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### "The Irrelevance of Political Parties' Differences for Public Finances - Evidence from Public Deficit and Debt in Portugal (1974 – 2012)"

André Corrêa d´Almeida
Paulo Reis Mourão

NÚCLEO DE INVESTIGAÇÃO EM POLÍTICAS ECONÓMICAS

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# The Irrelevance of Political Parties' Differences for Public Finances

## - Evidence from Public Deficit and Debt in Portugal (1974 – 2012)

### Abstract[1]

This paper attempts to empirically test whether inter-parties' political differences impact public finances in Portugal differently. Focused on public debt and the government budget deficit, and using data collected since 1974 for several variables, this paper applies econometric modeling to show that inter-parties' differences have had no significant impact on the performance of public finances in Portugal. We observed that the Portuguese public budget deficit and the Portuguese public debt are mainly influenced by the process of globalization, the profile of the Portuguese Welfare State, and the phases of the economic cycle. In this context, this paper aims to dispel some myths regarding the "value" of a policy process based on political intrigue, enmity, and confrontation around differentiated political parties' merits in European democracies.

**Authors:**

1)André Corrêa d'Almeida[2]

2) Paulo Reis Mourão[3]

[2] Adjunct Associate Professor at the School of International and Public Affairs and Director of Executive Programs at the Earth Institute's Center on Globalization and Sustainable Development, Columbia University.
[3] Professor of Economics at the Economics & Management School, Minho University, Portugal.

**The Irrelevance of Political Parties' Differences for Public Finances**

**- Evidence from Public Deficit and Debt in Portugal (1974 – 2012) -**

## 1. Introduction

Since 1976, the policy process in Portugal has been dominated by a competition between socialists and social democrats, which are the groups that have been alternating in power for nearly equal proportions of time.[4] The Socialist Party (PS) ruled the country for a total of 18 years since the first elections in April of 1976. Within the same period, the Social Democratic Party (PSD) ruled the country for a total of 21 years.[5]

The current analysis will show that, for almost four decades, the political differences between the two main political parties had no impact on the public finances and economic performance of Portugal. That is, actual long-term policy outcomes are indifferent to the differences in the political ideologies and discourse of the socialists and the social democrats. Within this period, both parties have been equally associated with (i) cycles of growth, stagnation and recession (see Figure 1) and (ii) continuous budget deficits (see Figure 2).

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[4] For a detailed description of the each party's ideological inclinations, consult www.ps.pt and www.psd.pt
[5] The authors classify the eight-month long government of Carlos Mota Pinto (Nov. 22, 1978 – Aug. 2, 1979) as Social Democrat and the five-month long government of Maria de Lourdes Pintasilgo (Aug. 2, 1979 – Jan. 3, 1980) as Socialist.

**Fig. 1:** Growth, Stagnation and Recession and Ruling Parties (%GDP)
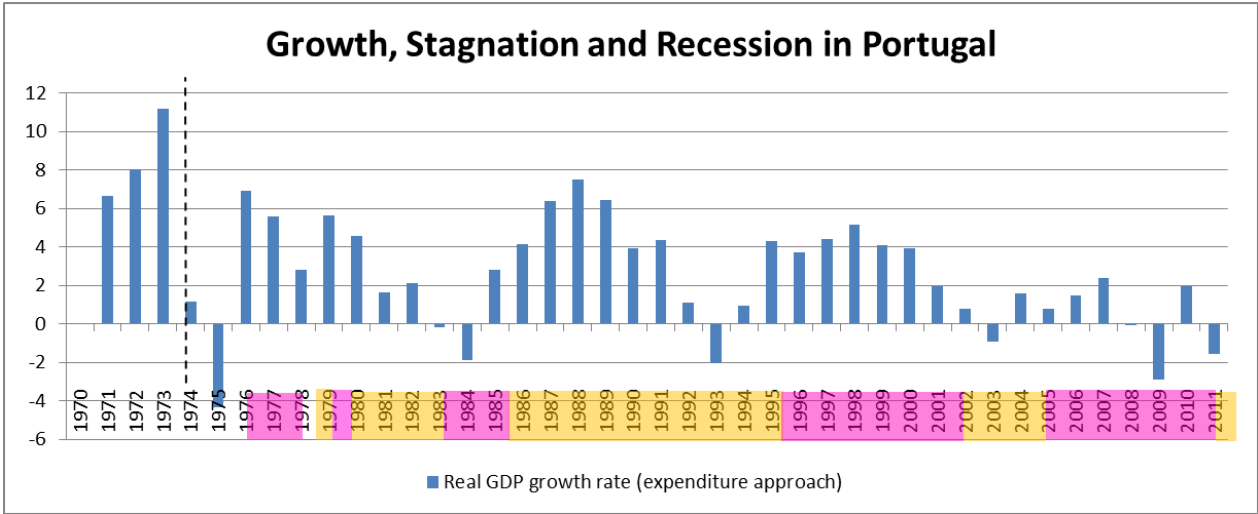


**Sources:** GDP data (IMF, 2013), Ruling Parties (Portugal Gov., 2013).
**Note:** Years highlighted in pink correspond to periods ruled by a Socialist government. Years highlighted in orange correspond to periods ruled by a Social Democrat government. The period 1970-1974 (until April 25th) corresponds to the last years of Salazar's dictatorship in the country. The period 1974-1976 corresponds to the so-called "Provisory Governments" which ruled the country prior to the 1976 new Constitution. The second half of 1978 was ruled by an independent government.

**Fig. 2:** Public Deficit and Ruling Parties (%GDP)
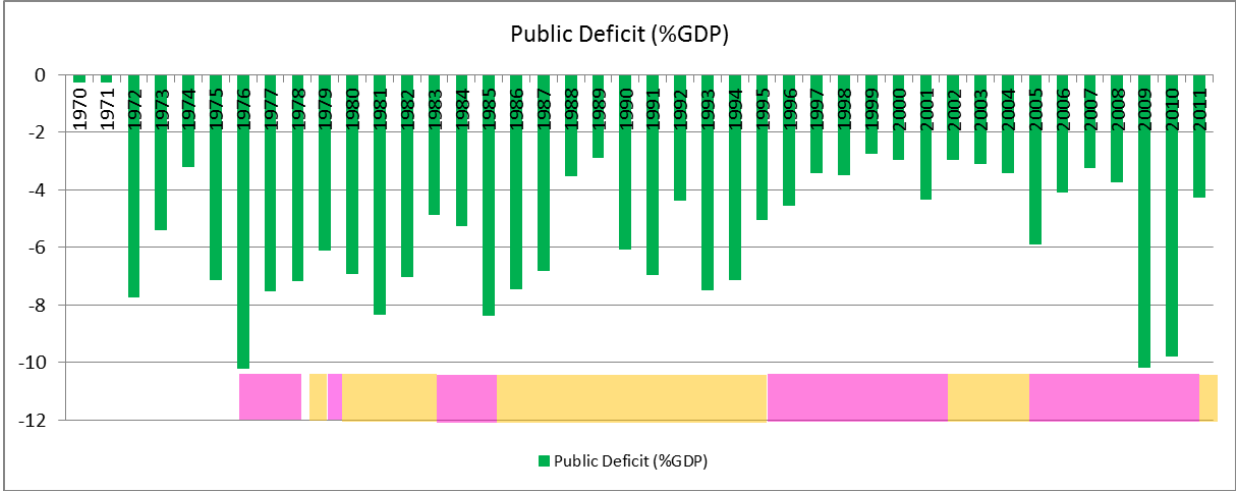


**Source:** Public Deficit (IMF, 2013), Ruling Parties (Portugal Gov., 2013).
**Note:** The authors chose to use the Primary Deficit indicator, which excludes interests paid to cover the cost of the debt, to focus the analysis on actual expenditure decisions.

This research adopts two of the most important public finance variables, budget deficit and public debt, as proxy variables for the country's performance to test the hypothesis that political parties' differences have no impact in fiscal outcomes. Testing whether political differences impact the country's performance is useful to shed light on the merits of a policy process that is based on competitive intrigue, enmity and confrontation between the two parties. Revenues are not considered to be proxies for performance (i.e., a dependent variable) in this analysis because tax policies are a much more resilient variable over time.

While the problems of inter-parties' competition in the policy process have been highlighted, the merits of an alternative approach still need to be explained. Almond and Verba (1963) argue that civic political culture is what a country needs to advance its democratic society's political structure. More specifically, they consider political culture to be the element that connects individual attitudes with the overall political system structure. Of the ten key characteristics of a civic political culture identified by these authors, at least half of these refer directly to political parties' behavior: (i) expectation of fair treatment from government authorities; (ii) emotional involvement in elections; (iii) tolerance toward opposition parties; (iv) valuing of active participation in local government activities, parties, and in civic associations; (vi) civic cooperation and trust.

Since the work of Almond and Verba, several other authors have been emphasizing the key role of cooperation to promote development and advance democratic organization, e.g., Coleman (1988) with the concept of social capital, Ostrom (1990) with the idea of collective action, Nordhaus (1990) with the political business cycles models, Putnam (1992) with the concept of networks of civic engagement, Wright (2001) with the nonzero sum logic of human destiny, and Hardin (2005) with the role of trust and reciprocity in solving social dilemmas.

The next section explores the bodies of literature capable of explaining the relationship between deficits, debts and partisan politics. A special focus is dedicated to authors who focus their work on the variables that are the most relevant to the Portuguese case. Section 3 details the techniques, variables and datasets used to test our research hypothesis. This section also offers some preliminary results regarding the role of inter-party differences in a country's performance. While analyzing the main results obtained from this research regarding a country's performance, Section 4 pays special attention to the distinction between external macroeconomic effects and domestic politics. Section 5 concludes with the implications of the paper's findings for the democratic process and suggestions for future research as well.

## 2. Deficits, Debts and Partisan Politics: An overview of the literature

The differences in policies due to the presence of different parties on charge have already a substantial literature. For instances, Cusack (1997) studied this question for a set of 14 OECD countries for the period of 1961-1991 but did not include Portugal because it was not a democracy during part of the period under study. Focusing on Portugal, Mourão (2007) found that the long-term determinants of the Portuguese public expenditures (1947-2002) are the number of unemployed people, the number of public employees (i.e., the size of the public sector), the rate of openness of the economy, and the real current transfers per capita. However, Mourão's study (2007) left unanswered the following question: are there any partisan-biased differences in the expenditures policy in Portugal? Our research aims at offering an answer to this question.

Our review of the literature (detailed below) identified four main topics on the issue of the influence of partisanship on public finances: due to differentiated redistributive policies, due to voters' attraction, due to different reactions to exogenous forces like globalization, and due to political business cycles. Let us discuss these issues.

### 2.1 Partisanship and redistributive policies

There are several theoretical models that try to explain partisan-biased differences in public finance, especially related to redistributive policies.

Usually, the number of unemployed people suggests that an increase in expenditures is more associated with socialist-led governments. This may be the result of the commitment of left parties to the Keynesian paradigm of expanding government programs and the welfare state (Alesina et al., 1993; Hahm et al., 1995), which is pushed by a relatively more economically vulnerable electorate (Cusack 1997). Cowart (1978) and Carlsen (1997) argue that left governments are far more responsive to problems of unemployment than are right governments that foreswear interfering with the self-adjusting workings of the markets' invisible hand (Cusack, 2001).

Carlsen (ibid.) also argues that right parties are more prone to pro-cyclical policies by which fiscal policy is tightened as demand slackens and unemployment rises. If real current transfers per capita are associated with economic redistribution processes, then, for the same reasons described above, this variable seems to be more associated with left governments.

According to Meltzer and Richard (1981), the redistributive role of the government is determined by voters' demand for income redistribution. Voters with income below (above) the mean will favor higher (lower) taxes and more (less) redistribution. Thus, under universal suffrage and majority rule, a major determinant for explaining the fact that the real government debt per capita increases is income inequality.

Right-wing governments try to avoid (significant) budget deficits because they believe that structural deficits raise interest rates, impede investment, reduce national saving, slow down long-run economic growth, and thus undermine the social democratic supply-side economic policy (Boix, 1998).

## 2.2 Public sector and voters

The size of the public sector follows the Leviathan hypothesis (Brennan and Buchanan, 1980) according to which politicians are politically unconstrained agents who aim to maximize their power and the rents associated with holding office. In this context, power and rents are directly

associated with the size of the public sector, and both socialists and democrats, who have been alternating in power in quasi-equal proportions since 1976, could equally be responsible for the increase in public expenditures (i.e., the Leviathan hypothesis emphasizes the parties' behavior homogeneity). Other authors point to the principle-agent dilemma as the justification for an inbuilt bureaucratic preference against any reduction of acquired rights by public employees and as supporting ever larger sizes of public agencies in a large public sector such as that of Portugal (Frey and Pommerehne, 1984; and Castles, 1982).

**2.3 Other mediating factors: competition and globalization**

Several authors (Besley, Persson and Sturm, 2005; Padovano and Ricciuti, 2008) suggest that parties' competition improve economic outcomes but what they do not discuss is how further could outcomes improve with collaborative approaches to the policy process. Besides, the baselines of their analyses are situations of monopoly of power by one party, which obviously cannot be compared with the multipartidarism framework studied in this paper.

Given the competitive setting that has been driving the political confrontation between socialists and social democrats over the past 39 years, the Partisan model (Boyne, 1994; Solé-Ollé, 2006) can also be relevant for this analysis. According to this theoretical framework, increased competition between political forces reduces deficit for left governments and increases it for right governments (i.e., the Partisan hypothesis emphasizes the parties' behavior heterogeneity). This result contradicts previously analyzed theoretical principles that point to higher public expenditures in socialist-led governments.

Similar to the Partisan model, which introduces political competition as a mediating factor between ideology and policy outcomes, the rate of openness introduces macroeconomic interdependence as a mediating factor. Carlsen (1997) argues that parties on the left will follow a counter-cyclical expansionary fiscal policy when demand slackens and a contracting one when demand surges.

Garret and Lange (1991) argue that the ever greater openness of national economies and the related interdependencies dictate decreasing latitude for the relevance of the governing parties' ideology; i.e., there has been a convergence of right and left with no notable distinctions between their fiscal policies. Because of interdependence,

> [G]overnments no longer possess the autonomy to pursue independent macroeconomic strategies effectively, even if they were to seek to do. In anything but the short run, the fiscal and monetary policies of governments of the left and the right should converge (p. 543).

Other authors agree that the economic demands generated by the global financial markets have weakened any linkage between partisanship and fiscal policy (Artis, 1987; Peters, 1991; Scharpf, 1991; Kurzer, 1993; Hlleiner, 1994). This finding is even more applicable to a small, open economy such as the Portuguese economy.

Contradicting the rate of openness-driven convergence argument, Garrett (1996, 1998) shows that strong left party governments with the presence of strong labor unions run larger deficits under the conditions of great capital mobility and trade because those governments try to mitigate the market dislocations that are experienced by their populations in the integrated international economy.

**2.4 Non-partisanship and political business cycles**

Albeit from a different perspective, Nordhaus (1975), Frey and Schneider (1981) and Rogoff and Sibert (1988) argue that public expenditures' drivers are more associated with the structural components of democratic models than with the differences in party ideology. For these authors, the temporal proximity to electoral moments is what explains public expenditure's cyclical peaks. In fact, as illustrated by Figure 3, there seems to exist a temporal "coincidence" in Portugal between election years and expenditures' peaks.

**Fig. 3:** Public Expenditures, Ruling Parties and Electoral Cycles
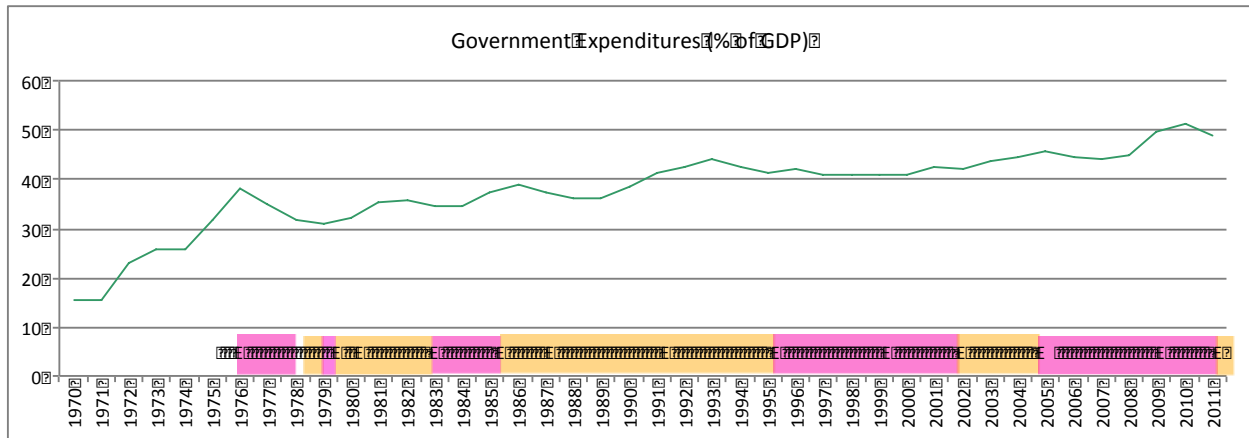


**Source:** Government Expenditures (IMF, 2013), Ruling Parties (Portugal Gov., 2013), Electoral cycles (CNE, 2013).

Nordhaus (1975, 1990) explains these cyclical peaks with his political business cycles (PBC) theory. According to this author, these peaks result from the opportunistic behavior of political incumbents who strategically change public expenditures in pre-electoral periods to signal competence (i.e., the ability to produce a given level of government services with less revenue) to voters and increase their chances of reelection. This opportunistic-cycles approach departs from the models of economic performance that are explained by political ideology and ideological cycles discussed earlier. For Nordhaus, partisan effects are of secondary importance to opportunistic behavior.

Advocates of PBC argue that, in facing choices between present and future welfare, the behavior of democratic political systems is biased against future generations (Nordhaus, 1990; Coelho et al., 2006). Elections are viewed to be a source of political instability, and they affect growth through the shortening of governments' horizons and the disruption of long term economic policies that are conducive to a better economic performance (Aisen and Veiga, 2011).

Veiga and Veiga (2007) find strong evidence for opportunistic cycles at the municipal expenditures level in Portugal and very little evidence of ideological cycles between left-wing

oriented incumbents and right-wing ones. Coelho et al. (2006) also find strong evidence of PBC in municipalities' employment in Portugal.

**2.5 In Summary**

The literature that has been explored does not clearly answer the question raised at the beginning of this section: does partisan politics matter for public finances in Portugal? All types of answers—yes, no, and maybe—have been found for this question. Studies about Portugal, where evidence for PBC was found and/or no evidence for ideological/partisanship cycles was found, do not adopt the whole country as their level of analysis, do not cover the entire period of democracy in Portugal, and do not clarify whether there is any partisanship effect in the amplitude of the cycle.

Next, we will test whether differences between different parties in charge of the government make any difference for the Portuguese public deficits and public debt.

**3. Methodology**

To test our research hypothesis, the methodology will use descriptive statistics and bivariate analyses that will provide initial insights into the role of inter-parties' differences in fiscal outcomes and the country's performance. In this context, descriptive statistics and empirical evidence will also try to dispel some myths that are circulating in the public opinion regarding the role of parties in fiscal performance.

**3.1 Variables: Datasets and sources**

Our first methodological step was to collect data for some of the most important variables that are associated with a country's performance. We collected yearly data since 1974[6] from official and available sources for the following socio-economic variables:

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[6] This year (1974) is the year of the Carnation Revolution. Our data also include the years when Portugal had to fulfill the Maastricht criteria related to the Stability and Growth Pact (since 1997) and the periods of financial and economic crisis when Portuguese fiscal autonomy has been highly influenced by the International Monetary Fund (1978-1979 and 1983-1985), the European Central Bank and, the European Commission (since 2011). Therefore,

- Public expenditures (% GDP)

- Public revenues (% GDP)

- Number of public employees

- Public investment (% GDP)

- Real GDP

- Budget deficit (i.e., public expenditures minus public revenues as a % of GDP)[7]

- Public debt (% GDP)

- Unemployment rate

- Number of unemployed people


Data for the following electoral and political variables were also collected for the same period:

- Electoral (legislative and municipal elections) year

- Number and share of seats belonging to left-wing parties in the Portuguese National Parliament

- Year of left-wing majority in the Portuguese National Parliament

- Tenure duration


Several sources of information were used to build the time series for these variables. For public expenditures, public revenues, public investment, real GDP, openness rate, unemployment rate, and the number of unemployed people, we used Pinheiro (1997) for data until 1995 and the International Financial Statistics (IMF, 2013) for data from 1995 to 2012. Neves (1994) was the source for the number of public employees for data before 1994. For the period that followed, the information was collected from the Portuguese Institute for Employment and Professional Training (IEFP, 2013). For the Portuguese public budget deficit and public debt, the data source was the IMF (2012). The data for electoral years that detail the nature—municipal or legislative—of the popular consultation, was provided by the official National Electoral Commission (CNE). The information about the ruling parties at the national government level

for each year, the breakdown of the number of Parliamentary seats between the left and right wing parties, and the tenure duration of each government was collected from PORDATA (2013).

## 3.2 Descriptive Statistics

To discuss our first descriptive statistics, we built two tables (see Table 1 and Table 2 in the appendix). Each table shows the mean, standard deviation, maximum values, and minimum values for each of the previously introduced socio-economic variables and for the entire study period (1974-2012, N=39). In addition, these statistics have also been analyzed within both those sub-periods in which left-wing parties had the majority of the seats in the National Parliament (N=18) and those in which right-wing parties had the majority of the seats (N=21).[8] Table 1 shows the descriptive statistics for the socio-economic variables expressed in logarithmic form, and Table 2 shows the same statistics for the raw variables.

[Insert here Tables 1 and 2]

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[8] We considered the following parties and movements/coalitions to be Portuguese left-wing parties: PS (Partido Socialista, the main Portuguese Socialist Party), PCP (Partido Comunista Português, the main Portuguese Communist Party), MDP (Movimento Democrático Português), UDP (União Democrática Portuguesa), APU (Aliança do Povo Unido), FRS (Frente Republicana e Socialista), CDU/PCP-PEV (a coalition of PCP with the environmentalist party *Os Verdes*), and BE (Bloco de Esquerda, a coalition of heterogeneous leftist movements). Source: http://eleicoes.cne.pt/raster/index.cfm?dia=16&mes=12&ano=1979&eleicao=am

A preliminary inspection of Tables 1 and 2 allows us to state that the years in which left-wing parties ruled the country exhibit higher values for the following variables (if compared to the years that were ruled by right-wing parties):

- Public expenditures (% GDP)

- Public revenues (% GDP)

- Number of public employees

- Public investment (% GDP)

- Real GDP

- Openness rate

- Budget deficit (% GDP)

- Public debt (% GDP)

The exceptions to this statement were found for the unemployment rate and the number of unemployed people. For these variables, the years that were ruled by left-wing governments in Portugal exhibited lower values than the years that were ruled by right-wing governments.

Table 3 shows the same descriptive statistics that were analyzed above but for the yearly growth rates of the studied variables.

[Insert here Table 3]

Table 3 suggests that the years in which there was a right-wing majority in the Portuguese Parliament are characterized by higher growth rates in the following variables (if compared to the years that are associated with left-wing governments):

- Public expenditures (% GDP)

- Public revenues (% GDP)

- Public employees

- Real GDP

- Openness rate

- Unemployed people

In contrast, the years that are associated with left-wing governments tend to have higher growth rates of the following variables (if compared to the years that are associated with right-wing governments):

- Public investment (% GDP)

- Budget deficit (% GDP)

- Public debt (% GDP)

- Unemployment rate

However, these preliminary results require further inspection. Many of the comparisons described above are arguably commonplaces in the Portuguese media. However, a more accurate assessment of these commonplaces requires data variability and that the different number of observations collected for each political wing are factored in using more complex approaches. A commonly used technique to address these limitations is the nonparametric Mann-Whitney U test, which is similar to the Two-sample $t$ test with unequal variances. This type of test allows the equality of two means to be tested (in our case: the mean observed for the years that were ruled by left-wing parties and the mean observed for the years that were ruled by right-wing parties). The rejection of the null hypothesis (of equal means) can be interpreted as the existence of significant differences between the financial performances that are assumed by the different Portuguese political wings.

[Insert here Tables 4, 5 and 6]

Tables 4, 5 and 6 exhibit the asymptotic significance (2-tailed) p-values for the variables of this study.[9] Because p-values lower than 0.100 were not found, it cannot be concluded that there are significant differences in our variables vis-a-vis the party wing in power.

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[9] For a more complete description, please contact the authors.

In conflict with popular beliefs and other misconceptions of political parties' role in modern democracies, our results find no evidence for a differentiated impact of the Portuguese parties on the country's macroeconomic and fiscal performances. This is the case for all variables' transformations performed: absolute values, log and yearly growth rates.

## 4. Empirical Models and Bivariate Analysis: the irrelevance of inter-parties difference

The next step in our methodology is to build two models to test and discuss the hypothetical influence of political wings on the two macroeconomic variables that are most commonly used to describe country performance: the budget deficit and the public debt (each of which are measured both as a percentage of GDP and as yearly changes). The results obtained from the Mann-Whitney U tests suggest that there are no differences among the ruling parties when considering each variable in isolation. However, we also need to evaluate this relationship by considering multivariate regressions. Therefore, the following two equations will be estimated (equation 1 for public budget deficit and equation 2 for public debt):

$$budget_t = const + A * X_t + B * Elect_t + C * Polit_t + e_t \qquad \text{(Equation 1)}$$

$$debt_t = const + A * X_t + B * Elect_t + C * Polit_t + e_t \qquad \text{(Equation 2)}$$

On their right-hand side, both of these equations use a column-vector of socio-economic determinants that is suggested by the literature ($X_t$, with the estimated coefficients represented by the line-vector A), a column-vector of electoral determinants ($Elect_t$, with the estimated coefficients represented by the line-vector B), and a column-vector of political-wing variables ($Polit_t$, with the estimated coefficients represented by the line-vector C). The errors are assumed to follow white-noise processes. These variables follow authors who have studied the budget deficit and the public debt in Portugal (Mourão, 2007) and authors who have analyzed the influence of partisan politics on national public finances (Cowart, 1978; Cusack, 1997; Carlsen, 1997).

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Tables 7 and 8 show the coefficients that were estimated by the Static Ordinary Least Squares for the various specifications of our models by considering the two transformations of the Portuguese public deficit—logs and yearly growth rates—and their stochastic explicative variables. Table 9 shows the coefficients that were estimated for the log variables but now using different estimators—the Dynamic Ordinary Least Squares (DOLS)[10], a Vector of Error Correction Models (VECM), and a model derived from autoregressive distributed lags (ARDL) (Pesaran, Shin and Smith, 2001). These estimators lead to a better understanding of the nature of the nonstationarity of the variables, and their estimates provide a clearer idea of the direction and significance of the influence of our explicative variables on public debt and the public deficit.

To measure the influence of political wings, three alternative variables have been introduced in the model (Cameron, 1978; Castles, 1982; Elkins 1974):
- A binary variable that signals each year in which there was a majority of left-wing parties in the national parliament
- The share of seats for left-wing parties in the Portuguese parliament
- Length of tenure

We recall that the descriptive statistics of these variables are shown in Table 1 (log scale) and in Table 3 (yearly growth rates).

Finally, we want to analyze the statistical significance of the political wings on the Portuguese budget deficit and on the Portuguese public debt. To do this, we are going to use the traditional binary variable that identifies those years that were ruled by a left-wing coalition of parties as "1" and those years that were ruled by a right-wing coalition of parties as "0." Additionally, we are going to use the share of seats that belong to left-wing parties in the national parliament. Therefore, the null hypothesis of the statistical non-significance of the estimated coefficients

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[10] Using the case of the public budget (also replicated for public debt), the respective DOLS is given by $budget_t = const + A * X_t + B * Elect_t + C * Polit_t + D * L_t + e_t$ where $L_t$ represents a set of leads and lags of the first differences of the explicative variables (Stock and Watson, 1993).

for these political variables shall be interpreted, if accepted, as the confirmation of the irrelevance of the parties' differences for public finances management in Portugal. We control these political variables using the tenure length, which is measured as the number of years that the incumbent party holds the office. This is a common procedure for two main reasons. First, the procedure recognizes that the tenure length can be used to control for the awareness effect that is more visible in governments that have been in power for more years (Ferris and Moia, 2009), i.e., more mature governments tend to have more knowledge of national public finances. Second, the procedure identifies that more mature governments have a greater propensity to run consolidation programs on national public finances than do governments with less experience (Merlo, 1998; Désiré, 2007).

[Insert here Table 7 and Table 8]


We continue no to find evidence in support of the influence of electoral moments or of partisanship on the Portuguese public budget deficit. No evidence was found that signaled a statistically significant influence of a particular wing party. Again, these results are supported by Meltzer and Richard (1981), Garret and Lange (1991), Peters (1991), and Scharpf (1991) who have identified that the national public finances of highly globalized and small economies are driven mostly by socio-economic dimensions and not by inter-parties differences.


We recognize that these results have pioneering implications for the study of the relationship between structural economic and social realities, electoral moments, political wings and public finances in Portugal. They clarify which factors truly influence the Portuguese public budget deficit and the Portuguese level of public debt.


## 5. Conclusions and Further Research

There is no empirical evidence to support the hypothesis that differences between political parties matter for the public finances or for the overall financial and economic performance of Portugal. It is simply not true that one party is better for the country than the other, at least not in the last 39 years, which is the entire period of democracy in the country. Parker (2006) finds

similar results for the U.S. when comparing the performances of the Republican Party and the Democratic Party during the period 1949-2005.

The policy processes and political rhetoric based on competitive intrigue, enmity and confrontation between parties keep promising differentiated economic and social outcomes depending on who is in power: PS or PSD (either alone or in coalition). While commonplace in popular belief and partisanship, this research found no statistical significance to support this differentiated effect. Using various techniques and procedures such as graphic analysis, descriptive statistics, and Mann-Whitney tests, it cannot be claimed that the years that were ruled by one of the Portuguese political wings produced significantly different outcomes than the years that were ruled by the opposite political wing. Future research could focus on whether these undifferentiated results between parties also apply to the composition of expenditures.

This conclusion applies not only for the main public finances variables being studied—budget deficit and public debt—but also for the GDP growth rates, unemployment rates, size of the public sector and public investment. These indicators have performed indifferently to the political parties' differences.

Three main strong implications for the Portuguese democracy and policy process can be derived from these results. First, the parties' differences do not matter but the parties matter. In democracy, political parties try to build unique identities and support bases to be elected for office. While these differences should be emphasized during the official electoral campaign periods, outside these periods, political leaders should behave according to a certain ethical code that would allow them to embrace legislation from a national priority standpoint and not from a competing democracy paradigm. For example, it was always possible during the three times that the IMF intervened in the country since 1974, and during the EURO process, to have a broad inter-parties political pact regarding institutional development and international commitment. Future research could try to understand why these domestic pacts are rare in

Portugal without international intervention. Why do specific configurations of situations and conditions increase or decrease political cooperation? What institutional changes would enhance the likelihood of cooperation?

Second, Portugal and modern democracies in general need new institutional designs that aim at creating a better incentives structure to foster collaboration between political parties. The central theme here is the gains from association that are achieved when politicians are able to develop trust and reciprocity and coordinate action. If politicians are the legitimate representatives of the people, the question is how to sustain agreements that counteract individual temptations to select short-term self-interested actions when all parties would be better off if each party selected actions that lead to higher collective and individual returns. Short-term competing approaches to the policy process, as illustrated by the intensity of political quarrels that every day are brought to us in several formats (e.g., the press, social media, political discourse), take too much of the energy, attention and political vision that a long-term strategic debate for the country would require from all group and individual actors.

Third, collaboration and coordinated action require the development of trust and reciprocity between political parties. As empirically shown, the current schemes of adversarial democracy have failed in Portugal and, apparently, in other southern European countries such as Spain, Italy and Greece. Trust building is an evolutionary process of multiple iterations through which parties generate cognitive systems and decision rules that lead to outcomes that are greater than those of alternative designs over time.

Parties' differences, ideology, and identity matter for the diversity of political ideas, the engagement of civic participation in the lives of their communities and the advancement of societies. What the results of his research show is that, because neither of the two major parties has been better for the country than has the other, differences should be reconciled for policy enhancement and should not undermine the collective good. Ideas should still compete in the political arena, but collaboration that is driven by an ethics of trust and reciprocity and/or

the need for a broader social and political support base should be the norm in policy design and implementation. Moving forward, the focus should be on leveraging the overlaps between the parties' agendas and negotiation skills.

Two last suggestions for further research that can be derived from this study. The first is the role that the regulation of the activities of political parties could play in fostering collaborative work between political leaders. Indeed, the failure to cooperate for mutual benefit does not always signal ignorance or irrationality. Game theorists explain in various ways how the contextual conditions such as history, rules and norms within which games are played influence players' behavior and outcomes. North (1990, 2005) and Ostrom (1990, 2005) argue that if rules change, so will outcomes. The second, is the use of multivariate econometric models which will clarify the significance of domestic inter-party differences for the performance of public finances within the broader context of economic globalization. For this step, several economic, institutional, political and social variables will also be considered.

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Table 1 – Descriptive statistics, log scale (Portuguese data, 1974-2012)

| | Public Expenditures (obs=39) | Public Revenues (obs=39) | Public Employees (obs=39) | Public Investment(obs=39) | Real GDP (obs=39) |
|---|---|---|---|---|---|
| Mean | -0.849 | -0.996 | 12.659 | -3.359 | 15.889 |
| (Standard Deviation) | (0.188) | (0.203) | (0.307) | (0.232) | (1.388) |
| [Maximum-Minimum] | [-0.577-(-1.465)] | [-0.707-(-1.509)] | [13.29-12.18] | [-2.933-(-4.029)] | [17.27-12.91] |
| | Openness rate (obs=39) | Budget Deficit (% GDP) (obs=39) | Public Debt (% GDP) (obs=39) | Unemployment rate (obs=39) | Unemployed people (obs=39) |
| Mean | 4.128 | 1.639 | 3.884 | -2.671 | 5.791 |
| (Standard Deviation) | (0.166) | (0.402) | (0.406) | (0.350) | (0.390) |
| [Maximum-Minimum] | [4.400-3.689] | [2.322-0.999] | [4.68-2.60] | [-1.85-(-3.85)] | [6.566-4.412] |

| | Public Expenditures | | Public Revenues | | Public Employees | | Public Investment | | Real GDP | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) |
| Mean | -0.835 | -0.867 | -0.981 | -1.016 | 12.686 | 12.627 | -3.369 | -3.341 | 15.946 | 15.821 |
| (Standard Deviation) | (0.186) | (0.193) | (0.202) | (0.209) | (0.354) | (0.249) | (0.200) | (0.271) | (1.492) | (1.296) |
| [Maximum-Minimum] | [-0.571-(-1.299)] | [-0.615-(-1.465)] | [-0.784-(-1.449)] | [-0.707-(-1.509)] | [13.29-12.22] | [13.179-12.180] | [-3.090-(-3.822)] | [-2.932-(-4.030)] | [17.266-13.060] | [17.256-12.913] |
| | Openness rate | | Budget Deficit (% GDP) | | Public Debt (% GDP) | | Unemployment rate | | Unemployed people | |
| | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) |
| Mean | 4.128 | 4.127 | 1.668 | 1.604 | 3.911 | 3.852 | -2.673 | -2.669 | 5.793 | 5.790 |
| (Standard Deviation) | (0.210) | (0.089) | (0.422) | (0.386) | (0.398) | (0.426) | (0.312) | (0.399) | (0.350) | (0.442) |
| [Maximum-Minimum] | [4.399-3.689] | [4.235-3.970] | [2.322-0.999] | [2.121-1.052] | [4.536-2.953] | [4.680-2.603] | [-2.226-(-3.221)] | [-1.851-(-3.847)] | [6.295-5.034] | [6.566-4.412] |

Table 2 – Descriptive statistics, absolute scale (Portuguese data, 1974-2012)

| | Public Expenditures (obs=39) | Public Revenues (obs=39) | Public Employees (10^3) (obs=39) | Public Investment (obs=39) | Real GDP (10^7) (obs=39) |
|---|---|---|---|---|---|
| Mean | 0.435 | 0.376 | 330.428 | 0.036 | 1.46 |
| (Standard Deviation) | (0.073) | (0.070) | (113.103) | (0.007) | (1.15) |
| [Maximum-Minimum] | [0.565-0.231] | [0.493-0.221] | [591.3-194.9] | [0.053-0.018] | [3.15-0.05] |
| | Openness rate (%) (obs=39) | Budget Deficit (% GDP) (obs=39) | Public Debt (% GDP) (obs=39) | Unemployment rate (%) (obs=39) | Unemployed people (10^3) (obs=39) |
| Mean | 62.830 | 5.564 | 52.206 | 7.31 | 349.871 |
| (Standard Deviation) | (9.612) | (2.198) | (18.491) | (2.43) | (123.03) |
| [Maximum-Minimum] | [81.410-40] | [10.2-2.716] | [107-8-13.5] | [15.7-2.13] | [710.7-82.46] |

| | Public Expenditures | | Public Revenues | | Public Employees (10^3) | | Public Investment | | Real GDP (10^7) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) |
| Mean | 0.441 | 0.427 | 0.382 | 0.369 | 344.335 | 314.204 | 0.035 | 0.036 | 1.61 | 1.29 |
| (Standard Deviation) | (0.075) | (0.072) | (0.069) | (0.072) | (131.904) | (87.225) | (0.016) | (0.009) | (1.21) | (1.07) |
| [Maximum-Minimum] | [0.565-0.273] | [0.541-0.231] | [0.457-0.234] | [0.493-0.221] | [591.3-202.8] | [529.1-194.9] | [0.045-0.021] | [0.053-0.018] | [3.15-0.05] | [3.12-0.05] |
| | Openness rate (%) | | Budget Deficit (% GDP) | | Public Debt (% GDP) | | Unemployment rate (%) | | Unemployed people (10^3) | |
| | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) |
| Mean | 63.274 | 62.249 | 5.765 | 5.316 | 53.406 | 50.724 | 7.21 | 7.43 | 346.28 | 354.06 |
| (Standard Deviation) | (11.97) | (5.47) | (2.434) | (1.910) | (18.326) | (19.149) | (2.04) | (2.88) | (111.30) | (138.66) |

| [Maximum-Minimu | [81.41-40] | [69.05-53] | [10.2-2.716]] | [8.34-2.86] | [93.32-19.17] | [107.8-13.5] | [10.8-3.99]] | [15.7-2.1] | [541.80-153.55] | [710.7-82.46] |
|---|---|---|---|---|---|---|---|---|---|---|

Table 3 – Descriptive statistics, yearly growth rates (Portuguese data, 1975-2012)

| | Public Expenditures (obs=38) | | Public Revenues (10^6) (obs=38) | | Public Employees (obs=38) | | Public Investment (obs=38) | | Real GDP (10^7) (obs=38) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean (Standard Deviation [Maximum-Minimum | 0.025 (0.059) [0.166-(-0.073)] | | 0.022 (0.041) [0.131-(-0.054)] | | 0.026 (0.058) [0.041-0.001] | | -0.003 (0.168) [0.446-(-0.463)] | | 0.115 (0.084) [0.262-(-0.034)] | |
| | Openness rate (%) (obs=38) | | Budget Deficit (% GDP) (obs=38) | | Public Debt (% GDP) (obs=38) | | Unemployment rate (%) (obs=38) | | Unemployed people (obs=38) | |
| Mean (Standard Deviation [Maximum-Minimum | 0.013 (0.089) [0.186-(-0.294)] | | 0.025 (0.060) [0.166-(-0.073)] | | 0.055 (0.096) [0.350-(-0.126)] | | 0.061 (0.176) [0.625-0.293] | | 0.066 (0.187) [0.360-(-0.074)] | |
| | Public Expenditures | | Public Revenues | | Public Employees | | Public Investment | | Real GDP | |
| | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) |
| Mean (Standard Deviation [Maximum-Minimum | 0.025 (0.060) [0.166-(-0.073)] | 0.084 (0.061) [0.148-(-0.042)] | 0.020 (0.043) [0.131-(-0.054)] | 0.024 (0.046) [0.099-(-0.036)] | 0.026 (0.073) [0.185-(-0.120)] | 0.027 (0.034) [0.038-(-0.010)] | 0.009 (0.166) [0.447-(-0.289)] | -0.018 (0.176) [0.235-(-0.464)] | 0.110 (0.084) [0.251-(-0.020)] | 0.121 (0.087) [0.262-(-0.034)] |
| | Openness rate (%) | | Budget Deficit (% GDP) | | Public Debt (% GDP) | | Unemployment rate (%) | | Unemployed people | |
| | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=17) |
| Mean (Standard Deviation [Maximum-Minimum | -0.003 (0.096) [0.113-(-0.294)] | 0.031 (0.078) [0.186-(-0.082)] | 0.025 (0.060) [0.166-(-0.073)] | 0.024 (0.061) [0.148-(-0.042)] | 0.071 (0.099) [0.350-(-0.077)] | 0.034 (0.088) [0.236-(-0.126)] | 0.065 (0.191) [0.625-0.293] | 0.057 (0.163) [0.401-0.192] | 0.057 (0.191) [0.622-(-0.268)] | 0.076 (0.187) [0.508-(-0.198)] |

Note: The Yearly growth rate for two consecutive values of the variable X ($X_t$, $X_{t+1}$) is given by the formula ($X_{t+1}$ – $X_t$) / ($X_t$)

Table 4 – Two-sample t test with unequal variances (Yearly growth rates for Portuguese data, 1975-2012)

| Public Expenditures | | Public Revenues | | Public Employees | | Public Investment | | Real GDP | |
|---|---|---|---|---|---|---|---|---|---|
| Left-Wing (obs=21) | Right-Wing (obs=17) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) |
| H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.977 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.731 | | H0: Mean (Left)=Mean (Right Pr (|T|>|t|)=0.968 | | H0: Mean (Left)=Mean (Right Pr (|T|>|t|)=0.628 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.695 | |
| Openness rate (%) | | Budget Deficit (% GDP) | | Public Debt (% GDP) | | Unemployment rate (%) | | Unemployed people | |
| Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) | Left-Wing (obs=21) | Right-Wing (obs=18) |
| H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.291 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.213 | | H0: Mean (Left)=Mean (Right Pr (|T|>|t|)=0.240 | | H0: Mean (Left)=Mean (Right Pr (|T|>|t|)=0.895 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.760 | |

Note: The Yearly growth rate for two consecutive values of the variable X ($X_t$, $X_{t+1}$) is given by the formula ($X_{t+1}$ – $X_t$) / ($X_t$)

Table 5 – Two-sample t test with unequal variances (log values for Portuguese data, 1974-2012)

| Public Expenditures | | Public Revenues | | Public Employees | | Public Investment | | Real GDP | |
|---|---|---|---|---|---|---|---|---|---|
| **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** |
| H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.575 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.606 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.551 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.769 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.784 | |
| **Openness rate (%)** | | **Budget Deficit (% GDP)** | | **Public Debt (% GDP)** | | **Unemployment rate (%)** | | **Unemployed people** | |
| **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** |
| H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.993 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.634 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.664 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.975 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.760 | |

Table 6 – Two-sample t test with unequal variances (absolute values for Portuguese data, 1974-2012)

| Public Expenditures | | Public Revenues | | Public Employees | | Public Investment | | Real GDP | |
|---|---|---|---|---|---|---|---|---|---|
| **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** |
| H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.537 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.592 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.414 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.605 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.392 | |
| **Openness rate (%)** | | **Budget Deficit (% GDP)** | | **Public Debt (% GDP)** | | **Unemployment rate (%)** | | **Unemployed people** | |
| **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** | **Left-Wing (obs=21)** | **Right-Wing (obs=18)** |
| H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.753 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.538 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.663 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.785 | | H0: Mean (Left)=Mean (Right) Pr (|T|>|t|)=0.360 | |

Table 7 – SOLS results for Portuguese Budget Deficit (1974-2012)

| | Budget Deficit (% GDP) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Openness rate (%) | -1.432** (0.607) | -1.422** (0.620) | -1.351** (0.613) | -1.362** (0.588) | -1.443** (0.584) |
| Public Employees | 0.506 (0.352) | 0.488 (0.365) | 0.461 (0.355) | 0.658* (0.364) | 0.693* (0.362) |
| Unemployed people | 0.661** (0.248) | 0.611** (0.250) | 0.619** (0.248) | 0.550** (0.244) | 0.590** (0.246) |
| Real GDP | -0.148* (0.081) | -0.143* (0.083) | -0.143* (0.082) | -0.163* (0.080) | -0.167** (0.080) |
| Electoral year | 0.135 (0.123) | | | | 0.117 (0.119) |
| Electoral year (lag) | | 0.007 (0.105) | | | |
| Parliament's election | | | 0.110 | 0.096 | |

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | | | | (0.186) | (0.179) | |
| Municipalities' election | | | | 0.120 | 0.120 |
| | | | | (0.117) | (0.113) |
| Parliamentary majority of left-wing parties | -0.014 | -0.027 | -0.023 | | |
| | (0.109) | (0.110) | (0.109) | | |
| Share of seats for left-wing parties at Portuguese Parliament | | | | -0.934 | -0.881 |
| | | | | (0.676) | (0.678) |
| Tenure duration | 0.010 | -0.027 | 0.017 | -0.001 | -0.007 |
| | (0.062) | (0.053) | (0.089) | (0.086) | (0.061) |
| R2 | 0.554 | 0.535 | 0.564 | 0.592 | 0.579 |
| ADF (1) | -5.575 | -7.913 | -12.744 | -4.637 | -4.743 |

Constant estimated but omitted in the table. Standard errors between parentheses. Significance levels: 1%, ***. 5%, **. 10%, *. ADF (1): Augmented Dickey-Fuller test for unit root on the residual series.

Table 8 – SOLS results for Portuguese Budget Deficit (1974-2012)

| | Yearly change of Budget Deficit (% GDP) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Openness rate (%) | -0.845 | -0.769 | -0.650 | -0.678 | -0.878 |
| | (0.768) | (0.789) | (0.735) | (0.729) | (0.763) |
| Public Employees | 0.637 | 0.489 | 0.523 | 0.529 | 0.631 |
| | (0.446) | (0.464) | (0.426) | (0.452) | (0.473) |
| Unemployed people | -0.002 | -0.068 | -0.062 | -0.063 | 0.002 |
| | (0.315) | (0.318) | (0.298) | (0.303) | (0.321) |
| Real GDP | -0.034 | -0.020 | -0.026 | -0.023 | -0.030 |
| | (0.103) | (0.105) | (0.098) | (0.099) | (0.105) |
| Electoral year | 0.274* | | | | 0.273* |
| | (0.155) | | | | (0.156) |
| Electoral year (lag) | | -0.169 | | | |
| | | (0.133) | | | |
| Parliament's election | | | 0.377 | 0.374 | |
| | | | (0.222) | (0.222) | |
| Municipalities' election | | | 0.230 | 0.231 | |
| | | | (0.140) | (0.140) | |
| Parliamentary majority of left-wing parties | 0.052 | 0.027 | 0.042 | | |
| | (0.138) | (0.142) | (0.131) | | |
| Share of seats for left-wing parties at Portuguese Parliament | | | | 0.148 | 0.236 |
| | | | | (0.838) | (0.885) |
| Tenure duration | 0.081 | 0.012 | 0.155 | 0.154 | 0.081 |
| | (0.078) | (0.068) | (0.106) | (0.107) | (0.079) |
| R2 | 0.184 | 0.143 | 0.286 | 0.284 | 0.182 |
| ADF (1) | -3.217 | -11.499 | -2.873 | -6.216 | -6.412 |

Constant estimated but omitted in the table. Standard errors between parentheses. Significance levels: 1%, ***. 5%, **. 10%, *. ADF (1): Augmented Dickey-Fuller test for unit root on the residual series.

Table 9 – DOLS, VECM and ARDL results for Portuguese Budget Deficit (1974-2012)

| Budget Deficit (% GDP) | | | |
|---|---|---|---|
| | DOLS | VECM | ARDL |
| Openness rate (%) | -1.709* | -2.389*** | -2.211*** |
| | (0.845) | (0.542) | (0.697) |
| Public Employees | 1.003** | 1.084*** | 2.375*** |
| | (0.465) | (0.276) | (0.353) |
| Unemployed people | 0.486* | 0.470*** | -1.202*** |
| | (0.256) | (0.167) | (0.215) |
| Real GDP | -0.094 | 0.213* | 0.018 |
| | (0.177) | (0.109) | (0.153) |
| Parliament's election | 0.042 | 0.002 | 0.006 |
| | (0.193) | (0.185) | (0.418) |
| Municipalities' election | 0.132 | 0.011 | 0.327 |
| | (0.137) | (0.140) | (0.267) |
| Share of seats for left-wing parties at Portuguese Parliament | -0.808 | -0.189 | -0.789*** |
| | (0.738) | (0.432) | (0.555) |
| Tenure duration | -0.029 | -0.056 | 0.007 |
| | (0.086) | (0.141) | (0.163) |
| Main statistics | R2=0.653 | Alfa: -1.193*** (0.242) Trace Test: Rank ( p-value) 0: 0% 1: 5% 2: >10% 3:> 10% 4: > 10% | R2=0.413 Wald (p-value) = 0.02 |
| ADF (1) | -6.186 | | |

Constant estimated but omitted in the table. Standard errors between parentheses. Significance levels: 1%, ***. 5%, **. 10%, *. ADF (1): Augmented Dickey-Fuller test for unit root on the residual series

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