Econometric

Project Paper

Title:

Structural change in Export and economics growth: Analysis for spain (1980-2001)

**Shahrul Nizam Haron*

**Mohd Zahari Mat Amin*

**Mohd Fauzi Azmi*

1. Abstract

The Spanish export-led growth hypothesis is re-examined from the trade liberalization process initiated four decades ago. For this purpose both the export expansion and the progression from 'traditional' export to semi manufactures export are taken into consideration. Alongside a feedback between personal Disposable Income (PDI), Personal consumption Expenditure (PCE), Corporate Profits After Tax (PROFITS) & Export (X),are taken to be proved that it also become a key factor for Spain's economic development.

2. Introduction

A distinctive feature of the Spanish economy has been the rapid and sustained growth of their exports during the last four decades. This phenomenon contracts with the evolution of exports in the precedent period in which the economy was characterized by a protectionist and autarkic situation. The process of growth in export has its origin in an outward-looking regime known as Stabilization and Liberalization Plan of 1959. Since then, Spain has carried out a continued process of liberalizing its economy finally leading to the integration of the country in the European Union in 1986.

The effects of a open trade regime and a policy of promoting exports on domestic real output was the fundamental concern dealt with in Balaguer and Catavella-Jordai (2001). A comparison between the autarkic period and the trade liberalization period through the use of historical series for the last century was carried out. In contrast with the existing evidence for the preceding period, the aggregate export evaluation was a significant factor in order to explain economic growth in the last four decades. After

highlighting the importance of export expansion in that period, it would be interesting to re-examine that cycle taking into consideration some additional factors such as PDI, PCE and PROFITS will be taken. Thus, bearing in mind that a great part of the historical time series was estimated, new data series will be used now and, what is more important, information about the change in export composition will be analyzed.

The empirical literature on GDP (Gross Domestic Products) and macroeconomic instability deals either with time series studies based on Spain average over time or 1980 – 2001 averages of panel data. We include relation between GDP growth and macroeconomic indicators such as Personal Consumption Expenditure (PCE), Personal Disposable Income (PDI), Corporate Profit after Tax (profit), and Net Corporate Dividend (dividend). GDP is the total market value of a country's output. It is the market value of all final goods and services produced within a given period of time by factors or production located within a country. The centrality of GDP as a working concept cannot be overestimated. Just as an individual firm needs to evaluate the success or failure of its operations each year, so the economy a whole needs to assess itself. GDP, as a measure of the total production of an economy provides us with a country's economic report card. Because GDP is such an important concept we need to take some time to explain exactly what its definition means.

A large part of GDP consists of personal consumption expenditure (PCE). There are three main categories of consumer expenditure; there is durable goods, nondurable goods, and services. Durable goods, such as automobiles, furniture's and household appliances, last relatively long time. Nondurable goods, such as food, clothing, gasoline and cigarettes, are used up fairly quickly. Payment for services is those things that we

buy that do not involve the production of physical items. It is include expenditures for doctors, lawyers and educational institutions.

PDI or Personal Disposable Income is the subtract personal tax payments from personal income, and personal income is the national income accounts measure of the income received by persons from all sources. National income is a measure of income earned from current production of goods and services. For some purpose, however, it is useful to have a measure of income received by person regardless of sources. For example consumption expenditure by households would be influenced by income. The relevant income concept would be one of all income received by persons. Also we would want to measure of income needed to make tax payments could not be used to finance consumption.

Although, GDP have been widely used in order to analysis the demand effect on the economic development, the use of this information may be insufficient when there exits a deep change in export structure. In fact, alongside the structure change in export composition has also been frequently suggested as an importance factor of a country's economic growth.

3. Literature review

Researches showed repeatedly that in the expenditure approach shows that the Personal Consumption Expenditure (PCE) is use in accounting GDP. It also includes investment expenditures (I), government expenditure (G) and net export (NX). To get the GDP, these four of spending must be added up.

Gross Domestic Product *or* GDP for a given economy:

$$PCE(+)I(+)G(+)NX = \sum P_i Q_i = GDP$$

National Income represents the return to labor and the remaining one-quarter is known as the return to capital. Historically, the percentage of national income allocated between labor and the other factors of production like corporate profit and net interest. The difference between gross domestic product and national income is due to depreciation expense, indirect business taxes, and business transfers to individuals.

Profit can give effect in calculating the GDP. Profits are the amount of money a company has over from the sale of its products after it has paid for all the expense of production. In such countries, profit belongs to the owners of companies or the stockholders of corporations; one of the chief reasons for operating a business is to make a profit.

The advent of imperfect competition and strategic trade theory has led to the investigation of pass-though at industry level. Such analyses examine if estimates of incomplete pass-thought provide support for models of imperfect competition. Recent literature, which deals with the impact of demand schedules in responding to GDP

changes, e.g. partial pass-thought occurs if demand becomes more elastic as price increase (Dornbusch, 1987; Marston, 1990). Variation across industries in the extent of pass-thought has been attributed to factors such as the degree of industry competition, product, substitutability and relative domestic and foreign shares in the market.

Honohan and Flynn (1986) found that exports changes were fully reflected in aggregate domestic prices in the long run using an error-correction framework. O'connel and Frain (1989) examined if price and wages fully responsive to gross domestic product changes. In the model, the change in the price of domestic goods (GDP deflator) is explained by the personal disposable income, personal consumption expenditure, and corporate profits after tax and export in semi manufactures and capital goods.

Wagner (1883) was the first who observed the diachronically tendency to increase public spending, which he managed to combine with the positive rates of economic growth. While an economy is developing, public spending as a percentage of gross national product-increase at the expense of the costs of the private sector. The fact that the percentage of public spending on the national products increase with time means that elasticity consumption for public goods is greater than one. More specifically, one can examine if the expansion of public sector had a favorable effect on economic growth or if public spending, as dictated by Keynesian Theory, stimulated economy growth.

The previous section proved existence of a positive relationship between PDI, PCE, PROFITS, and EXPORT, but this does not allow conclusions to be drawn about the direction of the underlying causality. The data employed can be used to test both Wagner's theory, according to which the direction of gross domestic product increase towards public spending, and also Keynesian theory in which the direction is reverse.

One of the approaches that has supported the export-led-growth hypothesis and provided much influence in subsequent papers can be found in Feder (1983). On the one hand, the author argues that development can be boosted though resource reallocation of less efficient sectors towards those those are more efficient. On the hand, he, tighter with other authors, claims that external demand-oriented sectors experience more efficiency. Following the latter argument, it can be inferred that resource allocation and production efficiency can be improved through the dynamics exports. In order to capture the latter it would be sufficient to consider the aggregate evolution of exports if their structure held relatively constant in time. Except for a few papers that address the change in export structure such as Ghatak et al. (1997) and Amin Gutiérrez de Piňeres and Ferrentino (1997), this is the implicit assumption in most empirical literature on export-led growth.

Nevertheless, it should be borne in mind that the resource allocation towards a new external demand may also contribute to increase a country's general efficiency in a very significant manner. Thus, even though aggregate export expansion was stagnated, the export structure change might generate a beneficial effect on the economic activity.

In this paper, the Spanish export-led growth hypothesis is re-examined. For this purpose, not only exports and economic growth as such are taken under consideration but also the structure change in PDI, PCE and PROFITS. The empirical approach used in this analysis allows, in a simple way, to study the GDP growth effect caused by the distribution of resources among different export, PDI, PCE and PROFITS.

4. Data, Methodology and Empirical Results

The empirical analysis uses annual data and the sample period spans from 1980 to 2001. This project paper considers five variables; gross domestic product (q), personal disposable income (PDI), personal consumption expenditure (PCE), profits and exports (X). The X variable has been constructed by including semi-manufactured and capital goods divided all by total exports.

4.1 Analysis

The Gross Domestic Product (GDP) determination function of Personal Disposable Income (PDI), Personal Consumption Expenditure (PCE), Corporate Profits after Tax (PRO) and Exports (X) is defined as:

$$q_t = \alpha_0 + \alpha_1 PDI_t + \alpha_2 PCE_t + \alpha_3 PRO_t + \alpha_4 X_t + \varepsilon_t$$

where *q*, *PDI*, *PCE*, *PRO* and *X* stand for Gross Domestic Product, Personal Disposable Income, Personal Consumption Expenditure, Corporate Profits after Tax and Exports respectively. α's are parameters to be estimated. Meanwhile *t* denotes time-subscript, whereas, ε is the error term.

The below table shows our estimation of our study:

Dependent Variable: Y
Method: Least Squares
Date: 10/08/04 Time: 03:06
Sample: 1980:1 2001:4
Included observations: 88

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	719.1150	99.80033	7.205537	0.0000
PDI	0.093420	0.097583	0.957338	0.3412
PCE	1.034736	0.115617	8.949684	0.0000
PRO	1.203594	0.167811	7.172320	0.0000
X	1.470364	0.624605	2.354069	0.0209

R-squared	0.997318	Mean dependent var	3865.606
Adjusted R-squared	0.997188	S.D. dependent var	630.0349
S.E. of regression	33.40692	Akaike info criterion	9.910543
Sum squared resid	92629.83	Schwarz criterion	10.05130
Log likelihood	-431.0639	F-statistic	7715.238
Durbin-Watson stat	0.478483	Prob(F-statistic)	0.000000

4.2 Our Report

$$q_t = \alpha_0 + \alpha_1 PDI_t + \alpha_2 PCE_t + \alpha_3 PRO_t + \alpha_4 X_t + \varepsilon_t$$

$$q_t = 719.1150 + 0.093420 PDI_t + 1.034736 PCE_t + 1.203594 PRO_t + 1.470364 X_t$$

S.E =(99.80033) (0.097583) (0.115617) (0.167811) (0.624605)

t-s = (7.205537) (0.957338) (8.949684) (7.1723200) (2.354069)

P.v= (0.0000) (0.3412) (0.0000) (0.0000) (0.0209)

R^2 = 0.997318 $\overline{R}^2$ = 0.997188 F-statistic=7715.238

$n = 88$ Sample= 1980:1-2001:4

As our results towards our study, after an estimation examination we find that all the sign are meet with our earlier expected equation. Therefore, we are surely to say that all the sign of independent variables is in positive sign. Meant that increasing in independent variables will increase the value of GDP.

4.3 Hypothesis Test

4.3.1 We have conducted an appropriate hypothesis test to test whether our values of α_1 is significantly positive at 5% level or not. The result of our hypothesis test is as followed:

Step 1: *Define the* H_0 *and* H_A

H_0: α < 0 ($\hat{\alpha}_1$ is significant not positive)

H_A: α ≥ 0 ($\hat{\alpha}_1$ is significant positive)

Step 2: *Decision Rules*

choose α = 0.05

df = n-k-1

= 88 – 4 - 1

= 83

t 0.05 , 83 = 1.671

$\therefore$ Reject H_0 if |calculate *t* | > 1.671

Otherwise, do not reject H_0

Step 3: *Compute test- statistic*

$$t = \frac{\hat{\alpha} - \alpha}{SE(\hat{\alpha})}$$

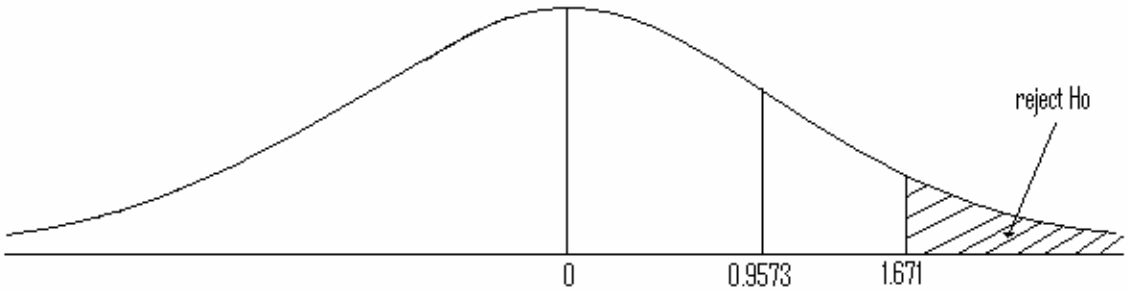
$$= \frac{0.093420 - 0}{0.097583}$$

$$= \underline{\underline{0.9573}}$$

Step 4: *Decision*

Since |calculated t | = 0.9573 < critical t = 1.671,

H_0 is not rejected at 5% significant level.



Step 5: *Conclusion*

Since we have rejected H_0 at 5% significant level, we have enough statistical evidence to infer that $\hat{\alpha}_1$ is not significant positive.

4.3.2 We have conducted an appropriate hypothesis test to test whether our values of $\hat{\alpha}_2$ is significantly different from zero at 10% level or not. The result of our hypothesis test is as followed:

Step 1: *Define the* H_0 *and* H_A

H_0: $\alpha \neq 0$ ($\hat{\alpha}_2$ is not significant different from zero)

H_A: $\alpha = 0$ ($\hat{\alpha}_2$ is significant different from zero)

Step 2: *Decision Rules*

choose $\alpha = 0.10 \Rightarrow \alpha / 2 = 0.05$

df = n-k-1

= 88 – 4 - 1

= 83

$t\ 0.05\ ,\ 83 = 1.671$

$\therefore$ Reject H_0 if $|\text{calculate } t| > 1.671$

Otherwise, do not reject H_0

Step 3: *Compute test- statistic*

$$t = \frac{\hat{\alpha} - \alpha}{SE(\hat{\alpha})}$$

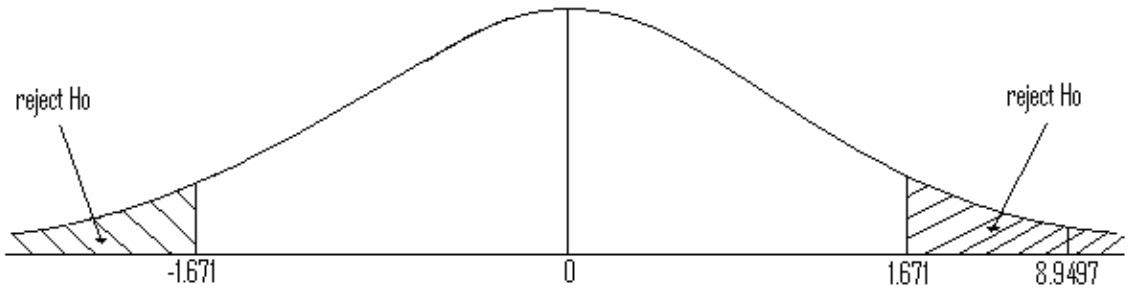
$$= \frac{1.034736 - 0}{0.115617}$$

$$= \underline{\underline{8.9497}}$$

Step 4: *Decision*

Since $|\text{calculated t}| = |8.9497| \geq \text{critical t} = 1.671$,

H_0 is rejected at 10% significant level.



Step 5: *Conclusion*

Since we have rejected H_0 at 10% significant level, we have enough statistical evidence to infer that $\hat{\alpha}_2$ is significant different from zero.

4.3.2.1 We have conducted an appropriate hypothesis test to test whether or not Corporate Profits after Tax (PRO) and Exports (X) should be excluded from the estimation. The result as it followed:

Dependent Variable: Y
Method: Least Squares
Date: 10/11/04 Time: 00:37
Sample: 1980:1 2001:4
Included observations: 88

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2541.349	23.81252	106.7232	0.0000
PRO	3.361107	0.272390	12.33929	0.0000
X	12.76585	0.342313	37.29289	0.0000

R-squared	0.986083	Mean dependent var	3865.606
Adjusted R-squared	0.985755	S.D. dependent var	630.0349
S.E. of regression	75.19546	Akaike info criterion	11.51155
Sum squared resid	480620.3	Schwarz criterion	11.59601
Log likelihood	-503.5084	F-statistic	3011.263
Durbin-Watson stat	0.196846	Prob(F-statistic)	0.000000

$$q_t = \alpha_0 + \alpha_1 PRO_t + \alpha_2 X_t + \varepsilon_t$$

$$q_t = 2541.349 + 3.361107 PRO_t + 12.76585 X_t$$

S.E= (23.81252)(0.272390) (0.342313)

t-s= (106.7232) (12.33929) (37.29289)

P.v= (0.0000) (0.0000) (0.0000)

$R^2 = 0.986083$ $\hat{R}^2 = 0.985755$ F-statistic= 3011.263

$n = 88$ Sample= 1980:1- 2001:4

***F-statistic* Test:**

Step 1: *Define the* H_0 *and* H_A

$H_0 : \hat{\alpha}_1 = \hat{\alpha}_2 = 0$ (PRO_t and X_t should not be excluded)

$H_A : H_0$ is not true.

Step 2: *Decision Rules*

choose $\alpha = 0.01$

The 1% critical *F*- value for *m* (number of the constraints implied by H_0)

and (*n-k-1*) degrees of freedom is:

m=2 (PRO_t and X_t), *d.f*=*n-k-1*

=88-4-1

=83

$F_{\alpha,m,d.f} = F_{0.01,2,83} = 4.98$

$\therefore$ Reject H_0 if |calculate F | > 4.98 otherwise do not reject H_0.

Step 3: *Compute F- statistic*

$$F = \frac{(R_{UR}^2 - R_R^2)/m}{(1-R_{UR}^2)/(n-k-1)}$$

where $R_{UR}^2 = R^2$ value of the unrestricted regression model.

where $R_R^2 = R^2$ value of the restricted regression model.

$$F = \frac{(0.997 - 0.986)/2}{(1-0.997)/83}$$

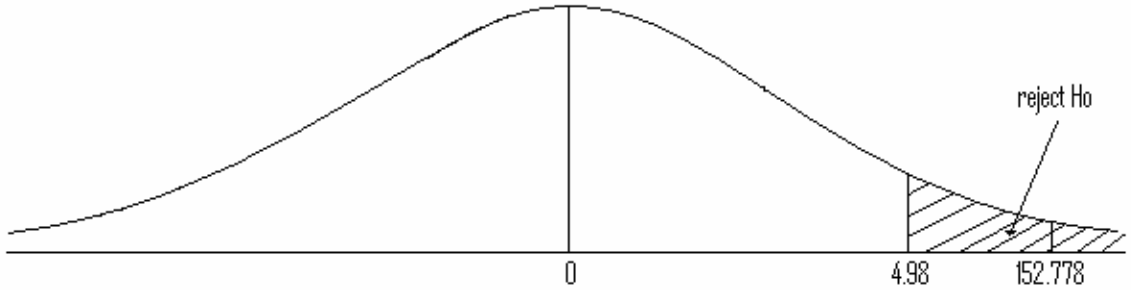
$$F = \frac{0.0055}{0.000036}$$

$$F = \underline{\underline{152.778}}$$

Step 4: *Decision*

Since |calculated F | = 152.778 > critical F = 4.98,

H_0 is rejected at 5% significant level.



Step 5: *Conclusion*

Since we have rejected H_0 at 1% significant level, we have enough statistical evidence to infer that PRO_t and X_t should be excluded in the model.

4.4 Interpretation of P value

Note that P value is important to show whether H_0 is rejected or not in addition to prove our hypothesis test. If the P value is smaller than α it mean that H_o is rejecting. From the estimate table it proves that:

- P value of GDP < α_0

  0.0000 < 719.1150

  Therefore, H_0 is rejecting.

- P value of PDI > α_1

  0.3412 > 0.093420

  Therefore, H_0 is not going to reject.

- P value of PCE < α_2

0.0000 < 1.034736

Therefore, H_0 is rejecting.

- P value of PRO < α_3

  0.0000 < 1.203594

  Therefore, H_0 is rejecting.

- P value of X < α_4

  0.0209 < 1.470364

  Therefore, H_0 is rejecting.

4.5 Study Interpretation

Our interpretations of our study are as followed:

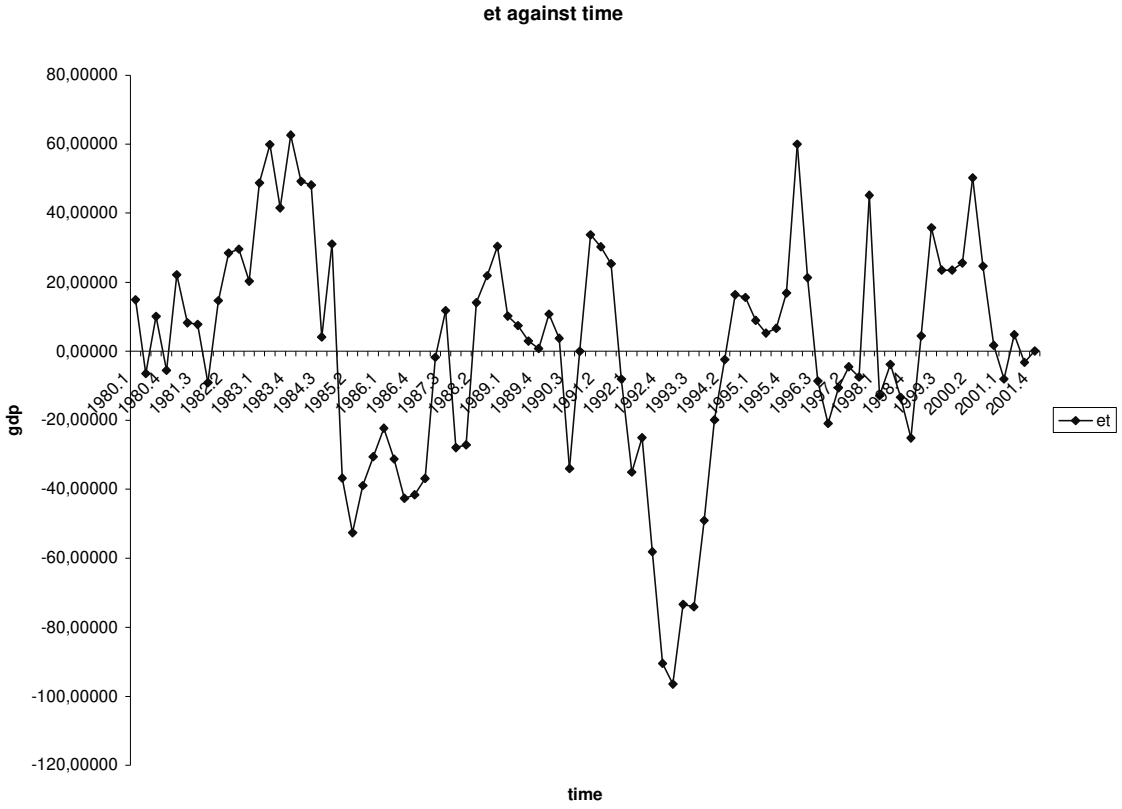
- There are negative relationship between Personal Disposable Income (PDI) and Gross Domestic Product (GDP). As an example, if PDI is increase with 1 unit, it may decrease the value of GDP with 0.093420 units.
- There are positive relationship between Personal Consumption Expenditure (PCE) and Gross Domestic Product (GDP). As an example, if PCE is increase with 1 unit, it may increase the value of GDP with 1.034736 units.
- There is positive relationship between Corporate Profits after Tax (PRO) and Gross Domestic Product (GDP). As an example, if PRO is increase with 1 unit, it may increase the value of GDP with 1.203594 units.
- There are positive relationship between Exports (X) and Gross Domestic Product (GDP). As an example, if X is increase with 1 unit, it may increase the value of GDP with 1.470364 units.

4.6 R^2 Interpretation

Note that our R^2 is 0.997318 and nearly with value of 1, it should be the best to assume that independent variables are efficiently will affect the GDP as a dependent variable. Therefore, R^2 with the value of 0.997318 means the variation in independent variable can explained 99.7% of the variation on y. R^2 criterion is to find a subset model so that adding more variables to the model will yield only small increase in R^2. In practice, the best model found by the R^2 criterion will rarely be the model with the largest R^2.In addition, R^2 does not account for the number of β parameters in the model.

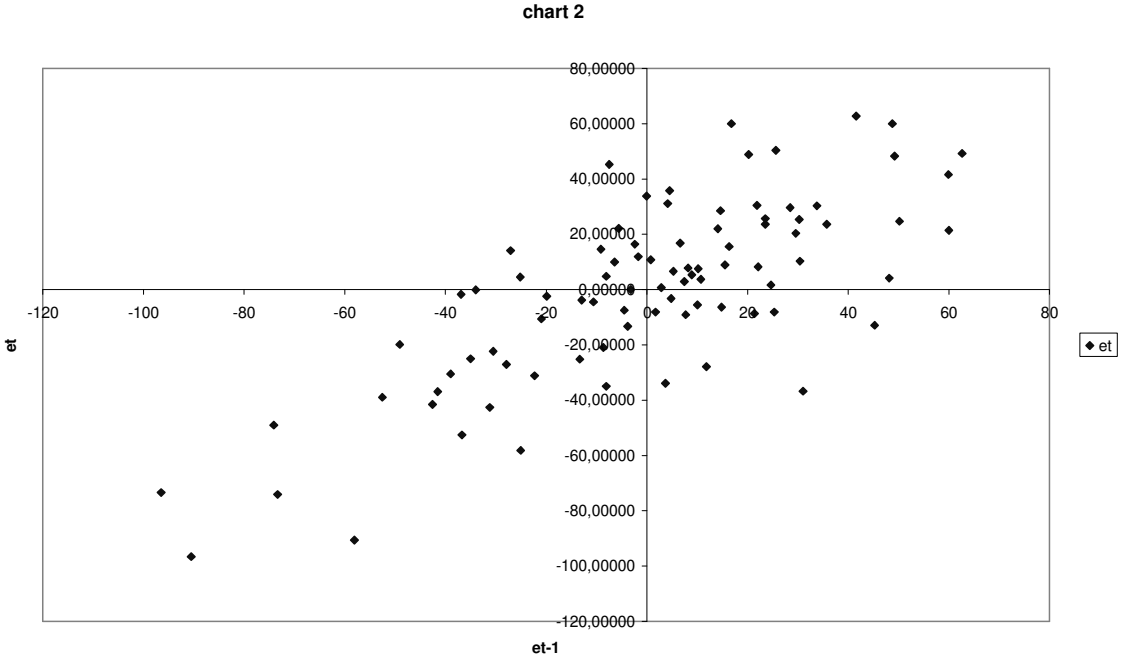
4.7 Residuals Diagnosis:

i. e_t against time



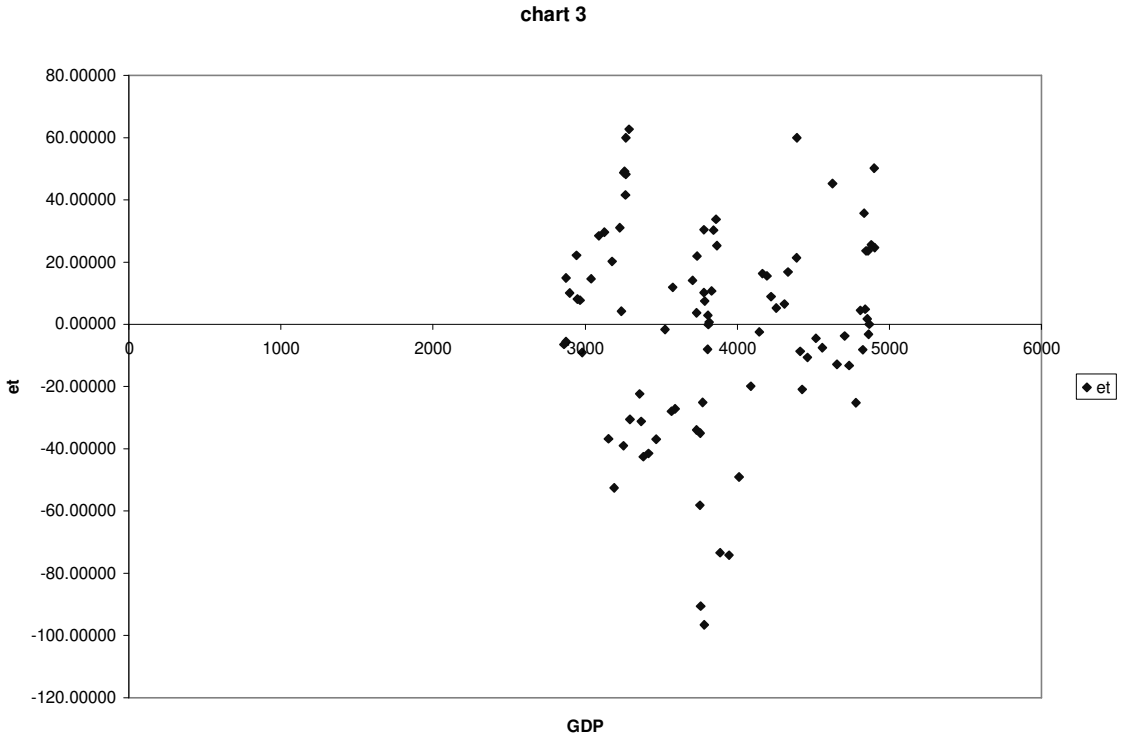
The graft is fluctuating around the mean zero. It means that it was satisfied the CLRM. As a matter of the fact they exhibit the distinct behavior, it generally positive, then become negative and turn up to positive. The e_t is up down around zero.

ii. e_t against e_{t-1}



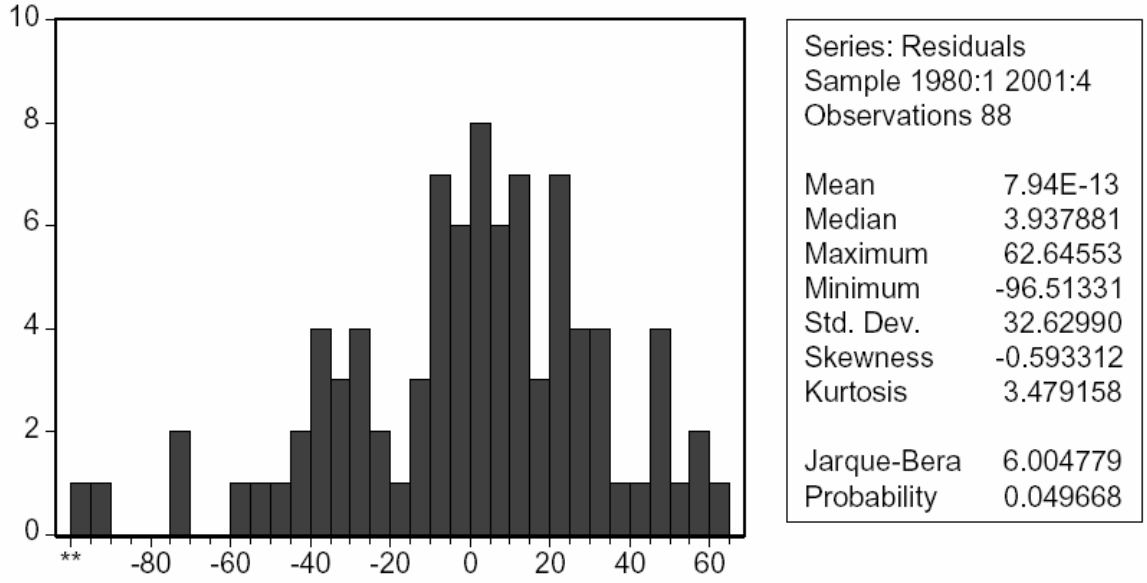
The plotting of e_t against e_{t-1} is positive relationship towards its other. It was in systematic pattern Most et are bunched in the first (northeast) ante third (southwest) quadrants.

iii. e_t against GDP



The graph shows that there are no correlations because it did not have any sign about the straight line, curve or the systematic pattern. It doesn't have heteroscedasticity and it covariance is zero.

iv. Histogram of e_t



As a result from our histogram or e_t, it show that the residuals are not normally distributed.

To test whether it was normally distributed or not we used the *Jarque-Bera* test.

Define H_0 and H_A

$H_0 =$ normal distributed

$H_A =$ not normal distributed

If P value < *Jarque-Bera,* H_0 is rejected.

So, 0.04967 < 6.00478, H_0 is rejected.

As a result, the histogram above is not normally distributed.

4.8 Limitations of Study

Our points of limitation in our study are, in our model it should include others variables that could give some others affect towards our GDP. As examples, it could useful if we include with imports so that it should give some different sign to influence the GDP. The sign of import should be negative and it was negative relationship. We also should include our model with Net Corporate Dividends Payments. The first items subtracted from Spain national income are the portion of the corporate profits item in the national income accounts that are not paid out as dividends includes corporate profits tax payments, undistributed profits (retained earnings), and a valuation adjustment made by the Spain Commerce Department. The details of the valuation adjustment need not concern us here expect to recognize that, because this adjustment was made to the corporate profits entry in the national income, but did not actually affect profits that can be paid out to persons, it must be subtracted in computing personal income.

5. Conclusion

This research paper focused on the role of exports as an engine of Spanish growth in the last four decades but with the particularity of taking under consideration the existence of a deep structural change in exports. The motivation of this research paper aims at examining whether the economic growth has been spurred by either a general increase of exports or other sectors to those more efficient or maybe by both of them.

The inclusion of past information on the export variable improves the forecast for output. Nevertheless, it is found at the same time that real exports are driven by economic growth, that is, bidirectional causality exists between exports and output. This result is compatible with the fact that the resource movement from one sector to another has aimed at satisfying the external demand of goods with greater added value. This result shows evidence regarding the important of that variable in the explanation of the export-led growth process.

Therefore, it can be said that even in circumstances in which the evolution of exports is kept constant, it is possible that the resource allocation towards more competitive sectors generated by external dynamics may cause significant growth rates. In this sense, not only export has a fundamental role in the economic growth, but also it has to be supported by the suitable industrial policy which favors the mobility of resources towards the efficient export sectors.

6. References

Akaike, H. (1969) Fitting autoregressive models for prediction, *Annals of the Institute of Statistical Mathematics*, 21, 243-7.

Amin Gutiérrze de Piñeres, S. and Ferrantino, M. (1997) Export diversification and structural dynamics in the growth process: the case of Chile, *Journal of Development Economics*, 52, 375-91.

Balaguer, J. and Cantavella-Jordà, M. (2001) Examining the export-led growth hypothesis for Spain in the last century, *Applied Economics Letter*, 8, 681-85.

Dickey, D. A. and Fuller, W. A. (1979) Distribution of the estimators for autoregressive time series with a unit root, *Journal of the American Statistical Association*, 74, 427-31.

Dickey, D. A. and Fuller, W. A. (1981) Likelihood ratio statistics for autoregressive time series with a unit root, *Econometrica*, 49, 1057-72.

Feder, G. (1983) On exports and economic growth, *Journal of Development Economics*, 12, 59-73.

Ghatak, S., Milner, C. and Utkulu, U. (1997) Exports, export composition and growth: cointegration and causality evidence for Malaysia, *Applied Economics*, 29, 213-23.

Greenaway, D. and Sapsford, D. (1994) What does liberalisation do for exports and growth?, *Weltwirschaftliches Archives*, 130, 152-74.

Johansen, S. (1988) Statistical analysis of cointegration vectors, *Journal of Economic Dynamics and Control*, 12, 231-54.

Moreno, L. (1997) The determinants of Spanish industrial exports to the European Union, *Applied Economics*, 29, 723-32.

Osterwald-Lenum, M. (1992) A note with quantiles of the asymptotic distribution of the maximum likelihood cointegration rank test statistics, *Oxford Bulletin of Economics and Statistics*, 54, 461-72.

Phillips, P. and Perron, P. (1988) Testing for a unit root in time series regression, *Biometrica*, 75, 333-46.

Romer, P. M. (1986) Increasing returns and long run growth, *Journal of Political Economy*, 94, 1002-37.

Shan, J. and Sun F. (1998) On the export-led growth hypothesis: the econometric evidence from China, *Applied Economics*, 30, 1055-65

William Mendenhall & Terry Sincich, *Regression Analysis Sixth Edition*, Pearson Prentice Hall, 2003.