A Demand Determinants Model for Public Spending in Spain

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ABSTRACT

In this paper an attempt is made to analyze the causes of growth of public government considering a demand model. The main contribution is the elaboration of a comprehensive and synthetic model in which economic-structural and political-institutional variables are included. To our knowledge, it is the first work that attempts this kind of model as it considers such a high number of variables, which implies great difficulties upon conducting the corresponding analysis. We consider the public expenditure in Spain in the period 1958-2014 where there are structural points. Then we use unit root and cointegration tests in a structural breaks context.

Keywords: Government Spending, Demand Determinants Model, Cointegration, Structural Breaks
JEL Classifications: H11, H50, E62

1. INTRODUCTION

The evolution of public spending represents a major point of concern for politicians and economists in the vast majority of countries around the world. The efficiency and size of said spending determines the economy of most countries. The Spanish case is slightly different with respect to numerous countries that surround it as it had been submitted to a dictatorial regime for more than the first two thirds of the 20th century. This vastly conditioned the policies and evolution of the country's public spending. In 1978, which saw the first democratic government, it is possible to see the first significant public deficits begin to appear in the Spanish budget. It is important to take into account and to acknowledge that the demand for social rights provoked a substantial increase in public spending, which was also accompanied by broad fiscal reform. In the end of XX century and the first years of XXI century there are a strong reduction of public expenditures and deficit by the inclusion of Spain in European Union (EU) and the 2008 economic crisis.

The general growth of government spending in the last 150 years in the industrial societies is a fact established (Borcherding, 1977; Mitchell, 2007). Numerous theoretical explanations have also been proposed in the literature (Larkey et al., 1984; Borcherding, 1985; Mueller, 2003; Bergh and Henrekson, 2011).

However in the field of determinants of the activity in the public sector, there is not an only one theory that is completely accepted or completely tested. On the contrary, there are a wide variety of theoretical approximations. As stated by Lowery and Berry (1983), the existing literature consists of a large number of very simple and disparate models with little or no consideration for theoretical integration. Nevertheless, a quantitative model that attempts to explain government spending should incorporate elements from different theories into a coherent scheme.

That is precisely the goal of this work, which analyzes public spending growth in Spain during the period 1958-2014. With this objective, a demand determinants model is utilized whose formulation follows Larkey et al. (1984), Borcherding (1985), Henrekson and Lybeck (1988), Hackl et al. (1995) and Borcherding et al. (2004).

Studies on public spending growth from the perspective of demand are based on the supposition that governments adjust their size in direct response to the demands of the citizens, which Buchanan (1977) calls a "responsible" government. On the other hand, an "excessive" government, which operates independently of the people, produces results that are not in harmony with the wishes

of its citizens (Henrekson and Lybeck 1988)[1]. The descriptions of responsible government assume that this entity makes decisions neutrally regardless of the result of said decisions. That is to say, the changes in the size of the public sector are considered a manifestation of normal technological and economic processes, changes in people's expressed preferences and likes, or of both. This type of institution does not seek to influence the decisions related to government size but rather to be exactly what the public demands. From an analytical point of view, this concept is equivalent to assuming that the offer of public goods and services is perfectly elastic.

In this paper we adopted the dual scheme from Borcherding (1985) and Halsey and Borcherding (1997). They consider two types of possible influences on government spending growth: Institutional and non-institutional components.

The institutional approximation corresponds to a political explanation in terms of political practices, groups and rules of political conduct (Borcherding, 1985; Hackl et al., 1995). For Sorensen (1988), the role of institutions is explained by the following questions: What is the impact of increased political participation and the balancing of political rights on public spending growth? What is the role of legislation and institutional agreements on the configuration of the various paths of public spending?

The second influence corresponds to an economic explanation as it contains only economic variables of a structural nature that reflect underlying individual preferences.

The primary contribution of this work is the elaboration of a model that coherently synthesizes institutional and economic calculations. Said model was constructed by means of an econometric process that allows the elimination of the variables that are non-significant in partial models and, in a synthetic model, the inclusion of significant variables in partial models. The empirical analysis and test of the latter enable us to formulate a synthesis model which contributes to both the economic explanation and institutional explanation. As a result, we support those who claim that neither of the two is complete and that it is necessary to also consider the contribution of the other explanation.

The remainder of this work is structured as follows: In Section 2, empirical literature about the subject is considered. Section 3 considers the economic determinants. Section 4 considers those that are political. Section 5 formulates and tests the various models. Section 6 realize a robustness analysis. Section 7 summarizes the work and presents conclusions.

2. A BRIEF REVIEW OF THE LITERATURE ON DETERMINANTS OF PUBLIC SPENDING

The literature on determinants of public spending is rather vast, both in terms of approaches and the number of articles published.

In a recent survey, Facchini (2014) considers 19 explanations and 73 explanatory variables for the determinants of public spending. The author highlights the fact that the results from the regressions are hardly conclusive in most cases. The explanations vary from those that consider merely one explanatory variable to those dealing with a generally consistent group of said variables. As for the latter, variables for both supply and demand are taken into consideration.

In this review, we will focus on the dual scheme of explanations from the demand side: Economic-apolitical determinants and institutional-political determinants and the works based on this approach.

This dual scheme has been applied by Borcherding (1985) and Halsey and Borcherding (1997). The formulation of Borcherding represents a means by which it is possible to establish an indication of the relative importance of both models. This scheme is preferable to those used by Neck and Schneider (1988) which combines economic determinants with political ones (i.e., interest groups and bureaucracy, elections, ideology and centralization or power, fiscal stabilization and fiscal illusion).

The relevant question now becomes, what is the relative importance of the two types of variables (economics and political) in the determination of public spending? According to Borcherding (1977), non-institutional variables explain nearly 40% of the growth of the public budget in the United States over eight decades, starting in 1902. On the other hand, three changes (price, income and population) do explain why the government absorbs 18% of the gross domestic product (GDP) in 1978 but they do not explain the 35% of GDP in 1985 (Borcherding, 1985). Needless to say, institutions do matter for this author, but he is unable to determine the relevant importance of the institutional variables as the range of the estimators of the parameters and variables is too vast and imprecise.

In Neck and Schneider's line we can find a series of works such as those of Ahmed et al. (2001), Doessel and Valadkhani (2003), Neck and Getzner (2007) and Wu and Lin (2012).

Other models combine explanations related to the supply side and the demand side, albeit none are presented in a coherent scheme. In this regard, we can cite Kau and Rubin (2002), who combine determinants associated with supply, especially political theories which emphasize the role of interest groups in the expansion of government, with theories based on demand that focus on the ability of government to collect taxes. They find that the main determinant of growth in public spending in the US since 1930 is the increasing participation of women in the labor market. The taxes paid by women explain nearly 50% of total change in public revenue.

A number of references in direct relation to these findings include the works of Merrifield (2000), Legrenzi and Milas (2002a), Tridimas and Winer (2005) and Shelton (2007).

Upon consideration of some of the possible determinants, we find the articles by Gemmel et al. (1999) which analyze the relationship

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1   Supply side theories construct political economy models of representative government to give structure to the supply of public goods. They seek to explain variation in the pattern of expenditure as a function of political organization: Electoral rules, the type of government, and the degree of political participation.

between fiscal illusion and demand for public spending, using income and population as control variables. Additional works include those by Ram (2009), who considers the openness and size of a country, and Saenz et al. (2013), who analyze the relationship between economy openness and spending growth, using the emergence of democracy in Spain as a dummy variable.

3. ECONOMIC-STRUCTURAL DETERMINANTS

It is possible to study the economic-structural determinants of public expenditure considering various individual theories on government growth that are not mutually exclusive but rather, on the contrary, allow formulating a collective model that is relatively parsimonious and includes all (Tussing and Hennig, 1974; Lowery and Berry, 1983; Borcherding, 1985; Abizadeh and Yousefi, 1988; Henrekson and Lybeck, 1988; Gemmell, 1990; Hackl et al., 1995; Wu and Lin, 2012). Taking each of these theories into consideration makes it possible to adequately justify the use of the different model variables. First of all, Wagner's law is evaluated, which is named after Wagner (1890), who formulated his law on the expansion of government more than 100 years ago. He discovered three important reasons for the increase in government activity. Firstly, industrialization and modernization would lead to substitution of private activity for public activity. The growing complexity of legal and contractual relationships would increase the need for greater public activity in terms of protection and regulation. Urbanization and increased population density resulting from industrialization would lead to greater social conflicts, which, as a consequence, would imply more spending on law and order. Secondly, Wagner predicted that the growth of real income would facilitate the relative expansion of spending in certain demands with income elasticity greater than one such as education, culture and the redistribution of income. Finally, he stated that economic growth and changes in technology require the government to control and manage natural monopolies to increase economic efficiency. Henrekson and Lybeck (1988) and Tussing and Henning (1974) formulate Wagner's law synthetically, when economic growth progresses and the nation becomes more unified and interdependent, the integrating role of the state must expand, and public spending will increase in proportion greater than the national output, in particular in areas of general government, regulation and expenditures on law and order.

In Spain, after the 1950s, a process of change took place in society which was essentially a Wagner movement according to García Delgado (2015). He divides Spanish industrial development into different stages, the last of which being 1960-1993, which is known as the "period of opening and convergence." During this period, and after the 1960s, an economic growth took place that was superior to any other period prior. It is worth bearing in mind that there are three processes that categorically explain the enormous change that came to pass in the Spanish economy and society: The transition from an agriculture-based society to an urban society, the opening to foreign markets, and the expansion of the economic capacity of the public sector.

Focusing on the first of these processes, the abrupt decrease in the working agrarian population and of the rural sector in general is quite clear by observing the process of emigration from the country to cities. In the last six decades, the active agrarian population has dropped by no less than four million people, falling from 38.7% of the working population in 1960 to 9.9% in 1991, 4.2% in 2008 and 4.3% in 2014. The consequence is a significant transformation of both the production structure and the social and territorial structures. An accelerated process of employment growth took place and the industrial sector increased from 30.3% of the working population in 1960 to 31.7% in 1993 and 27.4% in 2014, while the service sector grew from 31.0% to 58.4%, and later to 64% in the same period. Depopulation of farming country also brought about a rapid process of urbanization, a change in the territorial distribution of the population and resources, along with the prevalence of new structures and organization of families: Nuclear families and the incorporation of women into the work force. This active process of urbanization is revealed by the fact the number of people living in cities with more than 100,000 residents increased between 1960 and 2014 by four million every 10 years. The employment rate for women went from 22.93% in 1964 to 35.8% in 1994 and to 53.67% in 2014, or in absolute values from 2,865,900 to 10,594,400. Industrialization, urbanization, emigration and related processes disrupted the stability of the community leading to the supremacy of the nuclear family. This eliminated the security and mutual protection mechanisms that characterized rural societies and made it necessary to substitute them for ones managed publicly, which are more efficient in this case than traditional mechanisms. The result is an increase in public spending, particularly for transfer payments, but also in other functions such as healthcare. In addition, there was also a rapid growth in income with average annual growth rates of GDP per capita of 3.4%.

In order to test the theoretical and empirical aspects mentioned, the following variables are utilized: GDP[2]. And the proportion of industrial workers out of total employed (INDEMPL)[3] to represent the changes in the industrial structure. For GDP we expect a positive sign and if it is superior to the unit, it will be consistent with an income elasticity superior to the unit (luxury good). As for the proportion of industrial workers, a negative sign is expected[4].

Secondly, we consider the price effect. As in the case of demand functions, there will be a price effect in the demand for public goods. These prices are rarely observed since many goods and services supplied publicly are considered pure public goods, which means that the size of the group receiving them, the percentage of the cost of these goods which will be financed by the average voter, the marginal cost, and the degree of publicity determine their "price" for the individual (Neck and Schneider, 1988). However, even when there is no explicit market price for many government

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2   Other possible variables are degree of urbanization and total population.
3   Other possible variables are the proportion of women in the work force and the proportion of agrarian product out of total product.
4   For Tussing and Henning (1974) urbanization and industrialization, along with the breakdown of the extended family, require rising public spending, above all in transfers and health due to the disappearance of familiar security mechanisms characteristic of traditional societies.

services, there is an explicit tax price that can be tested against the prices of private goods. Whether the tax price is perceived clearly or not, that will be evaluated later on in the theory of fiscal illusion. Here, assuming that there is no such illusion, a key determinant of relative prices will be the Baumol effect (Baumol, 1993; Winer et al., 2008; Baumol, 2012), which will reflect the growth of relatively low productivity in the public sector obliged to pay salary increases determined by the growth of salaries in the private sector. This will lead to a rise in the relative price of public outputs. Although the Baumol effect is normally classified as an explanation of the supply side, in order to have explicative power it is necessary to be united with inelastic demand to price and/or elastic to income[5]. With that reasoning, this explanation fits both the demand side and that of supply (Henrekson and Lybeck, 1988; Hackl et al., 1995). Empirically, we will use the ratio of the public spending deflator to the GDP deflator as an indicator of the relative price of private and public goods (DEFL). Sign is expected to be negative.

4. POLITICAL-INSTITUTIONAL DETERMINANTS

The political situation in Spain has undergone significant changes in past decades. In 1976, a transition took place from a dictatorship to a democracy. This change provoked a strong expansion of public spending both because of inherent political aspects and because of the demand by various groups in Spanish society for the redistribution of income, both in kind and monetarily. This redistribution brought about greater equality in the distribution of income in term of three aspects: Functional, personal and spatial. Regarding the first, the weight of pay to salary earners in the GDP tends to increase due to the fact that the population gradually becomes wage-earners in the job market. From the point of view of personal distribution, the percentage of income belonging to the upper decile passed from 39.6% in 1972 to 25.4% in 1990. Equality in terms of spatial distribution of income has improved as well. Measuring this improvement by means of the variation coefficient of income per capita among regions, Spain has, at present, a distribution similar to that of Germany, a country which has not experienced any variation over that last three decades.

In addition to political change, which redefined the political organization as well as the territorial organization of the autonomous regions and created the welfare state as an instrument of social cohesion, it is important to consider the economic crisis that made the intervention of the State necessary. This intervention came in the form of investment subsidies and capital to those companies in crisis and subsidies to the newly unemployed.

The unemployment rate in 1964 was 2.1% of the working population while in 1975 it rose to 4.7%. From that point it increased at an astonishing rate reaching 20.8% in 1986. The bonanza of the years that followed made it possible to lower this rate, which dropped to 16% in 1990 with a new peak a few years later in 1993 when it rose to 23.9%. The lowest unemployment rate

since was 8.47% in 2007, at the height of the Spanish economy's expansion. After that, due to the economic crisis, which is currently still a reality, a severe increase took place and in 2013 unemployment reached 25.73% and in 2014 it reached 23.7%.

The number of pensioners has increased as well due to both demographic factors (aging population) and discretionary factors, such as expanding the group in question and utilizing retirement as a way to alleviate the number of layoffs among companies in crisis. Between 1960 and 1991 the population over 65 years of age rose from 2.5 million people to 5.3 million, representing 14% of the population at the end of this period compared to 8% in 1960. In 2000, this figure was 6.7 million out of a population of 40.47 million (16.8%) while in 2014 it was 8.4 million out of 46.4 million (18.1%). Moreover, the population over 75 years of age represents 5% of the total population and those over 65 represent 41%.

The increase in the number of elderly people is accompanied by a decrease in the number of young people, which dropped from 27% of the population in 1960 to 19% in 1994.

The influence of these changes on public spending growth can be explained by various political-institutional theories. Moreover, the influence of spending growth brought on by the demand for the redistribution of income can be explained by the theory developed by Meltzer and Richard (1978; 1981; 1983). At the same time, growth caused by the influence of retirees and unemployed might lie in the theory of interest groups.

Meltzer and Richard argue that growth of the State is boosted by the competition to obtain political votes and the redistribution of income. In their campaign to receive votes, politicians propose many more programs than those that they can carry out. Each member of the electorate compares the benefits they expect to receive from the expansion programs of the government to the costs they expect to pay. Voters will choose the candidates that promise to act in their interest and also reelect those who do so.

With universal suffrage, the median voter had less income than the average income. Voters with an income below the average can benefit if the incomes above the average are taxed and the money collected is distributed among them and others.

Consequently, governments with high public spending are the consequence of the difference between the distribution of votes and the distribution of income. Government grows when suffrage extends to include more voters below the median income (the decisive voter), when growth of income provides government with the means to increase redistribution, and when the distribution of income becomes more unequal. However, sizeable redistributions also carry a cost in that they reduce the incentive to work and save. This cost will be borne by everyone to some extent and, as a result, constitutes a brake, albeit weak, on government growth.

Government will grow because there is a decisive difference between political and market processes. The market produces a distribution of income less equally than the distribution of votes. Consequently, those with a lower income will use the political

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5   If the unit cost of public sector goods increases faster than those of private sector goods and the demand for public sector goods is inelastic to price, it is expected that public spending will increase.

process to enact programs that will redistribute income in their favor. Politicians have an incentive to appeal to voters with incomes close to the median, and they do so by offering benefits which impose a net cost on those whose incomes are above the median. The redistribution program offered varies from place to place and according to the times, when the composition of the electorate changes. Nevertheless, the support for redistribution will continue while the disincentive to work, save and invest does not decrease future income enough to change expected profits into a loss.

The variable that is typically used to test this theory is the ratio of median income to the average income before taxes and transfers. As it is not possible to use this variable in Spain (provided that data are not available), we have considered different alternatives to utilize as proxy variables. However, none of them adequately reflect the redistribution of income; consequently, this effect could not be tested.

Secondly, we consider redistribution for influential interest groups. Societies are divided into many levels giving rise to the formation of groups of people with common interests in a given issue. People usually come together in these groups based on their relative income or, more frequently, their position in the division of labor or other personal or social characteristics. The number of groups and their importance is normally associated with a growing specialization of the economy, level of income, a decrease in the costs of information and transaction, the scope of non-competitive markets, and protectionism.

The state can provide private goods to specific groups and distribute their costs among the entire population. These groups pressure the public powers to achieve the supply or denial of certain benefits. In other terms, they constitute a tool that applies pressure on the government. Given that the population does not possess an exact appreciation of the costs or benefits of programs, costs may be widely distributed or may not have a direct relationship with the program and benefits may be overestimated. As a result each group can articulate its demands to obtain lower taxes and greater subsidies for a specific segment of society. The satisfaction of each group costs relatively little since an increase in taxes is distributed among the entire electorate. In addition, the party in power obtains the votes from the groups that have been appeased. Aranson and Ordeshook (1977) observe that there are many situations in which the state can continue supplying private goods although the costs are higher than the benefits. The result could be modeled after the n-person prisoner´s dilemma. All interest groups could prefer that no one obtains their private good from the hands of the state, but they would not cease to be motivated to fight for the good they desire, and, as a result, it would be supplied to them.

Although the existence of interest groups is not a factor of public sector expansion per se, there are, however, imperfections in the political market (such as differences in costs of information and transaction and pressure from different groups) that form coalitions that extract resources for their exclusive benefit. In this situation, at a given moment, the size of government is a product of the competition among groups to obtain money from the government. Among the factors that determine the power of a group is, firstly,

the number of individuals in that group. Therefore, large socio-economic groups, which tend to have a high number of members, are likely to have a powerful influence on public spending. A few examples would be the retired population, which looks out for its medical needs and financial aid, young people, who demand public policies in favor of their education needs, and the unemployed, who, similarly, constitute a vast socio-economic group; all of these groups demand serious attention from politicians. Such socio-economic groups, through their demands for public policies, influence the size of government. Moreover, they can change the amount of public spending over time. For example, an increase in the senior citizen population, even while maintaining demand for medical assistance and retirement pensions the same, would automatically cause an increase in the size of the government. Similarly, this would also occur with a relative increase in the population of young people or the unemployed[6] (Shelton, 2008).

In order to account for this effect we include independent variable such as the ratio of unemployed over the total working population (UNEMP). A positive sign is expected.

Government spending growth can also be determined by how open the economy of a country is. This is understood as the result of a strong industrial sector which at the same time promotes a climate in which unions can grow and possess decisive influence on the government[7]. For Cameron (1978), some nations have a high degree of dependence on external markets, for example for exports and sources of capital. If there is a high degree of substitution between domestic and foreign goods, with the production costs established in the international market, those economies are open and are exposed to the pressures of price and markets coming from other nations via international exchanges. For Lewis-Beck and Rice (1985), the greater the degree of dependence on foreign trade, the greater the demand made to the government to maintain economic stability, eliminating the harmful effects of an open economy on production, employment and consumption, by means of strategic increase in spending. For Rodrik (1998) the correlation extends to countries of all income levels and exists for all available measures. He hypothesizes that government expenditures may serve as a form of insurance against external risk.

Whether an open economy represents economic development and diversification of a country or if it is a barometer of general and domestic economy policy, it is still a reasonable measurement of dependence on foreign trade. Any country subject to a strong dependence on the foreign sector is subject to destabilizing external effects. If government policies seek to protect the domestic economy from the numerous fluctuations that take place in foreign countries, a relatively large foreign sector requires a greater degree of government involvement so that the ratio of spending will grow in parallel. In order to test this effect, we utilize a variable which is the degree of openness represented by the ratio of exports plus imports to the GDP (OPEN). The sign is expected to be positive. This variable can also be considered as a proxy for the influence

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6   Lowery and Berry (1983) include these variables among those derived from Wagner's law.

7   This idea is not very relevant in Spain, where the power of unions manifests itself primarily in the public sector.

of unions on the government given that open economies tend to promote large industrial areas that favor strong union movements (Neck and Schneider, 1988).

A third influence on the growth of public spending is the degree of fiscal illusion[8]. Pommerehne and Schneider (1978) define fiscal illusion as an erroneous and systematic perception of individuals about the volume of their tax burden they support, and about the benefits they obtain from public expenditure and their effect on decisions relative to public expenditure according to different institutions collectively chosen.

This erroneous perception leads individuals to underestimate the true cost of public goods and services and as a result they demand them in greater quantity than they would otherwise.

Fiscal illusion is interpreted in the literature as a systematic undervaluing of the burden of the subject caused by the limited visibility of various taxes and other public incomes. In general, three causes of this restricted visibility of fiscal burden can be identified (Wagner, 1976; Pommerehne and Schneider, 1978):

a. The cost of information due to the methods of valuation and distribution of public revenue. Direct taxes, such as on personal income, are more visible for individuals than indirect taxes. Moreover, perception of actual tax burden diminishes when taxes are paid through salary deductions than when they are paid directly

b. The cost of information due to time distribution of the tax valuation. Individuals consider it more burdensome to pay taxes all at once than to pay in small amounts on a regular basis. If the government finances spending by means of the sale of public properties or debt (which implies the payment of future taxes), the individual does not perceive any fiscal burden

c. Costs of information due to the complexity of the tax system. A complex system of direct and indirect tax complicate the measurement of its fiscal burden by taxpayers.

These three causes are observed, to greater or lesser extent, in the Spanish tax system during the study period. Until the reform started in 1977, the Spanish tax system followed what is known as a Latin system based fundamentally on the taxing of certain objects, such as rustic and urban goods, real estate, business activities, which combine work and capital, and services. These taxes are complemented by income taxes. During the lengthy period in which this system was established – since 1845 – two significant reforms were made (Tamames, 1993). The reform of 1957 established a voluntary scheme of agreements with groups of taxpayers (unions, trade associations, etc.) which allowed the distribution to individuals of a total sum which the state administration allocated to a given industry or trade, if the specific tax fees were variable. With this "distribution" system, taxes were collected from business activities, the personal work of professional such as doctors and lawyers, and it also served as

a tool for establishing taxes on companies in individual shape. However, the most serious drawback of this system lies in the fact that it implied a transaction between taxpayers and the government. In fact, the latter renounced specific knowledge of the actual tax regime and delegated tax control to business sectors, which under the protection of the system could have an effect of the taxes on prices (inflation effect) and could also obtain significant additional benefits from the evasion of deducted taxes (fiscal income).

The second reform – 1964 – had two virtues: The personalization of direct taxation and the organization of indirect taxes. It also had two serious flaws: The establishment of the beginning of global evaluation introduced in 1967 and the persistence of an excessive weight of indirect taxes.

In general terms, the most serious flaws of the Latin system can be found in the inadequate correspondence between the fiscal structure and any modern economy and social structure (Albi et al., 1993). The income elasticity of these systems is not enough to maintain revenue collection at the same pace as public spending growth. Its collection power is low and insufficient for the needs and objectives of countries in the modern world. At the same time, the requirements of equality that are currently demanded of tax systems are difficult to achieve without a tax on the individual.

The European tax method rejects the production tax because it is inefficient and unjust. Instead, it adopts a personal and synthetic tax on the income of physical people and legal entities. Encompassed by indirect taxes, sales volume is the selected object of taxation, fundamentally, by means of a value added tax.

As of 1979 deficits begin to appear in Spain's public budgets. The financing of this deficit was managed with the Bank of Spain until 1984. From that point on, the state began to issue public debt.

The characteristics of the tax system, described in this section, are what makes fiscal illusion possible. That is what happened with the dominance of indirect taxes, in the first phase, over direct taxes and the collection of direct taxes from worker paychecks. Similar actions came in the second phase, such as deductions from individuals' wages to a tax account, partial payment of taxes, and financing by means of non-taxable resources. Furthermore, given the complexity of the tax system, it proves quite difficult for taxpayers to measure their actual tax burden.

To test the influence of fiscal illusion on public spending growth we include as explanatory variable the deficit of the government (DEF)[9]. A negative sign is expected.

Finally, we take into consideration the possible influence of inflation on spending growth. Inflation causes a progressive tax

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8 This explanation is included by Lowery and Berry (1983) among reasons that cause an excess in public spending. That is, the reasons in which institutions operate to expand the percentage of government spending in the economy beyond the size demanded by the public.

9 In the empirical analysis they have been proposed diverse explanatory variables as the proportion of direct taxes out of total taxes (DIRTAX), the deficit of the government (DEF), and a Herfindahl index (HERF) (Wagner, 1976) of complexity of the tax system, defined as HERF = $\Sigma(TPi)2$ where TPi is the portion of the income category i out of the total public revenue. The lower this index is, the greater the complexity of the public revenue system.

on income with undefined brackets to collect progressively more revenue. As inflation places taxpayers in higher marginal brackets, a real increase occurs in public revenues, which is followed by expenditures. This explanation, known as bracket creep, is, in the view of Larkey et al. (1984), a much sounder idea than an explanatory theory on public spending growth.

5. FORMULATION AND EMPIRICAL TESTING OF THE MODELS

Following the model of the average voter by Borcherding and Deacon (1972) and Bergstrom and Goodman (1973) we consider the expression PE = f(GDP, INDEMPL, DEFL) for the first model and PE = f(OPEN, DEF, UMPLRATE) for the second where PE is public expenditure, in which the different variables are transformed in logarithms. In order to measure public spending we consider all levels of the public sector (local, regional and state) and all types of expenditures (current, investment and transfers). The period studied is 1958-2014. Given the existing controversy between considering magnitudes in constant or current prices, we opted to consider current prices as they allow us to take into account price effect (Legrenzi and Milas, 2002b; Saenz et al., 2013)[10].

The structure of the equations is as follows:

$$LogEXP = \alpha_1 LogGDP + \alpha_2 LogINDEMPL + \alpha_3 LogDEF + \varepsilon_1 \quad (1)$$

$$LogEXP = \beta_1 LogOPEN + \beta_2 LogDEFL + \beta_3 LogUMPLRATE + \varepsilon_2 \quad (2)$$

In the first model considered, which was economic-structural, the various series can be observed in logarithms in Figure 1.

In general, public spending displays a rising trend over the period. There were slight declines at the end of the 1970s, followed by an increase interrupted around 1998, at the time of the Maastricht Agreement. Subsequently, spending began to grow again from 2001 until 2008, at which time it started to decrease as a result of the current recession and European austerity measures. The GDP, apart from minor ups and downs, also follows a rising trend until 2008 when it begins to decrease.

The behavior of the other two variables is different. In the case of industrial employment, this difference is due to the change that took place in the Spanish economy in the mid-70s and early 80s. During that time, and following an industrial restructuring, Spain invested heavily in the services sector, and even more so following its entry in the EU. As for the last graph, this trend owes to changes in the prices of public goods and services with respect to private goods.

The estimate of the two models was conducted bearing in mind the possible existence of unit roots in both the variables and the

structural breaks, which may have arisen in the series representing the variables.

The initial analysis of the data was carried out considering an ordinary least squares regression of public spending in GDP. The residuals of this regression constantly change sign, leading us to conclude that structural breaks may possibly exist in the model variables. In the Figure 2 we have the plot of residual of the regression.

The graph reveals that the residuals change sign twice during the study period of 1958-2014. These changes can be placed at approximately 1978, 1997 and 2007, which correspond to periods of considerable change in the Spanish economy. The first year coincides with the beginning of the country's democracy, the second with the adaptation period to the conditions of the Maastricht Agreement, and the third to the beginning of the great recession.

This intuition can be formalized by using different stability tests that enable detection of structural breaks. Utilizing the Quandt-Andrews test, we obtain a breakpoint in 1980, whereas the Bai-Perron sequential test detects two breakpoints in 1980 and 2007. In this line, the following sections will deal with the structural breaks for 1980 and 2007.
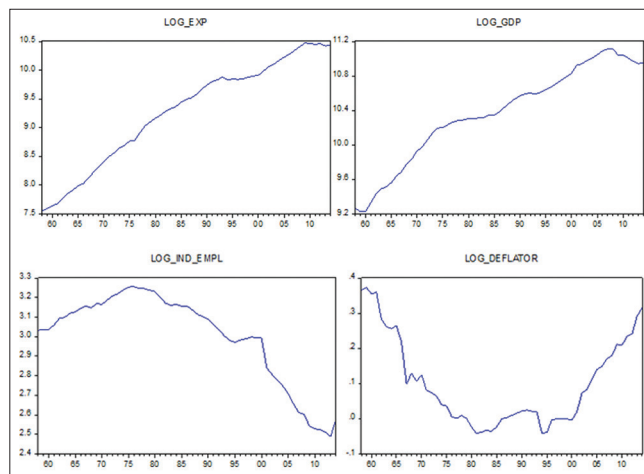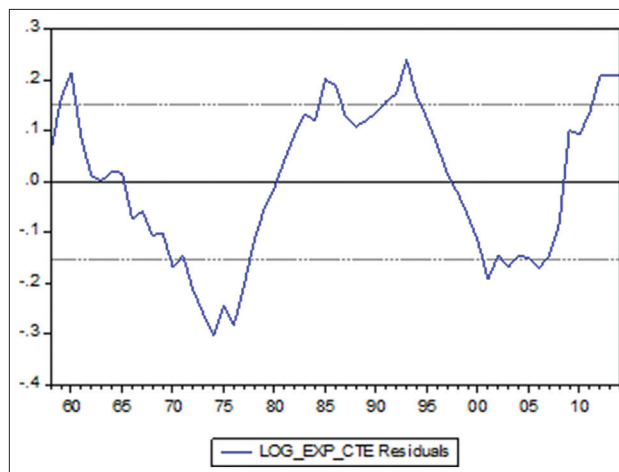
Figure 1: Variables of first model

Figure 2: Residual of the regression

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10 The data is taken from the following sources: Public spending of the general state comptroller and the databases of the Spanish National Statistics Institute (INE). The rest of variables from the databases of the Spanish National Statistics Institute (INE).

Table 1: Unit root of variables in level with break points[11]

Variables	ADF with structural breaks	P value	ZV	CV	PP	CV
LogEXP	−2.76 (2001)	0.81	−3.48 (1977)	−5.08	−3.11 (1976)	−5.59
LogGDP	−4.17 (1986)	0.10	−3.72 (2005)	−5.08	−3.03 (2002)	−5.59
LogINDEMP	−3.65 (2000	0.31	−2.94 (1971)	−5.08	−2.93 (1970)	−5.59
LogDEFL	−2.81 (2003)	0.78	−2.84 (2002)	−5.08	−1.68 (2001)	−5.59

GDP: Gross domestic product, ADF: Augmented Dickey–Fuller, PP: Phillips-Perron, CV: Critical value

The first step is to establish the integration order of the different time series that specify model variables. Once the integration order of variables is established, a test can be conducted to determine whether there is a long-term relationship among some or all the variables.

Then, we conduct unit root tests allowing one or several structural breakpoints at unknown moments in time. Tables 1 and 2 display the results obtained.

The three tests confirm that the series are I(1) with different breakpoints. Therefore, it is possible to carry out the cointegration tests taking into account the existence of breakpoints: Gregory and Hansen (GH) and Johansen, Mosconi and Nielsen (JMN). In the first case the test is conducted considering that the deterministic components have a constant and/or trend and that the break only occurs with the constant. The number of lags is calculated using Schwartz information criterion and Bayesian information criterion. In the GH test the null hypothesis is non-cointegration while the alternative is cointegration in the presence of a possible structural change. To be more precise, the cases considered are those in which the constant and the coefficient of the slope have a single structural break at an unknown moment. The breakpoint is detected endogenously by the test. The model by JMN considers either the constant or the trend in the data. This implies a structural break in the constant (change of level), which is taken into account by adding fictitious variables to the deterministic portion of the process. The test statistic remains unchanged while the calculation of the critical values depends on the number of non-stationary relationships and the location of the breakpoints (Table 3).

The Table 3 displays the results obtained utilizing the various structural breakpoints detected. The GH test rejects the existence of cointegration while the JMN test obtains mixed results. A cointegration relationship is obtained in the years 1980 and 2007 when trend is considered in the data. When the two breakpoints are considered, a cointegration relationship is obtained both with constant and with trend in the data. As a result, it can be deduced that cointegration exists among the three variables, making it possible to estimate these possible long-term cointegration relationships using least-squares regression methods (fully modified ordinary least squares [FMOLS], dynamic ordinary least square [DOLS] and canonical cointegrating regression [CCR])[11]. The results are shown in Table 4.

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11 The tests conducted are the Zivot Andrews unit root test (ZV), the Perron (P) unit root test and the ADF with structural breaks unit root test. All cases of breakpoints are detected endogeneously by the tests. In the three cases, a maximum of one breakpoint is admitted. Not one of them rejects the unit root hypothesis in the variables against the stationary alternative with structural change in both intercept and trend at an unknown date. The lags selection method belongs to the criteria of Schwartz. It is assumed there is a constant and trend in the data generation process, and that there are breaks in the constant and trend.

Table 2: Unit roots of variable in first differences with break points

Variables	ADF with structural breaks	P value	ZV	CV	PP	CV
LogEXP	−5.39	<0.01	−5.52	−4.93	−5.47	−5.23
LogGDP	−5.20	<0.01	−5.25	−4.93	−5.78	−5.23
LogINDEMP	−5.33	<0.01	−5.21	−4.93	−5.40	−5.23
LogDEFL	−7.91	<0.01	−7.55	−4.93	−10.95	−5.23

GDP: Gross domestic product, ADF: Augmented Dickey–Fuller, PP: Phillips-Perron, CV: Critical value

Table 3: Cointegration tests with breakpoints

Test	Contrast statistic (CV) and breakpoint
GH test with break in the intercept. We include constant in the data (CV 5%)	−2.91 (−5.28) Breakpoint (1980)
GH contrast with break in the intercept. We include trend in the data (CV 5%)	−3.57 (−5.57) Breakpoint (1997)
JMN trace test with break in 1980 and constant in the data (CV 5%)[12]	r=0: 56.31 (42.06) r≤1: 28.16 2 (5.09)
JMN trace test with break in 1980 and trend in the data (CV 5%)	r=0: 40.64 (53.31) r≤1: 29.76 (32.97)
JMN trace test with break in 2007 and constant in the data (CV 5%)	r=0: 65.46 (40.19) r≤1: 30.78 (23.73)
JMN trace test with break in 2007 and trend in the data (CV 5%)	r=0: 55.21 (49.12) r≤1: 20.79 23.73)
JMN trace test with break in 1980, 2007 and constant in the data (CV 5%)	r=0: 53.96 (46.78) r≤1: 25.39 (28.26)
JMN trace test with break in 1980, 2007 and trend in the data (CV 5%)	r=0: 40.63 (58.30) r≤1: 21.69 (36.32)

JMN: Johansen, Mosconi and Nielsen, CV: Critical value

We now proceed to analyze the results obtained in the three types of model equations utilized, initially focusing on specific points and ending with more general details.

In the first group of equations, we consider the three variables of the model and the two breakpoints. Both D1980 and LogINDEMPL are non-significant in the three equations (for the first: $\chi^2(1) = 2.04$, with a $P = 0.15$, and for the second: $\chi^2(1) = 1.86$, with a $P = 0.17$, while the other three variables are significant. This brings us to the second group of equations, in which D1980 was omitted, and the third group, in which LogINDEMPL was omitted. As a result, the significant variables are LogGDP, which has the expected sign but a coefficient less than one (the equality to one test of the coefficient gives a value of $\chi^2(1)$ of 2206.98 with a $P = 0.00$). This would signify indirect proof that Wagner's

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12 Critical values of Giles y Godwin (2011)

law is not fulfilled and, therefore, public spending would not be a luxury good in the traditional microeconomic sense (Durevall and Henrekson, 2011; Facchini, 2014). The LOGDEFL variable has the expected sign, which is logical considering an increase in public goods (the denominator) provokes an increase in public spending.

The second model considers the political-institutional variables. The analysis carried out is parallel to the one above.

Figure 3 plots the logs of the levels of the four variables of the second model

The degree of economic openness displays a rising trend, with neither major peaks nor breaks, unlike unemployment rate, which reveals a rather changeable trend. As for the latter, the figure rises considerably from the 1970s onward, yet declines at times when Spain's GDP increases, namely in the recession in 2007. In the case of public deficit, a notably erratic trend is observed. From the 1960s to the mid-70s, there is a fiscal surplus. This situation changes with the arrival of democracy and the consequential necessity to enter in deficit in order to meet the demands of basic public services for the population. In the early 21st century, the real estate bubble produced a temporary budget 1980s, 1990s, and the early 2000s. However, unemployment begins to increase once again at the outset of surplus which ended with the recession of 2007.

Given the existence of breakpoints, in general, we conduct unit root tests allowing one or several structural breakpoints at unknown moments in time. Table 5 display the results obtained.

Observing the Table 5 leads us to determine that the LogOPEN series is I(0). This means that in the cointegation analysis it will be considered as an exogeneous variable in the long term.

With respect to the remaining series, after considering the first differences, it is confirmed that all series are I(1) (Table 6).

The tests with structural breaks are the same as in the previous model: GH and JMN. In the second case, two lags were considered in the vector autoregression utilizing the Akaike information criterion and Schwarz Bayesian criteria (Table 7).

The results reveal the existence of a cointegration equation in the JMN test in all the models. This allows us to calculate the

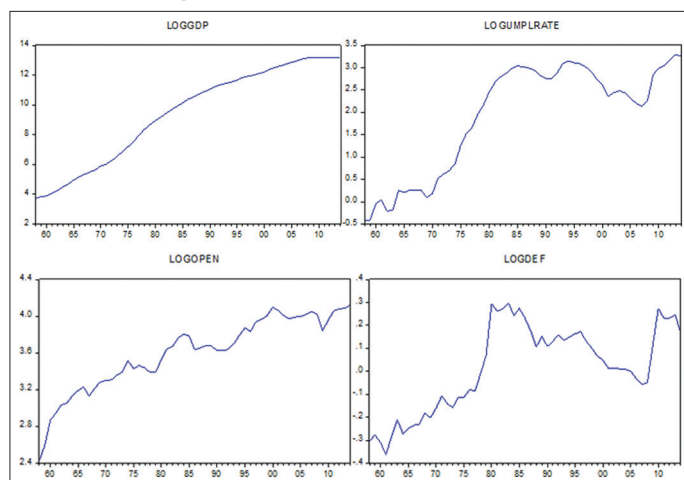**Figure 3:** Variables of the second model

Table 4: Cointegration equations

Cointegration equation	LogGDPa	LogDEFL	LogINDEMPL	D1980	D2007	C	R²
FMOLS (1)	0.69 (25.48)	−0.97 (−2.05)	0.29 (0.80)	0.03 (0.42)	0.21 (3.44)	1.36 (1.02)	0.99
DOLS (1)	0.68 (38.49)	−0.96 (−3.02)	0.29 (1.36)	0.07 (1.42)	0.26 (5.16)	1.36 (1.02)	0.99
CCR (1)	0.68 (35.60)	−0.93 (−2.74)	0.31 (1.31)	0.07 (1.33)	0.27 (4.95)	1.29 (1.42)	0.99
FMOLS (2)	0.70 (48.76)	−0.83 (−2.69)	0.36 (1.65)		0.25 (4.80)	1.04 (1.29)	0.99
DOLS (2)	0.70 (32.69)	−0.90 (−2.04)	0.37 (1.19)		0.22 (3.50)	1.08 (0.94)	0.99
CCR (2)	0.71 (44.46)	−0.76 (−2.23)	0.41 (1.67)		0.26 (4.61)	0.86 (0.94)	0.99
FMOLS (3)	0.68 (125.45)	−1.29 (−9.18)			0.23 (4.48)	2.33 (41.75)	0.99
DOLS (3)	0.68 (55.81)	−1.40 (−5.86)			0.21 (3.49)	2.49 (14.97)	0.99
CCR (3)	0.68 (124.21)	−1.29 (−9.24)			0.24 (4.37)	2.39 (41.48)	

FMOLS: Fully modified ordinary least squares, DLOS: Dynamic ordinary least square, CCR: Canonical cointegrating regression, GDP: Gross domestic product

Table 5: Unit root of variables in level with break points

Variables	ADF with structural breaks	P value	ZV	CV 5%	PP	CV 5%
LogEXP	−2.76 (2001)	0.81	−3.48 (1977)	−5.08	−3.11 (1976)	−5.59
LogUMPLRATE	−3,69 (1975)	0.28	−3.07 (1978)	−5.05	−3.94 (1969)	−5.59
LogDEF	−3.05 (1978)	0.65	−3.41 (1978)	−5.08	−3.37 (1977)	−5.59
LogOPEN	−4.59 (19799	0.03	−4.54 (1974)	−4.93	−4.47 (1975)	−4.93

GDP: Gross domestic product, ADF: Augmented Dickey–Fuller, CV: Critical value, PP: Phillips-Perron

Table 6: Unit roots of variable in first differences with break points

Variables	ADF with structural breaks	P value	ZV	CV 5%	PP	CV 5%
LogEXP	−5.39	<0.01	−5.52	−4.93	−5.47	−5.23
LogUMPLRATE	−4.18	<0.01	−8.98	−4.93	−15.13	−5.23
LogDEF	−7.83	<0.01	−6.82	−4.93	−8.00	−5.23

ADF: Augmented Dickey–Fuller, CV: Critical value, PP: Phillips-Perron

cointegration equations that provide the long-term relationship among the variables.

If we consider the coefficients of the two structural breaks we observe that they are significant. This confirms the existence of two structural breaks in the study period. In the three equations, both model variables have the expected signs, according to the theoretical framework, and both are significant at 5%. This result differs from that obtained in other studies as the degree of economic openness is normally highly significant in other cases (Saenz et al., 2013). In the present case, said variable is determined to be I(0), meaning it cannot be included as an endogenous variable in the long-term cointegration relationships, and it could only be included in the short-term model (Table 8).

Based on the previous result and taking into account the significance of the variables in the two models formulated, we can utilize a synthesis model for the economic-apolitical determinants and for the structural-political determinants. The same dependent variable, which is public spending, is used in this synthesis model along with the independent variables: GDP, deficit, deflator and unemployment rate.

Bearing this in mind, we analyze the possible cointegration relationships when there are structural breaks in 1980 and 2007. As in the cases of the previous models, we utilize the GH and JMN tests (Table 9).

As per usual, the GH contrast rejects the null of cointegration. However, the same does not occur with JMN in all cases except for 2007 with constant in the data. We can consider that the series are cointegrated and a cointegration vector exists which can be

estimated using the previously-mentioned methods (FMOLS, DOLS and CCR). The results are displayed in the Table 10.

The analysis was carried out by applying the strategy to eliminate non-significant variables step by step. Initially, it is observed that neither variable D1980 ($\chi^2(1) = 0.28$, with a P = 0.59) nor variable logUMPLRATE ($\chi^2(1) = 0.12$, with a P = 0.73) are significant. The combined hypothesis that both are equal to zero does not reject the null hypothesis either ($\chi^2(2) = 0.39$, with a P = 0.82). Nevertheless, we only discarded D1980 in the second estimation, and LogUMPLRATE proved to be non-significant (with a $\chi^2(1) = 0.85$, with a P = 0.77). Consequently, we merely utilize the third equation, where the variables representing GDP, the deflators quotient and deficit are significant. The first two are economic-structural variables while the third is a political-institutional variable. The sign of the three variables is as to be expected, meaning the public spending elasticities in relation to any of these variables offer an increase in public spending when said variables change. The first variable has a coefficient less than the unit and the Wald test of equality to one for said coefficient rejects the null hypothesis ($\chi^2(1) = 2432.67$ with a P = 0.00). This result is an indirect test of rejection of Wagner's law (Musgrave and Peacock, 1958). for the Spanish case and the period studied. The second variable confirms Baumol's cost disease in the sense that salaries in the public sector increase more quickly than in the private sector as its productivity is lower. Finally, growth in public deficit brings with it public spending growth, precisely as predicted by theory of fiscal illusion. The positive and significant value of variable D2007 indicates the existence of structural breaks during this period and reveals the influence of the growth of public spending at the beginning of the recession. Nevertheless, the demands of the EU and the modification of Article 135 of the Spanish constitution led to restrictions on spending and deficit.

The residuals of the model are stationary; the JB test indicates they fit a normal multivariate distribution while both the Chow-Denning joint test and the individual statistics confirm that the residuals constitute a random walk.

A graphic representation of the model fit and of its residuals is presented in Figure 4.

6. ROBUSTNESS AND STABILITY OF THE MODEL

Our analysis has identified the existence of two breakpoints in the three models considered (1980 and 2007). These breakpoints give rise to several problems. Firstly, the outliers may have a significant effect on the results of the estimation producing either unexpected or inadequate values in the coefficients. Secondly, the structural breaks might provoke a displacement effect, in the line of Peacock

Table 7: Cointegration test with structural breaks

Test	Contrast statistic (CV) and breakpoint
GH test with break in the intercept. We include constant in the data (CV 5%)	2.91 (−5.28) Breakpoints (1981)
GH contrast with break in the intercept. We include trend in the data (CV 5%)	−3.57 (−5.57) Breakpoints (1997)
JMN's trace test with break in 1980 and constant in the data (CV 5%)	r=0: 26.61 (26.34) r≤1: 5.62 (12.8)
JMN's trace test with break in 1980 and trend in the data (CV 5%)	r=0: 32.19 (37.14) r≤1: 9.03 (18.81)
JMN's trace test with break in 2007 and constant in the data (CV 5%)	r=0: 31.81 (25.09) r≤1: 10.57 (12.04)
JMN's trace test with break in 2007 and trend in the data (CV 5%)	r=0: 37.84 (32.97) r≤1: 12.80 (16.55)
JMN's trace test with break in 1980, 2007 and constant in the data (CV 5%)	r=0: 24.91 (46.22) r≤1: 3.85 (23.83)
JMN's trace test with break in 1980, 2007 and trend in the data (CV 5%)	r=0: 32.19 (31.69) r≤1: 9.03 (15.87)

JMN: Johansen, Mosconi and Nielsen, CV: Critical value

Table 8: Cointegration equations

Cointegration equations	LogDEF	LogUMPLRATE	D1980	D2007	C	R^2
FMOLS	−7.82 (−4.45)	2.25 (6.31)	1.39 (2.34)	0.96 (2.61)	3.48 (6.70)	0.93
DOLS	−8.23 (−3.57)	2.47 (5.77)	0.90 (1.22)	1.09 (2.64)	3.43 (4.93)	0.96
CCR	−7.87 (−4.43)	2.26 (6.17)	1.49 (2.16)	0.95 (2.60)	3.48 (6.71)	0.93

FMOLS: Fully modified ordinary least squares, DLOS: Dynamic ordinary least square, CCR: Canonical cointegrating regression

and Wiseman, with the corresponding bias of the coefficients of the model variables. We are unable to determine the duration of the economic recession with precision, and the post-recession period may last for a number of years. The changes that have taken place in the Spanish economy serve as examples of the consequences of the establishment of a democratic regime, entry into the EU, and the economic recession of 2007 and the years that followed.
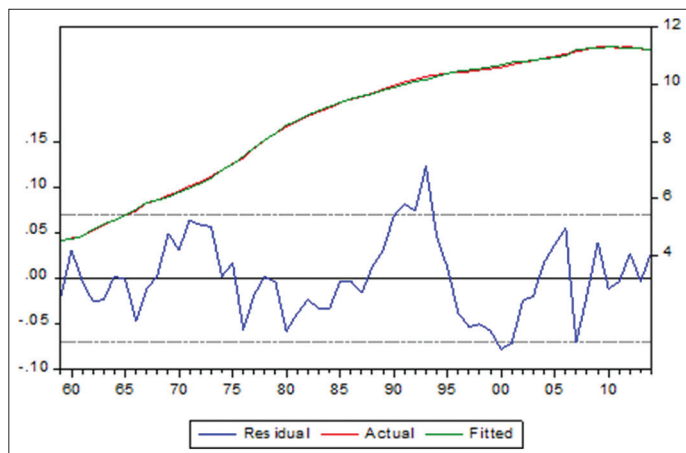
Figure 4: Fit and residuals of the model

Table 9: Cointegration tests with breakpoints

Test	Contrast statistic (CV) and breakpoint
GH test with break in the intercept. We include constant in the data (CV 5%)	−3.31 (−5.56) Breakpoint 1966
GH contrast with break in the intercept. We include trend in the data (CV 5%)	−4.25 (−6.4) Breakpoint 1996
JMN trace test with break in 1980 and constant in the data (CV 5%)	r=0: 91.74 (87.71) r≤1: 51.09 (62.88)
JMN trace test with break in 1980 and trend in the data (CV 5%)	r=0: 78.74 (77.52) r≤1: 50.08 (53.31)
JMN trace test with break in 2007 and constant in the data (CV 5%)	r=0: 85.76 (60.49) r≤1: 50.08 (40.19) r≤2: 27.69 (23.73)
JMN trace test with break in 2007 and trend in the data (CV 5%)	r=0: 74.84 (71.99) r≤1: 40.15 (49.12)
JMN trace test with break in 1980, 2007 and constant in the data (CV 5%)	r=0: 92.49 (84.26) r≤1: 50.30 (58.30)
JMN trace test with break in 1980, 2007 and trend in the data (CV 5%)	r=0: 73.96 (69.22) r≤1: 35.39 (46.78)

JMN: Johansen, Mosconi and Nielsen, CV: Critical value

Bearing these facts in mind, we conducted individual tests for robustness and for model stability. In terms of the former, we divided the samples into two parts: 1964-1980 and 1981-2014 (discarding the corresponding division at 2007 due to a small number of series values). We also estimated the three models once again without considering the dummy variables. The results obtained are displayed in the Table 11.

In the first group there are several discrepancies before and after the break. The LogINDEMP is non-significant in both equations. In this case, the discrepancy arises in the deflator; it displays the expected sign between 1958 and 1980, yet it has the opposite sign during the period 1981-2014. The explanation lies in the fact that during the period after the recession a severe convulsion took place in the public employment sector featuring a rise in the number of hours worked (from 35 to 37.5 h/week) and a salary decrease (dropping linearly by 5% and removing one bonus payment from all workers). Consequently, the prices in the public sector were lower than in the private sector, causing the deflator's change in sign. In any case, the deflator is non-significant in the second equation, meaning this change had little or no influence on public spending.

In the second group of equations there are discrepancies in the sign of LogDEF, yet a simple observation of the graph dispels any of our doubts about what caused them. As can be observed, until 1980 (the time of the dictatorship) Spain had fiscal surplus and balance. Subsequently, as was mentioned earlier, the transition to democracy caused citizens to demand better public services, which provoked fiscal deficits.

For the third group of equations, the GDP maintains its sign and magnitude and is significant in both equations. The deflator, however, although it maintains its sign, is not significant, whereas the deficit changes sign as occurred in the second group, albeit its magnitude is much lower. This is undoubtedly due to the fact that the GDP is responsible for a large part of the variation of EXP in the model.

Based on the three equations, in particularly the third, it can be stated that the model is not stable because the strong fluctuation of certain variables between periods makes both the sign and magnitude of some variables change from period to period.

In order to investigate more in depth, two standard tests of stability analysis are utilized (Figure 5 and 6).

Table 10: Cointegration equations

Cointegration equation	LogGDP	LogDEFL	LogDEF	LogUMPLRATE	D1980	D2007	C	R²
FMOLS (1)	0.67 (54.23)	−0.97 (−6.18)	−0.30 (−1.83)	0.02 (0.26)	−0.02 (−0.37)	0.12 (2.30)	2.38 (38.75)	0.99
DOLS (1)	0.69 (34.39)	−0.88 (−3.70)	−0.63 (−2.01)	−0.04 (−0.64)	−0.08 (−1.18)	0.026 (0.37)	2.53 (14.90)	0.99
CCR (1)	0.68 (48.12)	−0.97 (−5.51)	−0.31 (1.37)	0.005 (0.09)	−0.016 (−0.24)	0.12 (1.92)	2.38 (36.65)	0.99
FMOLS (2)	0.67 (67.61)	−1.03 (−7.42)	−0.23 (1.41)	−0.01 (0.19)		0.14 (2.77)	2.40 (46.22)	0.99
DOLS (2)	0.68 (34.92)	−0.90 (−3.97)	−0.49 (−1.64)	−0.04 (−0.61)		0.05 (0.79)	2.44 (17.57)	0.99
CCR (2)	0.67 (60.88)	−1.03 (−7.17)	−0.24 (−1.27)	0.005 (0.12)		0.14 (2.77)	2.41 (46.23)	0.99
FMOLS (3)	0.67 (130.67)	−1.03 (−7.28)	−0.28 (−2.99)			0.16 (3.47)	2.42 (47.91)	0.99
DOLS (3)	0.67 (62.82)	−1.39 (−4.12)	−0.32 (−2.54)			0.13 (2.12)	2.49 (17.03)	0.99
CCR (3)	0.67 (129.40)	−1.04 (−7.05)	−0.28 (−2.93)			0.16 (3.26)	2.42 (47.27)	0.99

FMOLS: Fully modified ordinary least squares, DLOS: Dynamic ordinary least square, CCR: Canonical cointegrating regression, GDP: Gross domestic product

Table 11: Robustness analysis

Cointegration equation	LogGDP	LogINDEMPL	LogDEFL	LogDEF	LogUMPLRATE	C	R²
FMOLS (1)	0.68 (51.36)	−0.41 (−0.93)	−1.49 (−5.81)			3.71 (2.63)	0.99
FMOLS (1bis)	0.63 (17.78)	0.046 (0.15)	0.15 (0.33)			2.75 (2.13)	0.99
FMOLS (2)				2.77 (1.52)	1.06 (3.35)	6.02 (12.25)	0.99
FMOLS (2bis)				−8.98 (−3.73)	3.03 (8.15)	3.06 (4.34)	0.99
FMOLS (3)	0.64 (29.90)		−1.45 (−7.83)	0.27 (1.83)		2.69 (16.15)	0.99
FMOLS (3 bis)	0.67 (33.60)		−0.27 (−1.38)	−0.41 (2.82)		2. 42 (10.17)	0.99

FMOLS: Fully modified ordinary least squares, DLOS: Dynamic ordinary least square, CCR: Canonical cointegrating regression, GDP: Gross domestic product

Figure 5: Stability analysis using recursive coefficient estimates (a) Model 1, (b) Model 2, (c) Model 3
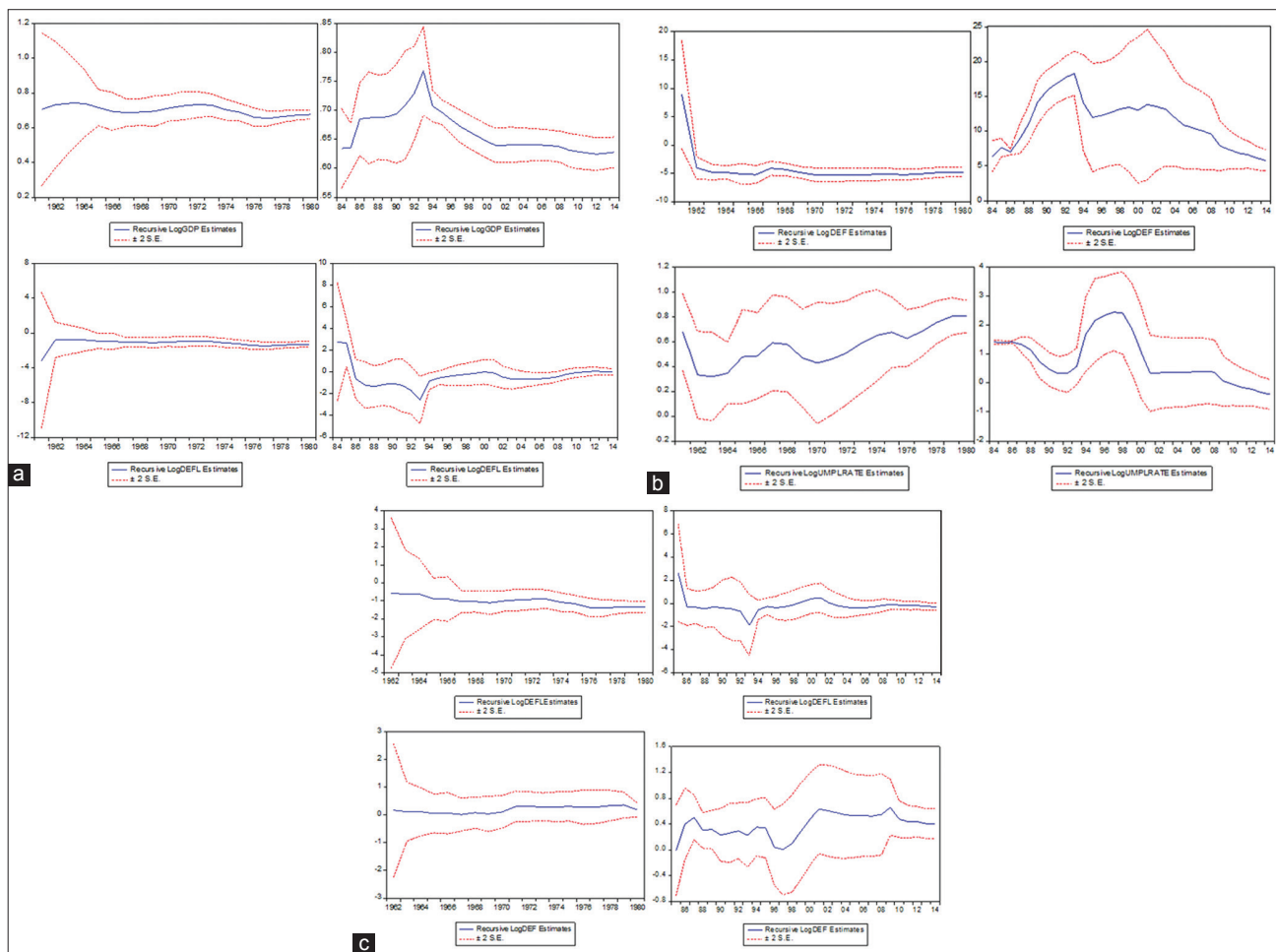

The first, recursive coefficient estimates, enables us to trace the evolution of estimates for any coefficient as more and more of the sample data are used in the estimation. The view will provide a plot of selected coefficients in the equation for all feasible recursive estimations. Also shown are the two standard error bands around the estimated coefficients.

The second, the cumulative sums (CUSUM) of squares test is based on the CUSUM of square recursive residuals. We obtain a plot of $S_t = (\sum_{r=k+1}^{t} w_r^2)/(\sum_{r=k+1}^{T} w_r^2)$ against t and the pair of 5% critical lines where w_r is the recursive residual. Movements outside the critical lines are suggestive of parameter variance instability.

The following graphs display the recursive coefficients of the various models, as well as the CUSUM Q test. The patterns in the three models are analogous. In the first sub-sample, 1958-1980, the recursive estimators of the coefficients prove rather stable. However, the period 1981-2014 is highly unstable with peaks in the 1990s, although the estimators subsequently maintain a rising or descending slope without major changes. In the case of Model 1, the coefficients remain almost constant in the 1958-1980 sample, while marked variations are present in the 1981-2014 sample, which is a new indication of instability in the model. In terms of Model 2, the unemployment rate coefficient is highly unstable, with drastic changes coinciding with expansions (1980s, 1990s, and early 2000s) and contractions (the periods that followed the aforementioned years). This does not occur, however, with the deficit, which is close to zero or negative (surplus) until 1980 and then switches to deficit, at times reaching substantially high levels, as occurred in the mid-1990s. Subsequently, the deficit declines in that same decade with Spain's entry into the EU and its adoption of the golden rule

Figure 6: Cumulative sums square test
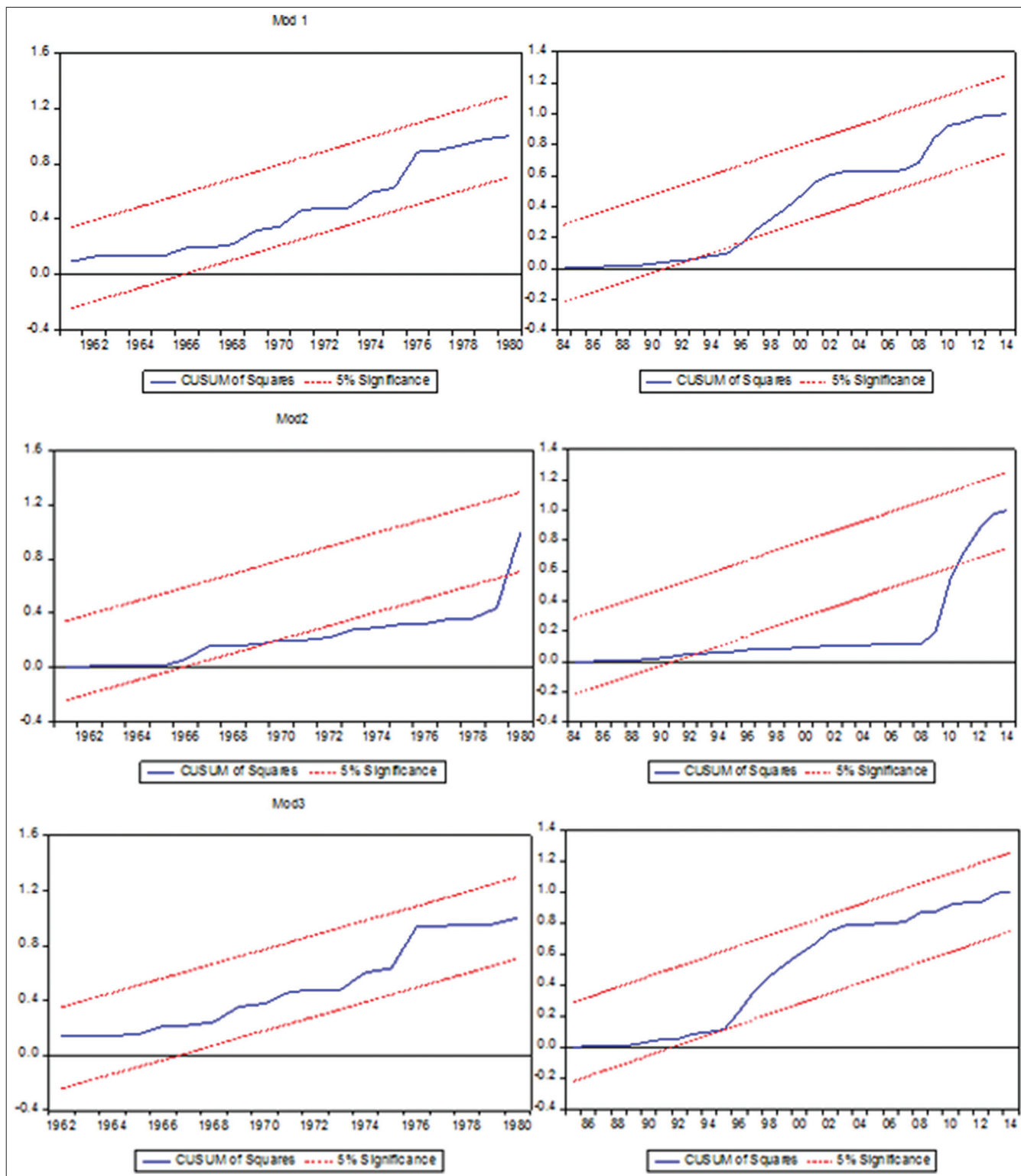
for budget policy. As for Model 3, few comments can be made considering it maintains the same patterns as the previous models.

The CUSUM Q tests indicate that Models 1 and 3 are quite stable throughout the sample. Model 2 is unstable in both subsamples, revealing signs of instability between the late-1970s and the late-1980s and the early-1990s until the mid-2000s.

The overall result tells us that the economic-structural model is quite stable and includes economic-structural and political-institutional determinants. In terms of Model 2, it may be biased due to the omission of variables. Nevertheless, a reestimation of the minimum classification error model including the variable LogOPEN as an exogenous variable rejects the significance of said variable in the short term.

The results obtained do not come as unusual if we take into account that, with regard to the existence of outliers in the economic variables, the structural relationships are restricted to a specific space and to a rather short period of time. In this way, each country has its own coefficients and there exist structural breaks rather than regularity. In keeping with this idea, each period of public finance history has its own characteristics and there are determinants for individual countries and for each period of time (Durevall and Henrekson, 2011).

7. SUMMARY AND CONCLUSIONS

This article separately studies two possible explanations of the recent evolution of public spending in Spain. The first analyses economic-structural variables whose purpose is to take into account the demand of public spending while considering only economic variables of a structural nature that reflect underlying individual preferences. The second addresses a political-institutional approximation. This institutional approximation corresponds to a political explanation in terms of political practices, groups and rules of political conduct (Borcherding, 1985; Hackl et al., 1995).

The results obtained are disappointing in the sense that neither of the two explanations prove convincing. Regarding the first explanation, one significant variable is GDP in terms of Wagner's law, although it would reject fulfillment of said law since the coefficient of the reference variable is lower than one. Another significant variable is the public spending deflator, which constitutes a confirmation of Baumol's disease for the Spanish case.

As for the second explanation, both deficit and unemployment rate influence growth of public spending. The first variable has previously been studied in relation to public spending, and it was systematically concluded that an increase in deficit provokes a rise in public spending. With respect to the second variable, an increase in unemployment causes a rise in public spending and, at the same time, a drop in fiscal revenue as the public sector must assume the costs of the resulting unemployment benefits.

In response to these results, a joint model of public spending determinants was formulated. This model rejected the significance of the unemployment rate variables in such a way that the only significant variables are GDP, deflator and deficit.

The consequences of this result in terms of economic politics are extremely considerable. On one hand, it does not appear that the aid derived from an unemployment subsidy influences growth of public spending; it must be taken into account that such benefits come from contributions previously made by workers. On the other hand, an increase in GDP results in an increase in public spending, with an elasticity near 0.7, meaning a 1% increase in GDP implies a 0.7% increase in public spending. This result has been discussed at length by numerous authors that have studied this subject. It is worth mentioning that an increase in GDP may be the result of greater productivity but also of a growth in the working population. This, in turn, affects the demand for more public investment and more benefits in the welfare state. The influence of deficit stems from the degree of shortsightedness of taxpayers with respect to the possible fiscal illusion associated with deficit itself. In addition, however, it is also the result of a situation in the economy that has required increased public spending without any possibility of raising taxes the same amount. These circumstances cause the deficit to increase, although taxpayers do not perceive that it is actually occurring. Furthermore, in Spain in 2007 and the years that followed an economic crisis took place which, at first, was sought to be alleviated by increasing public spending. An example of this was the government's Plan E in 2008, which cost 12 billion euros and created temporary jobs in public works, primarily in towns. The deflator coefficient gives an idea of the price differences in the public and private sectors and also the difference in productivity between both. This difference is logical based on the fact that the public sector is fundamentally a services sector, which various authors have demonstrated to have lower productivity than the industrial sector, but the salary increases of both are exactly the same. Finally, we do not find that openness to foreign trade is significant in the long term, unlike many other studies carried out both for Spain and other countries. The only explanation that can be found amidst this lack of influence is the fact that most Spanish foreign trade is conducted with the EU and significant changes have not been made since Spain became part of the EU. Nevertheless, it must be noted that the ratio of exports plus imports in relation to GDP increases without any spikes.

Future research will be aimed at determining how political determinants, such as government system, ideology of ruling party, and electoral cycle influence the size and growth of public spending in Spain.

8. ACKNOWLEGMENT

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