

ANALYSIS OF SPANISH SAVINGS AT A REGIONAL LEVEL:

EMPIRICAL APPRAISAL.

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Abstract

The primary aim of this paper is to present some empirical evidence on the existing relationship between public and private savings since there is hold the existence of a perfect substitution effect between these two components (the extra rational hypothesis). In addition, it is argued that households internalize the corporate behavior (the so-called consolidation effect). We are concerned in appraising the extent to which this substitution and consolidation effects did hold for the last decades in the 17 Spanish regions and in the country as a whole.

For analyzing this important issue we will use pooled cross-section time series data to test the null hypothesis of a unit root *versus* the gross saving rate of Spanish regions as stationary.

Keywords: regional savings, time series, panel data unit root tests, substitution and consolidation effects.

Jel Clasification: E20, C22,C23.

1. INTRODUCTION.

Over the last years there has been a wide interest for appraising savings behavior, which started from the consideration that an increase in savings leads to a virtuous circle of investment expansion postulated by the Say law and the neoclassical approach¹.

Therefore, the primary aim of this paper is to further explore savings behavior and to present some empirical evidence on the existing relationship among their components.

The article is organized as follows. In section 2 it is presented a literature review of the topic under study, while section 3 explains the data collection and sample design. In section 4 it is carried out an exploratory and correlation analysis of variables. Following, section 5 explains the methodology and the sequence of analysis proposed in this study. Finally, sections 6 and 7 presents the primary empirical results and conclusions, respectively.

2. LITERATURE REVIEW.

The issue regarding the importance of savings for improving a country economic growth is not new in the economic literature and there have been devoted lots of efforts in order to appraise, from a theoretical perspective, the main determinants of its behavior and *inter alia* the existing relationship among their components.

In the savings arena, should be cited the Barro's (1974) pioneer study. He states the view that any change in the level of the public savings magnitude will be counteracted by a private savings change in the opposite direction. That is to say that households and enterprises tend to take into account the intertemporal restriction of public finance decisions in terms of their future impact on private welfare. One of its manifestations is the Ricardian hypothesis (or the extra rational hypothesis), which states that the private sector discount any current public deficit in terms of either future taxes or future public debt issuance. On these grounds, substitution between

¹ See Bahmani-Oskooee, Galindo and Niroomand (1998) for a literature review of all economic theories in regard of savings ,economic growth and development.

public and private savings is of "one to one" and therefore any political decision can imply a direct expulsion of the private sector, either in terms of consumption or saving. Among advocates of this approach are the studies of Bailey (1972) and David and Scadding (1974). Other factors that are used as indicators in favor of this substitution effect is the interest rate behavior (Evans, 1985; Plosser, 1987; and Ballabriga and Sebastian, 1992).

Going beyond, there is an hypothesis supporting the view that, within the private sector, households also internalize the corporate behavior since they are the final owners of corporate results, either distributed or not. At this juncture, the private sector can be considered as an unity and any change should be considered on the whole. Hence, any fiscal incentive to the corporate sector at the expense of a higher taxation of households will have a neutral impact on the private savings magnitude due to the consolidation effect. The more extreme position of this approach is the perfect consolidation within the life-cycle framework firstly postulated by Denison (1958), the so-called hypothesis that "the household sector tear the corporate veil".

Within this line of thought there can be also cited the studies of Ando and Modigliani (1963), Glennon (1985), Engle and Granger (1987), Gulley (1990), Raymond (1990), Marchante (1993) and Argandoña (1995), among others.

The kind of analysis to be performed in this study share the same procedure of analysis as Argimón (1996) who applied country- specific unit root tests for a set of European countries from 1970 to 1990. In this study we go beyond by applying panel data unit root tests and analyzing a more recent period of years (under the new SEC-95 principles).

3. DATA COLLECTION AND SAMPLE DESIGN.

First of all, the scope of this study comprises the 17 Spanish regions, covering the period from 1995 up to 2001. The reason for not including longer time series is due to the existing change of methodology with the inclusion of SEC/95 principles in the national accounts protocol. Until now, no effort has been devoted in order to link the previous SEC/79 and the current SEC/95 accounting rules. Therefore, series under SEC/95 are only covering the aforementioned period.

Among all information sources available for collecting the data, we have chosen the regional economic balance of FUNCAS foundation (1998, 2001) because of its degree of savings desegregation at a regional level and for the different sectors. Additionally, information regarding the gross regional income has been taken from Alcaide (1998, 2002) and Alcaide *et al* (1998, 1999).

4. DESCRIPTION OF VARIABLES.

In this study we are aimed to analyze the savings behavior of both the private and the public sector, and to appraise what kind of relationship does exist between those. For this purpose we have consider the gross saving magnitude, even though it still remains some problems regarding the removal of inflation effects and the inclusion of capital gains and Pension Plans resources.

In Table 1 below we offer some descriptive statistics of the variables in order to give a first approximation to the mean average, standard deviation, variation coefficient (VC) and a proxy of the covariance (COVA)² for each of the sectors analyzed in this study.

² We are considering as a proxy for the covariance the difference between the square of the national variation coefficient (VC) and the weighted average of public VC and the private VC, respectively.

TABLE 1: DESCRIPTIVE STATISTICS OF THE GROSS SAVING RATES.

<i>REGIONS</i>	<i>COVA</i>	<i>MEAN</i>			<i>STANDARD DEVIATION</i>			<i>VARIATION COEFFICIENT</i>		
		Reg	Publ	Privat	Reg	Publ	Privat	Reg	Publ	Privat
Andalucía	-0.0530	12.35	-4.18	18.24	0.89	4.83	1.59	0.07	-1.16	0.09
Aragón	-0,0849	23.78	2.19	25.89	0.42	2.14	1.68	0.02	0.97	0.06
Asturias	-0,0832	14.12	-10.02	19.24	0.85	1.82	1.85	0.06	-0.18	0.10
Baleares	-0,0481	39.71	16.28	26.97	0.53	2.10	1.56	0.01	0.13	0.06
Canarias	-0,0390	18.82	-11.41	28.38	1.41	2.35	1.51	0.07	-0.21	0.05
Cantabria	-0,0845	21.90	-1.06	25.37	1.08	2.08	1.73	0.05	-1.96	0.07
Castilla La Mancha	-0,1085	19.31	-5.20	25.06	0.33	1.28	1.88	0.02	-0.25	0.08
Castilla y León	-0,0352	19.61	-6.81	24.59	0.85	0.92	0.83	0.04	-0.14	0.04
Cataluña	-0,0512	29.23	7.17	21.06	1.30	2.40	1.34	0.04	-0.33	0.06
C.Valenciana	-0,1027	24.76	3.96	19.41	1.94	4.06	2.61	0.08	1.03	0.13
Extremadura	-0,2025	9.78	-10.58	22.84	0.66	1.63	1.62	0.07	-0.15	0.07
Galicia	-0,0532	14.78	-4.15	20.11	0.76	1.08	1.06	0.04	-0.26	0.05
Madrid	-0,0757	29.14	9.13	22.39	1.10	2.40	1.95	0.04	0.26	0.09
Murcia	-0,0734	19.44	-2.88	23.77	0.88	2.27	1.47	0.05	-0.79	0.06
Navarra	-0,0727	28.75	2.14	24.46	0.29	2.12	2.28	0.01	0.99	0.09
P.Vasco	-0,2227	28.41	2.96	55.95	1.05	1.69	3.14	0.04	0.57	0.06
Rioja, La	-0,0639	27.43	-30.68	25.26	0.35	4.36	3.40	0.01	-0.14	0.13
Total Spain	-0,0781	22.59	-2.54	25.23	0.86	2.32	1.85	0.04	-0.92	0.07

Source: Funcas (2001) and own estimations.

At first sight, it can be appreciated that the mean of the private sector is higher than the public one, which presents a negative sign on average. In particular, in 10 out of the 17 Spanish regions the public gross saving rate is negative for the period under study.

By comparing the variation coefficient it is possible to conclude that the gross private saving rate tends to behave in a more stable manner than the public one, but less than the national magnitude. This can be appreciated by comparing the range of values for the different gross savings components: regional (0,01-0,08), private (0,03-0,13) and public (0,13-1,96). However, from this simply comparison we cannot obtain definitive conclusions.

Therefore, we have constructed a proxy of the covariance, the so-called COVA measure coefficient, that will give us a rough view as to what extent the degree of variation of the gross regional savings on the whole is less than the weighted average of its components. Therefore, the interpretation of results

according to the expression below is that a negative sign implies a partial counteraction of changes in private and public saving as to maintain a relative stability in the aggregate magnitude.

$$(1) \quad COVA = VC S.reg^2 - \left\{ (Mean.priv / Mean.reg)^2 VC priv + (Mean.pub / Mean.reg)^2 VC pub \right\}$$

where:

Mean.priv = mean of the regional private sector saving rate

Mean.reg = mean of regional saving rate

Mean.pub = mean of the regional public sector saving rate

VC priv = variation coefficient of the regional private sector saving rate

VC pub = variation coefficient of the regional public sector saving rate.

As it can be appreciated from the first column of Table 1, all Spanish regions present a negative COVA as means of a partial substitution between the private and public sectors. Thus, the former takes into account the public sector behavior at the time of making their decisions of consuming-saving, but not as to completely offset any change. However, we can conclude that the extra rational hypothesis of perfect substitution does not hold and only exists a partial compensation.

Another way to appraise this idea of substitution is to carry out a correlation analysis. Table 2 below presents the primary results of the correlation analysis between public and private saving rates. The second column presents the correlation coefficient that indicates the direction of the existing relationship between those magnitudes. As it can be seen, in all the regions analyzed this relationship present a negative sign, indicating that any change in one variable will be counteracted by the other. Focusing the attention on the last column, the linear determination coefficient (R^2) reveals that the strength of this relationship is considerably strong since on average it is 0,808, being the two more extreme cases Andalucía (0,0902) and Navarra (0,9891).

TABLE 2: CORRELATION BETWEEN**PUBLIC AND PRIVATE SAVINGS.**

<i>REGIONS</i>	<i>% GROSS REGIONAL DISPOSABLE INCOME</i>	
	Correlation Coefficient	R ²
Andalucía	-0,3003	0,0902
Aragón	-0,9739	0,9485
Asturias	-0,9467	0,8962
Baleares	-0,9776	0,9557
Canarias	-0,8869	0,7806
Cantabria	-0,8665	0,7508
C.L.Mancha	-0,9326	0,8698
Cast. y León	-0,7109	0,5054
Cataluña	-0,8306	0,6899
C.Valenciana	-0,9351	0,8745
Extremadura	-0,8856	0,7842
Galicia	-0,9886	0,9773
Madrid	-0,9697	0,9404
Murcia	-0,9677	0,9365
Navarra	-0,9946	0,9891
P.Vasco	-0,9075	0,8236
Rioja, La	-0,4458	0,1988
Total España	0,8542	0,8080

Source: Own estimations.

5. METHODOLOGY SPECIFICATION.

Before entering into the explanation of the different econometric techniques available for testing the presence of unit roots, we will define the stationary property of a time series. According to the original definition provided by Engle and Granger (1987) **strict stationary** is verified when moving all elements of a distribution elements "m" periods and the probability distribution does not change. Then, any time series without a deterministic trend do have a moving average representation that can be approximated by a finite moving average autoregressive process. It can be stated that:

$$\text{Mean:} \quad E(Y_t) = \mu \quad \forall t$$

$$\text{Variance:} \quad \sigma^2(Y_t) = E(Y_t - \mu)^2 = \sigma_e^2 \quad \forall t$$

$$\text{Auto-covariance:} \quad E (Y_{t+m} - \mu) (Y_t - \mu) = \gamma m \quad \forall t$$

Summarizing, any stationary series (i.e. $I(0)$) has a finite variance and hence any innovation will have temporary effect and so the time between two points of the variable that cross the horizontal axis is expected to be finite. On the contrary, a time series is not stationary in variance when it presents a stochastic trend. Going further, it can be argued that this sort of stochastic trends use to appear when there is a unit root in the autoregressive polynomial.

Among alternative procedures for testing stationary, we will apply unit root tests and we will assume that the data generating process (DGP) can be described by a panel data extension of the univariate augmented Dickey-Fuller (ADF) framework³.

According to Maddala and Kim (1998: 133): “the principle motivation behind panel data unit root tests is to increase the power of unit root tests by increasing the sample size”. The main feature of this analysis is that it combines temporal and cross-sectional information simultaneously. Therefore, this sort of technique is more powerful at the time of rejecting the presence of a unit root in favor of stationary in the light of the short number of years available for this study. As Levin and Lin (1993: 1) pointed out: “the panel framework can provide dramatic improvements in statistical power compared to performing a separate unit root test for each individual time series”.

Within panel data analysis there are various unit root tests available and in the first place we have chosen the sequence developed by Levin and Lin (1992) according to the following framework⁴:

(1) Without constant:

$$Y_{i,t} = \alpha Y_{i,t-1} + \varepsilon_{i,t} \quad H_0: \alpha = 1$$

(2) With constant:

$$Y_{i,t} = \alpha Y_{i,t-1} + \delta_0 + \varepsilon_{i,t} \quad H_0: \alpha = 1; \delta_0 = 0$$

³ Additional information can be found in Franses (1998) and Gujarati (1997).

⁴ See Henin *et al* (2001), León-Ledesma (2000) and Higgins *et al* (1999) for alternative procedures in testing unit root within a panel data framework.

(3) With constant and time trend:

$$Y_{i,t} = \alpha Y_{i,t-1} + \delta_0 + \delta_1 t + \varepsilon_{i,t} \quad H_0: \alpha = 1; \delta_0 = 0; \delta_1 = 0$$

(4) With time effect:

$$Y_{i,t} = \alpha Y_{i,t-1} + v_t + \varepsilon_{i,t} \quad H_0: \alpha = 1$$

(5) With individual effect:

$$Y_{i,t} = \alpha Y_{i,t-1} + \eta_i + \varepsilon_{i,t} \quad H_0: \alpha = 1; \eta_i = 0 \forall i$$

Levin and Lin demonstrated that:

$$T\sqrt{N}(\alpha-1) \Rightarrow N(0,2) \quad \text{and then} \quad t_\alpha \Rightarrow N(0,1)$$

From here, they have taken differences on the series in order to extend the univariate ADF test to the panel data setting, and imposing that under the alternative hypothesis the speed of convergence to long-run equilibrium is the same for all the individuals, as well as the lag length imposed in the exploratory differenced variable to avoid any problem of serial correlation. Thus, the hypothesis to be tested are the following ones⁵.

(6) Without constant:

$$\Delta Y_{i,t} = \beta Y_{i,t-1} + \gamma \sum \Delta Y_{i,t-j} + u_{i,t} \quad H_0: \beta = 0$$

(7) With constant:

$$\Delta Y_{i,t} = \beta Y_{i,t-1} + \gamma \sum \Delta Y_{i,t-j} + \delta_0 + u_{i,t} \quad H_0: \beta = 0; \delta_0 = 0$$

(8) With constant and time trend⁶:

$$\Delta Y_{i,t} = \beta Y_{i,t-1} + \gamma \sum \Delta Y_{i,t-j} + \delta_0 + \delta_1 t + u_{i,t} \quad H_0: \beta = 0; \delta_0 = 0; \delta_1 = 0$$

(9) With time effect:

$$\Delta Y_{i,t} = \beta Y_{i,t-1} + \gamma \sum \Delta Y_{i,t-j} + v_t + u_{i,t} \quad H_0: \beta = 0$$

⁵ These models presents a Least Squares with Dummy variables representation. The critical values have been tabulated in Levin and Lin (1992).

(10) With individual effect:

$$\Delta Y_{i,t} = \beta Y_{i,t-1} + \gamma \sum \Delta Y_{i,t-j} + \eta_i + u_{i,t} \quad \text{Ho: } \beta = 0: \eta_i = 0 \quad \forall i$$

The estimation of the t-statistic (LL1) is obtained by estimating a single equation for all the individuals included into the panel and including either a constant, or time trend, or time effect, or individual effect, or all together.

The next step of this study consists of carrying out an alternative test procedure according to the one developed by Levin and Lin (1993) as an improvement of the LL1 test, since it basically permits to eliminate the upward size distortion induced by contemporaneous cross-sectional dependence. Its main advantage is that it is less restrictive on the DGP than the previous one (LL1), allowing that under the alternative hypothesis β is different from zero and different among individuals as well. That is to say, the speed of convergence to long-run equilibrium under the alternative and the lag structure of the augmented Dickey-Fuller equation (ADF) can vary across individuals. In the author's words (Levin and Lin, 1993: 3) "the test proposed here allow for heterogeneity across individual in every respect except the presence or absence of a unit root". Due to the fact that our data strongly favor the presence of heterogeneous correlation among individuals, the failure to control for that will have a negative consequence on the power of the test.

The whole process can be summarized in four steps. **Firstly**, we will carry out for each of the regions analyzed two separate regressions by applying ordinary least squares (OLS). From the first regression of the differenced variable on its respective lagged values we will obtain the following orthogonalized residuals:

$$(11) \quad \hat{e}_{i,t} = \Delta q_{i,t} - \hat{\alpha}_i - \sum_{k=1}^{m_i} \hat{\gamma}_{i,k} \Delta q_{i,t-k}$$

while the second regression takes the lagged value of the variable (endogenous variable) on the lagged values of the differenced variable for obtaining the orthogonalized residuals:

$$(12) \quad \hat{v}_{i,t-1} = q_{i,t-1} - \hat{\alpha}_i - \sum_{k=1}^{m_i} \hat{\theta}_{i,k} \Delta q_{i,t-k}$$

⁶ If a deterministic element is included when it is not present in the data the power of the test will be reduced, while including it when it is not present in the data leads to inconsistent results

Following, it will be calculated the normalized residuals, being the normalization factor the standard error (also called the short-run variance for each country).

$$(13) \quad \hat{\sigma}_{i,T}^2 = \left(\frac{1}{T - m_i - 1} \right) \sum_{t=m_i+2}^T \left(\hat{e}_{i,t} - \hat{\delta}_i \hat{v}_{i,t-1} \right)^2$$

Then, we will obtain the heterogeneity-corrected orthogonalized residuals as:

$$(14) \quad \tilde{e} = \frac{\hat{e}_{i,t}}{\hat{\sigma}_{i,T}}$$

$$(15) \quad \tilde{v} = \frac{\hat{v}_{i,t-1}}{\hat{\sigma}_{i,T}}$$

In the **second step** the authors calculate the long-run variance for each country-specific ADF regression as⁷:

$$(16) \quad \hat{\sigma}_{\eta_i,T}^2 = \frac{1}{T-1} \sum_{t=2}^T (\Delta q_{i,t})^2 + 2 \sum_{j=1}^L \omega(j, L) \left(\frac{1}{T-1} \sum_{t=2+j}^T \Delta q_{i,t} \Delta q_{i,t-j} \right)$$

and then calculate the following average for the entire panel:

$$(17) \quad \hat{S}_{NT} = \frac{1}{N} \sum_{i=1}^N \frac{\hat{\sigma}_{\eta_i,T}}{\hat{\sigma}_{i,T}}$$

The **third step** considers the following pooled regression of the heterogeneity-corrected orthogonalized residuals:

$$(18) \quad \hat{e}_{i,t} = \beta \tilde{v}_{i,t-1} + e \quad i = 1, \dots, N; t = m_i + 2, \dots, T$$

⁷ The term $\omega(j, L)$ represents the Barlett weights which makes a non-negative value of equation 16.

from where to test the significance of the β coefficient (by using the t-statistic), and being the null hypothesis of unit root $\beta=0$ against the alternative of panel stationary. For doing so, it should be calculated the standard error of the regression 18 as:

$$(19) \quad \hat{\sigma}_{NT}^2 = \frac{1}{NT} \sum_{i=1}^N \sum_{t=2+m_i}^T (\tilde{e}_{i,t} - \hat{\beta}_{NT} \tilde{v}_{i,t-1})^2$$

In the **last step** it will be computed the panel unit root test statistic, defined as the pooled estimator of β divided by its standard error.

$$(20) \quad t(\hat{\beta}_{NT}) = \frac{\hat{\beta}_{NT}}{\hat{\sigma}_{NT} \left[\sum_{i=1}^N \sum_{t=2+m_i}^T \tilde{v}_{i,t-1}^2 \right]^{-1/2}}$$

Levin and Lin (1993) demonstrated that as the cross-section and time series dimension grow large ($T \rightarrow \infty$ and $N \rightarrow \infty$), a function of the aforementioned t-statistic converges to a standard normal variate $N(0,1)$. This adjusted test statistic is defined as follows:

$$(21) \quad LL2 = \frac{t(\hat{\beta}_{NT}) - NT \hat{S}_{NT} \hat{\sigma}_{NT}^{-2} RSE(\hat{\beta}_{NT}) \mu_T^*}{\sigma_T^*} \rightarrow N(0,1)$$

being μ^* and σ^* the mean and standard deviation adjustment factors⁸, respectively.

Before finishing the section, we will specify the **sequence of analysis** used here. Firstly, it will be carried out an exploratory analysis of the different series in order to identify the model that best fits the data; i.e., whether or not to include a time trend, a time effect variable, individual effects and so on. In addition, looking at the scatter plot it is possible to identify some outliers in the data that it is recommended to remove from the sample. In particular, the gross saving rate of La Rioja will be excluded from the sample due to the marked different pattern as compared to the rest of regions under study. Therefore, we will proceed with two different samples, with and without La Rioja (samples 1 and 2, respectively).

Once the exploratory analysis has been carried out, we will enter into the testing stage by firstly applying the well-known Levin and Lin test (1992) according to equations 6, 7, 8 and 10. In each one, we will try alternative specifications of the lag structure, starting from 4 to 1 testing the significance of the higher lagged term. This is the procedure proposed by Hall (1990), who recommend to choose the maximum lag order depending on the sample size and then use the t-statistic of the higher lag to determine if a smaller lag order will fit better. The next attempt is to apply the correction of Levin and Lin (1993) to see if there are notable differences when testing the null hypothesis of unit root versus the alternative of stationary after correcting for heterogeneity.

Lastly, let's specify that the computer packages that have been used to carry out the panel data unit root tests of Levin and Lin (1992) and the correction of Levin and Lin (1993) are GiveWin2 (PcGive module) and Excel worksheet.

6. PRIMARY RESULTS.

Our primary attempt in this section is to perform a time series analysis to detect the presence of a unit root in the finite order polynomials in the lag operator of time series.

Tables 3, 4 and 5 present the main results of the Levin and Lin test (LL1) under each of the aforementioned specifications, and indicating whether or not it is significant and at what significant level, either 5 or 10 per cent.

Starting with Table 3, we should point out that under whatever of the specifications the whole Spanish regions show no problem of serial correlation and due to that no lags have been included into the alternative models. In either specification we have found that there is no evidence for rejecting the null hypothesis, which means that the whole panel presents a unit root and hence the Spanish regional gross saving rate lacks of stationarity at a 5% significance level. In particular, the inclusion of a time trend is not statistically significant at a 10% level of significance.

⁸ Those adjustment factors have been obtained via stochastic simulations and they are tabulated for N=250 and different values of T, and

TABLE 3: REGIONAL GROSS SAVING RATE (t – statistic).

<i>EQUATION</i>	<i>Lag structure</i>	β coefficient	<i>t- statistic</i>	<i>Diagnosis</i>
Without constant				
Sample 1	0	0.00548376	1.94	No reject
Sample 2	0	0.00590619	1.93	No reject
With constant				
Sample 1	0	-0.0068552	-0.955	No reject
Sample 2	0	-0.0060957	0.806	No reject
With constant and trend				
Sample 1	0	-0.0074489	-1.07	No reject
Sample 2	0	-0.0066944	-0.918	No reject
With fixed effects				
Sample 1	0	-0.45422	-4.32	No reject
Sample 2	0	-0.445479	-4.26	No reject

Source: Own estimations. *, 10% significance level, **: 5% significance level.

Note: Sample one includes La Rioja, while Sample 2 does not include it.

Moving now onto the analysis of gross public saving rate, Table 4 shows homogeneous results in the sense that all regions present a unit root in their autoregressive polynomial at a 5% significance level, either with and without individual effects. In addition, the deterministic trend coefficient is not statistically significant at a 10%. As in the previous case, there is no enough evidence to reject the null hypothesis, neither at a 5% nor 10% significance level.

In the light of this result, we cannot support that public sector behavior in terms of gross saving rate follows a stationary pattern.

specifying whether the model includes individual-specific intercepts or time trends.

TABLE 4: PUBLIC GROSS SAVING RATE (t – statistic).

<i>EQUATION</i>	<i>Lag structure</i>	β coefficient	<i>t- statistic</i>	<i>Diagnosis</i>
Without constant				
Sample 1	0	-0.0528701	-2.67**	Reject
Sample 2	0	-0.0402772	-1.10	No reject
With constant				
Sample 1	2	-0.0194537	-1.02	No reject
Sample 2	2	0.0146032	0.877	No reject
With constant and trend				
Sample 1	1	-0.0210271	-1.21	No reject
Sample 2	2	0.020474	1.07	No reject
With fixed effects				
Sample 1	1	-0.400257	-3.94	No reject
Sample 2	1	-0.435691	-3.69	No reject

Source: Own estimations. *, 10% significance level, **: 5% significance level.

Finally, the last series to be analyzed applying the LL1 test is the gross private saving rate and its diagnosis results have been summarized in Table 5. Contrary to the previous cases, the private sector shows evidence in favor of stationary by rejecting the null hypothesis at a 5% significance level (except for the specifications with constant and time trend, and individual effects from which the test rejects the null hypothesis at a 10% significance level). It should be pointed out that the inclusion of a time trend appears statistically significant at a 5%. In addition, let's add that there is an homogeneous lag structure for each of the samples. Thus, in sample 1 there are needed two lags while in sample 2 we have include only one lag for avoiding any problem of serial correlation.

TABLE 5: PRIVATE GROSS SAVING RATE (t – statistic).

<i>EQUATION</i>	<i>Lag structure</i>	<i>β coefficient</i>	<i>t- statistic</i>	<i>Diagnosis</i>
Without constant				
Sample 1	2	-0.0542997	-7.49**	Reject
Sample 2	1	-0.0404665	-6.74**	Reject
With constant				
Sample 1	2	-0.0295474	-2.71*	Reject
Sample 2	1	-0.03093	-5.56**	Reject
With constant and trend				
Sample 1	2	-0.0230535	-3.37**	Reject
Sample 2	1	-0.0259761	-6.1**	Reject
With fixed effects				
Sample 1	2	-0.517105	-5.88*	Reject
Sample 2	1	-0.445613	-6.21*	Reject

Source: Own estimations. *, 10% significance level, **: 5% significance level.

To end this section, we have carried out the correction of the Levin and Lin test (from here LL2). In the light of the results presented in Table 6 we can argue that in principle there is no contradiction between the results obtained for sample 1 or 2. Starting with the regional gross saving rate it shows no enough evidence against the null hypothesis of a unit root as we have found applying the previous version of this test (LL1).

However, into the fields of the public gross saving rate the results appears contrary to expectations since in this case we can reject the null hypothesis at a 5% level of significance. Therefore, we can argue that once we have corrected for heterogeneity within the panel, the LL2 test proves to be more powerful rejecting the null hypothesis than the corresponding LL1 version.

Entering into the analysis of the private sector, the evidence holds our previous findings supporting stationary in the private gross saving rate for the whole period analyzed.

TABLE 6: GROSS SAVING RATES: LEVIN AND LIN CORRECTION (1993).

	<i>ESTIMATES</i>		<i>DIAGNOSIS</i>	
	β coefficient	LL2 – statistic	Sample 1	Sample 2
REGIONAL	-0,5556245	0,688	No reject	No reject
Sample 1	-	0.111	No reject	
Sample 2	0.55917213			
PUBLIC				
Sample 1	-	-2,85**	Reject	Reject
Sample 2	0,37828286	-3.75**	Reject	Reject
	-			
	0.46830609			
PRIVATE				
Sample 1	-	-18,2**	Reject	Reject
Sample 2	0,55258988	-17.9**	Reject	Reject
	-0.5746753			

Source: Own estimations. *, 10% significance level, **: 5% significance level.

7. DISCUSSION AND CONCLUSIONS.

At this point it is expected that empirical results will shed light for policymakers aiming to improve the level of regional savings on the whole. In other words, policymakers will be better capable of evaluating the effectiveness of any decision intended to increase aggregate savings, and hence available resources for investment, which in turn will improve the country economic growth.

The econometric tests performed in this study permits to analyze whether or not the whole panel of Spanish regions shows a relative stability, or in other words, whether or not there exist a point of equilibrium towards which it tends to converge in the long term.

In the light of empirical results, the panel data unit root tests have detected the presence of a unit root in the gross regional saving rates under either the Levin and Lin test (1992) or the corrected version of 1993. This result can be interpreted from two different perspectives. On one hand, the absence of stationary implies that any exogenous shock will not necessarily be self- corrected in order to reach again the level of previous equilibrium. Therefore, a long term equilibrium does not exist when

referring to the regional gross saving rate. On the other hand, we can argue that the extra rational hypothesis does not found empirical support and hence the private sector is not fully offsetting changes in the public gross saving magnitude

Entering into the decomposition of aggregate savings into its components, we will first focus the attention on the public sector behavior. Overall, the econometric results of panel data unit root tests show mixed results since the null hypothesis is only rejected under the LL2 test, while the LL1 does not permit to reject the presence of a unit root. Accordingly, any political decision intended to foster the whole level of public savings will not necessarily have a permanent effect. In the grounds of the Keynesian dictations, this outcome will contradict the postulated effectiveness of an increase of public expenditure as a channel for encouraging economic activity.

Finally, in the light of empirical evidence we can conclude that the private sector considered as a whole shows a stationary gross saving rate. It means that there exists an optimal level of savings and citizens are promoting any change in that direction, both through their voting right at the time of choosing the political party, and through their own decisions in terms of expenditure-saving into a life-cycling framework. What is more, from this perspective economic theory dictates that households and corporations (financial and non-financial) are acting as an unity. In other words, the criteria that does prevail in the whole private sector is the final ownership of the enterprise results, and so if in one year corporations are presenting extra-positive results, households can devote a less effort to reach the optimal level of private savings.

However, at this juncture we should recognize that the methodology that have been used here is not exempt of shortcomings. On the one hand, the panel data unit root tests that have been performed only permits to detect whether or not it does exists a perfect substitution (changes of one to one), but no information is given regarding a partial substitution effect and its relative strength.

Taking all these arguments into consideration, further research that can draw on empirical data is still needed in the savings arena.

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