of regression	0.487237	Sum squared resid		84.51448
Log likelihood	125.4527	F-statistic		497.3275
Durbin-Watson stat	0.179960	Prob(F-statistic)		0.000000

Source: own estimations, using data from Chelem CEP II

All the coefficients seem significantly different from zero, which may mean that they have considerable importance in the interpretation of the Portuguese fluxes of trade. The coefficient of geographic distance is negative which is to be expected since bigger the distance, lower the trade, and the fact is that most of the considered countries are a bit away from Portugal; Portugal is the most occidental country of Europe.

The coefficient of the GDP of the importer is positive, which is also to be expected since the income of the importer country impulse trade, if not because it's a good client that may buy more in the future and has money to pay.

The coefficient of the GDP per capita of the importer is positive, as well as very close of 1, so Portugal seems to be mainly buying luxury goods (instead of normal products).

The coefficient for the Portuguese GDP is particularly different from zero. A strong positive value shows a tendency for production of goods intensive in capital.

The coefficient for the Portuguese GDP per capita is around 0,23, which means that is less significantly different from zero than the others. Testify in favour of an exchange of goods intensive in capital but not strongly.

A common frontier incentives trade, also because countries usually have similar economic structures, so its coefficient should be positive or that was to be expected according to the model of Bergstrand. That doesn't happen here and the negative value is significantly different from zero. But the fact is that most of the considered countries don't have a common frontier with Portugal; only Spain does. That may be the reason for the bias in the results.

The coefficient for the real exchange rate is negative This is to be expect since a depreciation of the coin is usually traduced for more trade since the Portuguese products will be less expensive outside the country. The value is also significantly different from zero.

The fraction of the variance of the dependent variable (exports) explained by the several independent variables is very significant since is close to 1 (0,907), so the regression fits almost perfectly. The t-student test seems to definitely reject the possibility that the coefficient for the GDP of the countries j is null.

The conclusions of the estimation are consistent with the explained in the historical resume made previously. Portugal is making considerable efforts in augmenting its intra-industry fluxes and distance was a considerable barrier in terms of external exchanges. Distance shown to be an important variable.

Let's now divide the period of 1970/1997 in two, to realise if the main conclusions are still verified or, for the contrary, the impact of the variables changed after the Portuguese adhesion to the European Regional Block.

Econometric Estimation 4.2: under the period of 1970-1985

Dependent Variable: LOG (XIJ?)				
Method: Pooled Least Squares				
Date: 09/14/00 Time: 12:07				
Sample: 1970 1985				
Included observations: 16				
Total panel (balanced) observations 208				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-37.67431	2.558174	-14.72703	0.0000
LOG (GDPI?)	2.367172	1.570457	1.507314	0.1333
LOG (GDPJ?)	0.660443	0.039343	16.78684	0.0000
LOG (GDPPCI?)	0.502432	2.000026	0.251213	0.8019
LOG (GDPPCJ?)	1.124917	0.138546	8.119432	0.0000
LOG (GIJ?)	-0.865200	0.153694	-5.629351	0.0000
LOG (FIJ?)	-1.633302	0.339584	-4.809716	0.0000
LOG (EIJ?)	-0.139208	0.167294	-0.832116	0.4063
R-squared	0.864183	Mean dependent var		4.291745
Adjusted R-squared	0.859430	S.D. dependent var		1.267974
S.E. of regression	0.475398	Sum squared resid		45.20062
Log likelihood	116.8974	F-statistic		181.7961
Durbin-Watson stat	0.269048	Prob (F-statistic)		0.000000

Source: own estimations, using data from Chelem CEP II

The coefficient of geographic distance is still negative (bigger the distance, lower the trade).

The coefficient of the GDP of the importer is positive, still meaningful but a bit lower (higher income from the importer country incentive trade).

The coefficient of the GDP per capita of the importer is positive and this time bigger than one. The Portuguese imported a lot of luxury goods, in part explained by the bought technology that, at that time, the country didn't produce.

The coefficient for the Portuguese GDP continues to be much superior to one. As before, a strong positive value testifies in favour of production of goods intensive in capital.

The coefficient for the Portuguese GDP per capita is still positive. Testify in favour of an exchange of goods intensive in capital.

The coefficient of the common frontier continues being negative and the value is even more meaningful. Here I have to say that is to be expected since Portugal and Spain didn't trade much before 1986, also because of historical reasons.

The coefficient for the real exchange rate is still negative Is to be expect since a depreciation of the domestic money was used to incentive trade.

The fraction of the variance of the dependent variable (exports) explained by the several independent variables is very significant since is close to 0,9 (0,86), so the regression fits almost perfectly. The t-student test seems to definitely reject the possibility that the coefficient for the GDP of the countries j is null, and also has a high t-student in the case of the GDP per capita of the importer.

Econometric Estimation 4.3: under the period of 1986-1997

Dependent Variable: LOG (XIJ?)				
Method: Pooled Least Squares				
Date: 09/14/00 Time: 12:12				
Sample: 1986 1997				
Included observations: 12				
Total panel (balanced) observations 156				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-33.16582	26.74457	-1.240095	0.2169
LOG (GDPI?)	7.308357	11.67429	0.626021	0.5323
LOG (GDPJ?)	0.889781	0.032946	27.00727	0.0000
LOG (GDPPCI?)	-5.763367	11.65752	-0.494391	0.6218
LOG (GDPPCJ?)	0.208888	0.171453	1.218345	0.2250
LOG (GIJ?)	-0.785248	0.127663	-6.150950	0.0000
LOG (FIJ?)	0.449597	0.289821	1.551294	0.1230
LOG (EIJ?)	-1.829150	0.304261	-6.011786	0.0000
R-squared	0.925056	Mean dependent var		6.224330
Adjusted R-squared	0.921512	S.D. dependent var		1.257826
S.E. of regression	0.352389	Sum squared resid		18.37838
F-statistic	260.9741	Durbin-Watson stat		0.198618
Prob (F-statistic)	0.000000			

Source: own estimations, using data from Chelem CEP II

The coefficient of geographic distance continues negative, as well as the coefficient of the GDP of the importer is still positive. The coefficient of the GDP per capita of the importer is positive but much smaller, in favour of lower expenses on luxury goods. The coefficient for the Portuguese GDP is higher than ever (7,308), explaining that the domestic production of goods intensive in capital increased exponentially.

The surprise appears in the coefficient of the Portuguese GDP per capita now negative, testifying in favour of an exchange of goods intensive in labour.

A common frontier incentives trade, also because countries usually have similar economic structures, and the estimation finally traduces that exactly. The coefficient is positive when in the other two estimations was negative. A frontier does matter. It's consistent with the fact that Spain became a strong partnership in the Portuguese commercial fluxes.

The coefficient for the real exchange rate is even more negative (and superior to one). This is to be expected since a depreciation of the money is usually traduced for more trade.

The fraction of the variance of the dependent variable (exports) explained by the several independent variables is very significant since is close to 1 (0,907), so the regression fits almost perfectly. The t-student test seems to definitely reject the possibility that the coefficient for the GDP of the countries j is null.

3.3 Indicators for the Portuguese Trade

3.3.1 The Main Indicators for Trade

Knowing that:

X (exports)
M (imports)
i (country studied)
k (chains)
Xi+Mi (total of external trade)
Xi-Mi (balance on goods)
$X_i^k + M_i^k$ (total of external trade for a certain chain)
$X_i^k - M_i^k$ (balance of a certain chain in the external trade)
X_i^k / X_i (weight of a certain exported chain in the total of exports)
M_i^k / M_i (weight of a certain imported chain in the total of imports)

- Index of the Balance on goods over GDP: $IB = \frac{X_i - M_i}{GDP_i} * 100$ (I.1)

- Herfindahl Index: $H_{exports} = \left(\frac{X_i^k}{X_i} \right)^2$ (I.2)

$$H_{imports} = \left(\frac{M_i^k}{M_i} \right)^2 \quad \text{(I.3)}$$

- Gini-Hirshman Index: $GH_{exports} = \sqrt{\sum_k \left(\frac{X_i^k}{X_i} \right)^2} * 100$ (I.4)

$$GH_{imports} = \sqrt{\sum_k \left(\frac{M_i^k}{M_i} \right)^2} * 100 \quad \text{(I.5)}$$

- Grugel-Lloyd Index: (for each sector) $GL_i = 1 - \frac{\left| X_i^k - M_i^k \right|}{X_i^k + M_i^k}$ (I.6)

(for the whole) $GL = 1 - \frac{\sum_k \left| X_i^k - M_i^k \right|}{\sum_k (X_i^k + M_i^k)}$ (I.7)

There was a previous selection of the indicators, choosing these for their efficiency and fitness in the objectives of this paper.

The weight of the balance on goods over the GDP was to reach the importance of external trade in the Portuguese economy.

After that general idea about trading fluxes a new step was to be followed by dealing with each chain of the Portuguese bilateral relations with the state-members of the European regional block. This paper also considered the aggregated result of the relations with those countries as a whole according to the successive enlargements of the regional block, this to reach a true idea about the evolution from which Portugal beneficiated or not by being outside and afterwards inside the community.

Not being the information until that time sufficient, this paper used other indicators, such as the ones of Herfindahl and Hirshman to estimate more specific information about the industrial environment of the markets of those countries of Europe.

With the indicator of Gini-Hirshman if the results were equal to 100% the level of concentration was maximum, if were equal to 1% is minimum. The problem was that when countries were structurally similar it was difficult to distinguish the intra-industry trade from the inter-industry trade for not containing on its estimations the difference between exports and imports, so the analysis of the indicator of Grugel-Lloyd became indispensable. The Grugel-Lloyd gave the difference between 1 and the inter industry trade, which was the same as saying the gave the intra-industry trade, so closest to zero meant the existence of inter-industry trade and, for that, stronger comparative advantage; closest to one there was intra-industry trade.

The whole of the estimations is presented in annexes. The heart of this paper includes some squares with the estimations considered most relevant and it