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Corruption and Fragmented Decision-Making Process in the Fiscal Sector: Is Delegation the Solution?

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Abstract: In the present study we develop a utility maximization process with budget delegation to examine the interactions between corruption, fiscal performance and political-institutional factors. Our empirical findings for Greece over the period 1984-2018 show that a fiscal reform to improve the quality of the corruption detection mechanism and of the budget institutional framework, would yield important fiscal benefits. The funding of the corruption detection services affects the expected fiscal deficit through the channel of the audits. Ideology is a central factor to determine the probability of corruption detection. A stronger government and a more stable political system with less fragmentation signal a commitment to confront with the pressure of the interest groups, thus leading to a higher effectiveness of the government's auditing mechanisms.

Keywords: Fiscal governance, Corruption, Budget institutions, Political system, Utility maximization

JEL Classification: D73, E62, H61

1. Introduction

Debt crisis in Europe has highlighted the issue of the study of the causes which led to unsustainable fiscal deficits. However, budget deficits and fiscal reforms cannot be fully explained relying on economic determinants and their economic consequences. It is rational to assume that the governments do not implement the economic policies that are optimal, due to the political cost and corruption, and thus there is a strong possibility for the emergence of unsustainable high debts.

Instead, the conventional wisdom would agree that a policymaker takes into account political considerations, like the forthcoming elections, the possibility to manipulate the debt in order to get reelected or if not possible, to use it strategically in such a way that will tie the hands of their successor. Ideology is also an important determinant of policymakers' decisions. Left wing policymakers tend to favor different fiscal policies than right wing policymakers. Interest groups, like local authorities, lobbies or even unions, also play a major role, as some of them may have a bargaining power which is higher that the share of their vote. Counter to our intuitive expectation, Alesina, Carloni and Lecce (2013) find no evidence that governments that reduce budget

deficits, even decisively, are systematically voted out of office. However, lobbies with high electoral influence may be in the position to postpone important decisions when they realize that they will carry a cost of said decisions (Alesina, Perotti and Tavares, 1998). Polarization is another political factor that can affect the fiscal decisions. The same holds with the budget institutions, as they set the framework of the available fiscal choices. In this framework, corruption is, undoubtedly, a crucial determinant of the decision-making process.

In order for our analysis to be consistent with what happens in the real world, we accept a decision-making environment where there is fragmentation, namely there are interest groups with heterogeneous preferences and conflictual interests. Thus, despite the predictions of the seminal models of Barro (1979) and Lucas-Stokey (1983) that debt is a tool to smooth consumption, empirical evidence does not confirm it, or in the best cases confirm only partially, the hypothesis of consumption smoothing.

Within this context, the present study analyzes the interactions between the fiscal performance, the political system, the institutional framework and corruption in Greece, during the period 1984-2018. Under the assumption that Greece had implemented a fiscal reform both in the budget decision making process and the corruption detection mechanism, we aim to provide an optimal probability of corruption detection mechanism that would allow the government to achieve an improved fiscal performance. For this reason, we develop a utility model with fiscal delegation that will be tested empirically over the above- mentioned period. The foregoing methodological procedure enables us to contribute to the existing literature by diversifying our analysis in that the interaction between fiscal outcomes, institutional-political environment and corruption is tested empirically using an optimization procedure. The existing literature on fiscal governance has not paid much attention on the issue of the empirical testing of the models, as the interaction between the above variables is empirically tested using predicted values based on regression analysis. Except for this, most studies examine the impact of corruption on growth, leaving a lot of space for research, when it comes to the interaction between corruption and fiscal outcomes. Our results have an added policy relevance given the fact we examine an overindebted country like Greece. Even before the global financial crisis of 2009, the economy of the country was characterized by large fiscal deficits, huge debt, corruption and a continued erosion of competitiveness. Thus, our findings may contribute to the design and formulation of the proper budget institutions and corruption detection mechanisms to enhance fiscal consolidation to other countries sharing similar characteristics.

The rest of the paper is organized as follows. Section 2 presents a brief review on the literature of political explanations for budget deficits and corruption. Section 3 presents some stylized facts. In Section 4 we develop a utility model with fiscal delegation to extract an optimal probability of

corruption detection to achieve an improved fiscal performance. Finally, section 5 concludes laying out policy implications.

2. Review of the literature

Corruption and fragmentation are the two notions that summarize in high degree the non-economic determinants of fiscal outcomes. Corruption, according to Jain (2001), is an act in which the power of public officer is used for personal gain in a manner that contravenes the rules of the game. According to this definition, black market operations and money laundering do not constitute corruption, if no public officials are involved by using powers delegated to them by the public to serve their own interests at the expense of the common good. Tanzi (1998) accepts this definition of corruption (World Bank also defines corruption as the abuse of public power for private benefit), but he mentions that corruption also exists within private sector activities.

One of the earliest studies of illegal actions is the analysis by Becker (1968), who attempted to study criminal actions using economic instruments and the optimal detection mechanisms. He distinguished between two major tools for detecting illegal actions, namely fines and audits or equivalently, the probability of detection. According to Allingham and Sandmo (1972) the two instruments are substitutes with respect to reducing the illegal actions, since a reduction in fines (controls) can be compensated for by an increase in controls (fines). However, according to Myles (1995), the level of the fine may not be under the direct control of the tax collector, but there is a strong possibility that it may be determined by the justice relative to punishments for other crimes. In addition, he states that, if a majority of the population is taking place in tax evasion, then there will be very little public support for enforcement.

Aidt (2003) distinguishes corruption theories in four analytic approaches, based on the degree of benevolence of the government and the role of institutions: (a) Efficient corruption, which serves beneficial trade between agents, (b) Corruption with a benevolent principal, which arises when a benevolent principal delegates decision making power to a non-benevolent agent, (c) Corruption with a non-benevolent principal, which is caused because government officials introduce inefficient policies in order to extract gains from the private sector, (d) Self- reinforcing corruption, which depends on how many other individuals in the same organization or society are expected to be corrupt.

Tanzi and Davoodi (1997) find empirical evidence that higher corruption is associated with higher public investment, lower government revenues, lower expenditures on operation and maintenance and lower quality of public infrastructure. Mauro (1998) finds that corruption affects the composition of government spending, mainly by reducing public spending on education. Tanzi (1998) argues that corruption is closely related to the operation of the

government, implying that corruption cannot be faced without reforms in the public sector. Political stability is the most important channel through which corruption affects economic growth (Mo, 2001). Fredriksson and Svensson (2003) conclude that the interaction between political stability and corruption in policy making is important and thus we should pay more attention on their joint effects, rather than their separate effects. Hillman (2004) finds that the presence of corruption makes ineffective the impact of public spending on economic development. Boerner and Hainz (2009) show that lack of economic opportunities and lack of economic freedom lower the support for anti-corruption measures. Tullock (1996) argues that is not obvious that a corrupt tax collector would produce less government revenue than a non-corrupt one. Mendez and Sepulveda (2006) make a similar conclusion finding empirical evidence that the growth maximizing level of corruption is higher than zero.

Concerning fragmentation, Perotti and Kontopoulos (2002) define it as the degree to which individual fiscal policymakers internalize the cost of one dollar of aggregate expenditure. In other words, fragmentation implies that fiscal decisions of the policymakers have a cost, which is mainly political. They distinguish fragmentation between size and procedure. The former is measured by the size of coalition and the size of cabinet. The latter concerns the way that political actors interact with each other and it is measured as the nature of budget negotiation and the expenditure limits. Political fragmentation, namely the degree of polarization among political interest groups, is also a dimension of fragmentation with critical importance.

A seminal survey contribution, which presents and organizes the existing literature of political and institutional explanations for budget deficits, is that of Alesina and Perotti (1995). In general, the literature of political models can be classified in five categories. The first category consists of models based upon opportunistic policymakers. These models represent the political business cycles school or public choice school introduced by Nordhaus (1975) and Buchanan and Wagner (1977). The main assumptions here are that politicians are opportunistic in the sense that they manipulate debt in order to get reelected and voters are assumed to make continuous mistakes due to lack of information (fiscal illusion hypothesis). The second category includes models of intergenerational redistributions where the current generations have incentives to avoid the cost of a fiscal adjustment or of a loss in the benefits of fiscal expansion. Thus they have a strong incentive to transfer the burden of debt to future generations. The third category contains models of debt as a strategic variable, where debt is used as a tool in order to tie the hands of the successor. Seminal contributions are Persson and Svensson (1989); Tabellini and Alesina (1990). Fourth, there are models of coalition government where the hypothesis of the inability of a weak government to apply unpopular fiscal adjustments is tested. Seminal contributions here are the war of attrition model of Alesina and Drazen (1991) and the common pool problem of Velasco (1999,

2000). Finally, there are models emphasizing the effects of budgetary institutions. In this category we could distinguish between rules and procedures (Eslava, 2011).

The actions of all agents, political parties or interest groups take place under a specific institutional framework, which imposes certain restrictions to agents. As a result, the level of corruption and other political variables can affect and can be affected by the fiscal (budget) institutions. Eslava (2011) considers two types of budgetary institutions, namely numerical targets and procedural rules. The role of budgetary institutions is to limit inefficient spending of public funds.

Von Hagen (1992), finds empirical evidence that the strategy of giving the Finance Minister or the Prime Minister a dominant role in budget process leads to lower deficits. Hallerberg and Von Hagen (1999) show that the countries with political instability can reduce the deficit bias provided that they develop the proper institutional framework. Alesina, Ardagna and Trebbi (2006) empirically confirm that institutional constraints, like veto power, have a negative impact on the probability of fiscal adjustment. Krogstrup and Wyplosz (2010) develop a model which predicts that a national institutional framework is needed, complementary to the supranational one. Lavigne (2011) finds evidence that budgetary must be flexible, especially in cases of reforms. De Haan, Pin and Mierau (2013) find that budgetary institutions can contribute largely to reduce deficits, even under the condition of a high political fragmentation in the coalition in office.

3. Some stylized facts

Before presenting the methodology and results, an overview of the evolution of the basic fiscal tools for detecting corruption in Greece is presented. In the country, the government budget contains three major categories of fine revenues: (a) fines on direct taxes, (b) fines on indirect taxes and (c) fines from non-tax revenues. Figure 1 depicts the evolution of the fines received as a percentage of general government revenues, during the period 1984-2018.

According to figure 1, we observe that the fines received as a percentage of general government revenues, during the period 1984-2018, are very low, thus having a maximum value of 1.2% in 2006 and a minimum value of 0.7% in 2009. The average of the period is
0.94%. We observe that the fine as a fiscal tool to detect corruption does not bring significant cash revenue to the government. Its contribution lies in that it works as a deterrent mechanism to possible actions of corruption. Consequently, fine as a fiscal tool against corruption brings indirect cash revenues, as the fear of a fine creates disincentives for possible illegal actions. However, in order for a fine to work as a deterrent mechanism, the probability of detection must be significant. Otherwise, the actors will not perceive the threat of punishment as possible, thus accepting the risk to pursue
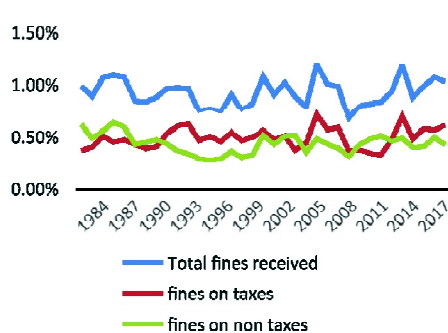
Figure 1: Fines received (total, tax, non-tax) as percentage of general government revenues
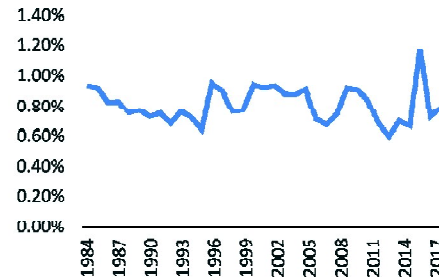
Figure 2: Ministry of Finance expenditures as percentage of the general government expenditures

overweighing possible losses from the fines, with gains that accrue from additional revenues from illegal actions. Consequently, a low probability of detection may also interpret the low level of fines received in Greece.

As the audits are closely related to the probability of detection, it is straightforward to refer to the probability of detection as synonym to the notion of audits. The Ministry of Finance is responsible for managing the tax collecting mechanism and the public expenditure mechanism. The detection of corruption, bribery and other similar illegal actions is designed and promoted by this ministry. If the Ministry of Finance is funded by the government budget with the appropriate amounts of funds, then it will afford the staff and equipment needed in order to support the audit services and thus, it will be improved the ability of the government to detect illegal actions. Figure 2 depicts the evolution of the Ministry of Finance expenditures as share of the general government expenditures, during the period 1984-2018.

After 2009, when the rapid fiscal adjustment starts, the financing of the ministry, in absolute terms, has been reduced from 1.138 million euro in 2009 to 0.681 million euro in 2018, thus representing a decline of 67.1%. During the period 1984-2018 the general government expenditures have increased by 96.9%, while the financing of the ministry has increased only by 66.9% (from 408 mil. in 1984 to 681 mil. in 2018). These evidences reveal that the Greek authorities were, gradually, weighting less the importance of financing the ministry. In addition, during the adjustment period, 2009-2018, the financing has been reduced by 67.1%, while at the same period the general government expenditures have been reduced only by 30.7%. These evidences run counter to the intuitive expectation that during the period of a rapid fiscal adjustment the Greek governments should have increased the financing of the auditing and tax collecting services. Consequently, they provide an explanation for the postponement of important fiscal reforms to restore fiscal consolidation.

4. The Model: Results and Discussion

In this section we consider the determination of the optimal value of the probability of corruption detection within a utility maximization context, where collective decisions on behalf of the government are short-sighted and the result of conflictual, thus, contradictive, interests. This implies that we assume a fragmented decision-making process. Consequently, we incorporate in our model the effects of the political and institutional environment of the country. We procced by examining the empirical validity of our model, under the assumption of a fiscal framework with budget delegation, or, equivalently, a strong finance minister. Then, we extract the possible fiscal gains from the implementation of the optimal rule for the probability of corruption detection.

In the analysis yearly data for Greece over the period 1984-2018 are employed. Data on corruption (δ), political stability (*STAB*), socioeconomic condition (*SOCIO*) and bureaucratic quality (*BUREAU*) have been obtained from the International Country Risk Guide (ICRG). Data on shadow economy (*SHADOW*) are from Elgin and Oztunali (2012) and Schneider (2019), data on fines (*F*) and data on Ministry of Finance expenditures (*Gec*) are from the annual reports of Ministry of Finance of Greece. Data on GDP, fiscal revenues (*T*) and fiscal expenditures (*G*) are from Macro-economic database AMECO.

4.1. The General Framework

We assume a government that applies a reform in the fiscal sector aiming at capturing a part of the illegal actions both in the fiscal revenues and fiscal expenditures sector. Thus, the expected fiscal result of the government, namely fiscal expenditures minus fiscal revenues, B^e, consists of two terms (eq. 1). The first term, B_0, denotes the fiscal deficit (surplus) when the fiscal reform towards the direction of reducing corruption has not been implemented. The second term, B_A, denotes the fiscal deficit (surplus) when the fiscal reform has been implemented. B_A consists of two terms. The first term denotes the fiscal expenditures reduced by the expenditures saved due to the fiscal reform against corruption, while the second term denotes the fiscal revenues increased by the extra revenues due to the reform. Consequently, the expected fiscal result of the government will be as follows:

$$B^e = [1 - \pi]B_0 + \pi\, B_A \tag{1}$$

Where, $$[1 - \pi]B_0 = [1 - \pi](G - T) , \tag{2}$$

Equation 2 represents a condition before the implementation of the reform against corruption. G, T denote fiscal spending and fiscal revenues.

The term $$\pi\, B_A = \pi\, \{[1 - (1 - a)\delta]G - [1 + a\delta(F+ 1)]T\} \tag{3}$$

denotes a condition where the fiscal reform is implemented and succeeds in capturing corruption with possibility π. It holds that $0 \le \pi \le 1$. F denotes the penalty rate, paid by the violator, who is arrested in taking part in an illegal

action (tax evasion, bribery) and it is measured as the ration of the fines received to the fiscal revenues of the government. *a* denotes the weight that government chooses for the mechanism of corruption detection in the fiscal revenues, while $1 - a$ denotes the corresponding weight for detecting corruption in the fiscal expenditure. It holds $0 \leq a \leq 1$.

Substituting (2), (3) into (1), we get:

$$B^e = (1 - p)(G - T) + \pi \{[1 - (1 - \alpha)\delta]G - [1 + a\delta (F + 1)]T\} \tag{4}$$

Equivalently, we get:

$$B^e = G - T + \pi (1 - \alpha)\delta G - \pi\, ad\, (F + 1)T \tag{5}$$

$$B^e = [1 - \pi (1 - a)\delta]G - [1 + \pi\alpha\delta (F + 1)]T \tag{6}$$

The interpretation of the equations (4)-(6) is that the expected deficit (surplus) of the general government will be the observed deficit (surplus) without the fiscal reform for the detection of corruption, reduced by the expenditures saved due to the fiscal reform for corruption detection and increases by the extra revenues received due to the fiscal reform. The expenditures that the government could potentially save from the corruption detection are $G_{save} = (1 - a)\delta\, G$ while, the potential extra revenues are $T_{add} = \alpha\delta (F + 1)T$. However, G_{save}, T_{add} represent the potential extra revenues and saved expenditures, if corruption is fully detected. In fact, the government succeeds in detecting only a part of the existing corruption level. That is, the final fiscal benefit from corruption detection depends on the probability of detection, denoted by π, namely $\pi\, G_{save} = \pi (1 - a)\delta\, G$ and $\pi\, T_{add} = \pi\alpha\delta (F + 1)T$ respectively.

So far, our model incorporates twï basic fiscal tools for the detection of the illegal actions, namely fines, *F*, and audits, or, equivalently, probability of detection π. Next, we proceed by incorporating in our analysis the role of the Ministry of Finance. The latter is responsible for managing the tax collecting mechanism and the public expenditure auditing mechanism. The detection of corruption (eg. tax evasion, bribery) is designed and promoted by the Ministry of Finance. If the Ministry of Finance is funded by the government budget with the appropriate amounts of funds, then it will afford the staff and equipment needed in order to support the audit services and thus, it will be improved the ability of the government to detect illegal actions. To provide a reasonably simple expression of the crucial role of this ministry, we make the rational assumption that its expenditures express the intention and the ability of the government to detect illegal actions concerning the fiscal governance. Consequently, we analyze the expenditures of the general government in two parts, namely Ministry of Finance expenditures, G_{ec} and rest of expenditures, G_r, as follows:

$$G = G_{ec} + G_r \tag{7}$$

Substituting (7) into (6), we get:

$$B^e = [1 - \pi (1 - \alpha)\delta](G_{ec} + G_r) - [1 + \pi\alpha\delta(F + 1)]T \tag{8}$$

To examine the impact of these fiscal tools on the expected fiscal result, B^e, we take the first derivative of the expected fiscal result with respect to the fines and the detection probability, as follows:

$$\frac{dB^e}{dF} = -\pi\alpha\delta T < 0 \tag{9}$$

Repeating for the probability of detection, or of auditing, gives

$$\frac{dB^e}{d\pi} = -(1-\alpha)\delta(G_{ec} + G_r) - a\delta(F+1)T < 0 \tag{10}$$

From (9) and (10) it can be seen that an increase in the level of fines or of the probability of detection, that is of the audits, leads to a lower expected fiscal deficit, B^e. Therefore, according to our model the two fiscal instruments to detect corruption in the fiscal sector are substitutes, since a reduction in one can be compensated for by an increase in the other, as also noted by Myles (1995). Taking the derivative of (10) with respect to G_{ec} we get:

$$\frac{d^2B^e}{d\pi dG_{ec}} = \frac{dB^e}{d\pi}\frac{d\pi}{dG_{ec}} = -(1-a)\delta < 0 \tag{11}$$

Eq. (11) shows the channel through which the Ministry of Finance expenditures affect the expected fiscal deficit, namely through the audits or, equivalently, the probability of detection. The interpretation of (11) is that an increase in the Ministry of Finance expenditures leads to a decrease in the expected deficit, through the channel of an improved audit mechanism. As a result, according to our model the Ministry of Finance expenditures reinforce the auditing mechanism and, thus, they are a measure of the quality of corruption detection mechanism.

Given the importance of funding the mechanism of corruption detection, as revealed by (11), we now proceed by explaining the determinants of the funding. As it became clear until now, the fragmented decision-making process is the main factor that makes essential the introduction of political and institutional determinants in our analysis. Based on the notion of fragmentation, we make the reasonable assumption that an effective mechanism for detecting the illegal actions is not in the interest of lobbies, unions and other interest groups. As a result, the government is under the constant pressure of these groups to weaken the detection mechanism, in exchange for their political support or other benefits for the party in office. The ability of these groups to achieve their goal and weaken the detection mechanism depends on political and institutional factors. A stronger government or a government with a higher degree of political stability is more likely to be in the position to confront with the pressure of the interest groups for a weak detection mechanism.

According to Grili, Masciandaro and Tabellini (1991) there are two theoretical approaches that explain the impact of the political and institutional environment on the fiscal performance, namely the political stability hypotheses and weak government hypotheses. As stressed by Grili, Masciandaro and Tabellini (1991), the first theoretical approach introduced by Persson and Svensson (1989) and Tabellini and Alesina (1990) examines how the political system affects the fiscal decisions of governments with different ideological preferences. On the contrary, the second ideological approach, introduced by Tabellini (1986), Drazen and Grilli (1990) and Alesina and Drazen (1991), also examines the role of the disagreement between political actors, but focuses on the impact of different decision makers in the government, which results in an inability of the cabinet to change the status quo and, thus, in the postponement of unpopular, but necessary, fiscal policies. These two theoretical approaches will be used in our analysis in order to examine their impact, not on the fiscal performance of the government, but on the financing of the detection mechanism. As one of our assumptions in developing our model is that the interest groups aim at putting pressure on the government in order to underfund the detection mechanism, it is straightforward to assume that a stronger government or a government with a higher degree of political stability will be more likely in the position to confront with this pressures.

Consequently, to quantify the above two theoretical hypotheses we choose four variables that are of interest: the government stability (STAB), as a measure of the political stability approach and the socioeconomic condition of the country (SOCIO), the quality of bureaucracy (BUREAU) and the shadow economy (SHADOW), as a measure of the weak government approach. Therefore, we express this relation using a Cobb-Douglas function, as follows:

$$G_{ec} = a_1 BUREAU^{a2} \, SOCIO^{a3} \, STAB^{a4} \, SHADOW^{a5} \tag{12}$$

Differentiating (12) with respect to each political and institutional variable and rearranging,

$$\frac{dG_{ec}}{dBUREAU} = \frac{a_2}{BUREAU} a_1 BUREAU^{a_2} SOCIO^{a_3} STAB^{a_4} SHADOW^{a_5} \tag{13}$$

$$\frac{dG_{ec}}{dSOCIO} = \frac{a_3}{SOCIO} a_1 BUREAU^{a_2} SOCIO^{a_3} STAB^{a_4} SHADOW^{a_5} \tag{14}$$

$$\frac{dG_{ec}}{dSTAB} = \frac{a_4}{STAB} a_1 BUREAU^{a_2} SOCIO^{a_3} STAB^{a_4} SHADOW^{a_5} \tag{15}$$

$$\frac{dG_{ec}}{dSHADOW} = \frac{a_5}{SHADOW} a_1 BUREAU^{a_2} SOCIO^{a_3} STAB^{a_4} SHADOW^{a_5} \tag{16}$$

In assessing the equations (13)-(16) it should be stressed that the impact of each of the political and institutional variable on the financing of the services of Finance Ministry depends on the parameters a_2, a_3, a_4, a_5, respectively. Therefore, in order to examine the impact of each of these variables, we proceed by estimating the respective parameters of equation (12). The model is estimated for the case of Greece, during the period 1984-2018, using GMM methodology. The results are presented in Table 1.

Table 1
Model estimation results using GGM method, over the period 1984-2018

Variable	estimate	Std Error	t-statistic
BUREAU	0.786***	0.136	5.802
SOCIO	0.511***	0.177	2.878
STAB	0.377**	0.181	2.079
SHADOW	-1.448***	0.217	-6.655
intercept	0.220***	0.066	3.332
2R (Adjusted)	0.6313		
S.E of Regression	0.1355		

* Denotes significance at 10% level ** Denotes significance at 5% level ***Denotes significance at 1% level

Further, it holds that:

$$G_{ec} = \hat{G}_{ec} + u \qquad (17)$$

Therefore:

$$G_{ec} = a_1 \, BUREAU^{a_2} \, SOCIO^{a_3} \, STAB^{a_4} \, SHADOW^{a_5} + u \qquad (18)$$

Substituting into (18) the estimated coefficients from the model estimation results of table 1, we get:

$$G_{ec} = 0.220 BUREAU^{0.786} \, SOCIO^{0.511} \, STAB^{0.377} \, SHADOW^{-1.448} + u \qquad (19)$$

Differentiating (19) with respect to each of the political and institutional variables, we get:

$$\frac{dG_{ec}}{dBUREAU} = \frac{0.786}{BUREAU} = 0.220 BUREAU^{0.786} \, SOCIO^{0.511} \, STAB^{0.377} \, SHADOW^{-1.448} > 0$$
$$(20)$$

$$\frac{dG_{ec}}{dSOCIO} = \frac{0.511}{SOCIO} 0.220 \, BUREAU^{0.786} SOCIO^{0.511} STAB^{0.377} SHADOW^{-1.488} > 0$$
$$(21)$$

$$\frac{dG_{ec}}{dSTAB} = \frac{0.377}{STAB} 0.220 \, BUREAU^{0.786} SOCIO^{0.511} STAB^{0.377} SHADOW^{-1.488} > 0 \quad (22)$$

$$\frac{dG_{ec}}{dSHADOW} = \frac{-1.448}{SHADOW} 0.220\, BUREAU^{0.786} SOCIO^{0.511} STAB^{0.377} SHADOW^{-1.488} > 0$$

(23)

From equations (20)-(23) we observe that the marginal impacts of bureaucratic quality, socioeconomic condition and political stability on the financing of the Ministry of Finance are, as expected, positive. According to our model, underfinancing of the detection mechanism has been interpreted as a result of the pressure that lobbies and interest groups put on the Greek governments. These groups aim at postponing any attempt to modernize the detection mechanism. From our empirical estimations, it is confirmed our assumption that the ability of interest groups and lobbies to weaken the detection mechanism depends on political and institutional factors. The sings of the effects are also according to both our theoretical and intuitive expectations. A more stable political environment, a better socioeconomic condition and a higher level of bureaucracy quality contribute to a stronger and more stable government, thus increasing its ability to confront with the pressure of the interest groups for an underfunded detection mechanism, or equivalently, an underfunded Ministry of Finance. On the other hand, a higher level of shadow economy implies a weaker government, thus allowing interest groups and lobbies to change the status quo, that is to impose their will for a weak detection mechanism. Consequently, our results confirm the impact of both the weak government approach and political stability approach on the financing of the detection mechanism.

4.2. Overcoming Fragmentation: A Utility Model with Delegation Form

In this section we use the framework described above in order to develop a utility model that incorporates the delegation form of fiscal governance, that is a strong finance minister. Delegation is a form of fiscal governance in which the governments lend authority to "fiscal entrepreneurs", whose interests generally coincide with the general interests and their function is to assure that all actors in the budget process cooperate (Hallerberg *et al.*, 2009). These "fiscal entrepreneurs" are more likely to consider and, thus internalize the full tax burden of their decisions, comparing to the other spending ministers of the cabinet. Therefore, we assume a government, in which in order to overcome the common pool problem arising from fragmented decision-making process, the agenda setting power has been delegated to the finance minister. Consequently, we consider a centralized (top-down) budget process, in which the objective purpose of the cabinet is not to maximize fiscal deficits, thus satisfying the interest groups of each minister, but to achieve a specific fiscal target. Thus, the cabinet will select spending levels that are closer to the collectively optimal for the government in office, than in the case of a limited agenda setting power finance minister. As a result, the government decision making process is expressed by the following utility function:

$$U = -\frac{1}{2}(B^e - B^*)^2 \tag{24}$$

Utility function in (24) implies that every deviation from the target level of fiscal B^*, implies utility loses. Thus, we assume that the government commits itself at the start of the fiscal year to a specific fiscal target set by the finance minister. The other members of the cabinet, namely the spending ministers, are obliged to commit themselves to the specific fiscal target, as the budget process is centralized. It is straightforward to assume that the agent setting power of the finance minister in the budget process is high.

Substituting (6) into (24) we get:

$$U = -\frac{1}{2}\left\{[1 - (1-a)\pi\delta]G - [1 + a(F+1)\pi\delta]T - B^*\right\}^2 \tag{25}$$

Where B^* denotes the fiscal target set by the finance minister, due to the delegation form of the budget process, T are the revenues of the general government, G are the expenditures of the general government, F denotes the penalty rate, paid by the violator, who is arrested in taking part in an illegal action (tax evasion, bribery) and it is measured as the ratio of the fines received to the fiscal revenues of the government. a denotes the weight that government chooses for the mechanism of corruption detection in the fiscal revenues, while $1 - a$ denotes the corresponding weight for detecting corruption in the fiscal expenditure. It holds $0 \leq a \leq 1$. π stands for probability of detection. It holds that $0 \leq p \leq 1$. Consequently, the term $[1 + a (F + 1)\pi\delta]$ T in (25) denotes the revenues of general government after the implementation of the fiscal reform, while the term $[1 - (1 - a)\pi\delta]G$ denotes the corresponding expenditures. According to our utility model, the government, through the implementation of the fiscal reform seeks to achieve a certain fiscal result and every deviation from this target results in negative utility.

In eq. (25) it also holds that:

$$G = G_r + G_{ec} \tag{26}$$

Where, G_{ec} are the expenditures of the Finance Ministry and G_r are the rest of the expenditures of general government. Substituting (26) into (25), we get:

$$U = -\frac{1}{2}\left\{[1 - (1-a)\pi\delta](G_{ec} + G_r) - [1 + a(F+1)\pi\delta]T - B^*\right\}^2 \tag{27}$$

In (27), it also holds that:

$$G_{ec} = a_1 BUREAU^{a2}\ SOCIO^{a1}\ STAB^{a4}\ SHADOW^{a5} \tag{27a}$$

The government aims at maximizing its utility, namely equation (25), by choosing the optimum level of detection probability, π. The first order condition of the maximization is the following:

$$\frac{dU}{d\pi} = -\{[1-(1-a)\pi\delta](G_{ec}+G_r) - [1+a(F+1)\pi\delta]T - B^*\}[-(1-a)\delta(G_{ec}+G_r) - a(F+1)\delta T] = 0$$

(28)

while the second order condition is:

$$\frac{d^2U}{d\pi^2} = -[(1-a)\delta G + a(F+1)\delta T[^2 < 0$$ (29)

Carrying out maximization in (27), using the first order condition in (28), provides the efficiency criteria:

$$\pi_{opt} = \frac{(G_{ec}+G_r) - T - B^*}{\delta[(1-a)(G_{ec}+G_r) + a(F+1)T+]}$$ (30)

Subsequently, we substitute (27a) into (30), thus receiving the optimal level of the probability of detection in open form:

$$\pi_{opt} = \frac{(a_1 BUREAU^{a_2} SOCIO^{a_3} STAB^{a_4} SHADOW^{a_5} + G_r) - T - B^e}{\delta[(1-a)(a_1 BUREAU^{a_2} SOCIO^{a_3} STAB^{a_4} SHADOW^{a_5} + G_r) + a(F+1)T]}$$ (31)

Using the formula of the optimal level of detection probability chosen by the government, (30), we proceed by presenting estimations of the optimal levels of detection probability, π_{opt}, over the period 1984-2018 for Greece, using alternative scenarios concerning the political orientation of the Finance Minister and the weight that the government assigns to each detection mechanism (revenues and expenditures). The period 1984-2010 was characterized mainly by large fiscal deficits and, consequently, the accumulation of a huge debt. The crisis of 2009 amplified these negative effects and accelerated the downturn of the Greek economy (Bank of Greece, 2009). However, Greece since May 2010 has implemented a bold economic reform and adjustment program in order to eliminate macroeconomic imbalances and restore a fiscally consolidated environment.

We derive the optimal level of detection probability under the assumption that Greece had implemented a fiscal reform in the corruption detection mechanism. This reform would have prevented the accumulation of a huge amount of debt, by allowing the government to achieve better fiscal results. Consequently, in our model we set the desirable fiscal target, B^*, and derive the optimal level of detection probability that would be necessary in order to achieve the fiscal target been set. In order for our estimations to be consistent with the real world, we take into account political considerations. Despite our model assumes a delegation form of budget process, that is any deviation from the fiscal target been set implies utility losses for the government, ideology (partisan hypotheses) is still an important determinant of policymaker's decisions. According to the partisan hypotheses, liberal policymakers tend to

favor different fiscal policies than conservative policymakers. In particular, the latter usually prefer a balanced or a surplus budget, while the latter tend to favor fiscal deficits in order to finance the provision of public goods like health and education.

Therefore, we opted for the following two scenarios. For the case of a conservative budget planner, we assume a target that meets the standard sufficiency conditions in a fiscally consolidated environment, namely a balanced budget. On the other hand, for the case of a liberal budget planner, we take into account the obligation of a country to meet the "Maastricht" criterion to have limited general government budget deficits, namely we allow for a 3% of GDP deficit. However, as Greece managed to achieve fiscal surpluses during the period 2016-2018 and our intention is to provide an optimal detection probability that would allow an improved fiscal performance, we set different fiscal targets for this period, compared to those we have set during the period 1984-2015. Thus, for the period 2016-2018 we set a 1% of GDP fiscal surplus target for the case of a liberal budget planner and a 2% of GDP fiscal surplus for the case of a conservative planner. We also opt for three different scenarios concerning the weight that the government assigns to each fiscal sector, namely revenues sector with weight, a and expenditure sector with weight $1-a$. Our results are presented in Table 2.

The setting of the fiscal target at the stage of the budget planning plays a major role in determining the optimal level of probability of corruption detection. Specifically, as predicted from our model, the empirical findings presented in Table 2 confirm that, under the delegation form of budget process, a conservative fiscal policy leads to a higher probability of corruption detection, thus increasing the chances for a better fiscal performance. This finding is confirmed regardless of the weights that the government assigns to the revenues and the expenditures detection mechanism. Specifically, we observe that for the period 1984-2018 the average optimal probability of detection for the case of a liberal planner is 25.55%, 26.54% and 27.58% for the corresponding weights 1/3, 1/2 and 2/3. For the case of a conservative budget planner the optimal probability of detection is 40.08%, 44.54% and 43.06% for the corresponding weights 1/3, 1/2 and 2/3.

Our results also show that despite the delegation form of budgeting, ideology remains a central factor in determining the fiscal targets that have been set at the planning stage of the budget process and, consequently, in determining the probability of corruption detection. As a result, the argument that the greater centralization of the budget process leads to greater fiscal discipline, holds only partially. The budget planner, even if he has the greater agenda setting power in the cabinet, can still set the fiscal target according to his party's ideological preferences (partisan hypotheses), thus not excluding the case of a fiscal target with deficit.

Table 2
Optimal values of detection probability

year	Liberal fiscal planner			Conservative fiscal planner		
	$\alpha=1/3$	$\alpha=1/2$	$\alpha=2/3$	$\alpha=1/3$	$\alpha=1/2$	$\alpha=2/3$
1984	27.00%	28.05%	29.13%	46.40%	48.20%	50.06%
1985	49.31%	51.88%	54.60%	70.57%	74.24%	78.15%
1986	46.64%	48.57%	50.58%	74.22%	77.29%	80.49%
1987	45.52%	47.31%	49.16%	73.86%	76.76%	79.76%
1988	43.30%	45.42%	47.66%	61.89%	64.93%	68.13%
1989	52.80%	55.83%	59.08%	71.09%	75.16%	79.54%
1990	57.89%	61.38%	65.15%	74.52%	79.02%	83.87%
1991	37.94%	39.59%	41.32%	55.27%	57.68%	60.20%
1992	41.18%	43.05%	45.02%	57.64%	60.26%	63.02%
1993	44.42%	46.53%	48.76%	60.12%	62.98%	66.00%
1994	26.22%	27.07%	27.94%	42.16%	43.52%	44.92%
1995	35.32%	36.67%	38.07%	48.67%	50.52%	52.45%
1996	27.60%	28.48%	29.37%	41.17%	42.48%	43.82%
1997	17.09%	17.49%	17.90%	31.06%	31.79%	32.53%
1998	16.66%	17.05%	17.44%	31.11%	31.84%	32.57%
1999	14.14%	14.44%	14.74%	28.01%	28.60%	29.19%
2000	5.21%	5.29%	5.36%	19.27%	19.53%	19.80%
2001	23.57%	24.03%	24.48%	52.25%	53.25%	54.26%
2002	11.81%	12.07%	12.33%	23.52%	24.04%	24.55%
2003	18.77%	19.31%	19.86%	30.43%	31.31%	32.20%
2004	22.31%	23.03%	23.78%	33.79%	34.89%	36.02%
2005	13.16%	13.46%	13.77%	25.54%	26.13%	26.72%
2006	10.21%	10.43%	10.65%	20.60%	21.05%	21.49%
2007	12.37%	12.66%	12.96%	22.37%	22.91%	23.44%
2008	22.62%	23.42%	24.25%	32.08%	33.21%	34.38%
2009	37.09%	39.07%	41.17%	46.25%	48.71%	51.33%
2010	25.15%	26.12%	27.12%	34.35%	35.68%	37.04%
2011	21.48%	22.20%	22.94%	30.34%	31.35%	32.40%
2012	16.61%	17.07%	17.53%	25.11%	25.79%	26.49%
2013	26.20%	27.19%	28.21%	33.94%	35.22%	36.55%
2014	4.60%	4.65%	4.69%	29.37%	29.67%	29.96%
2015	8.97%	9.12%	9.27%	19.26%	19.59%	19.91%
2016	9.91%	9.88%	9.85%	16.46%	16.41%	16.36%
2017	10.69%	10.65%	10.60%	19.05%	18.97%	18.89%
2018	10.55%	10.49%	10.44%	20.97%	20.86%	20.76%
Average	**25.55%**	**26.54%**	**27.58%**	**40.08%**	**41.54%**	**43.06%**

Substituting the optimal probability of corruption detection rule (eq. 30) into the equation of the expected fiscal result (eq. 6), we get, as expected, that $B^e = B^*$. The interpretation of this result is that if the government follows the optimal rule for the detection probability, shown in (30), then it will succeed in achieving the fiscal target, B^*, set in the budget planning stage. Such being the case, the fiscal benefits for the government arising from the combined implementation of the anti-corruption reform and the delegation budget process will be as in Table 3.

Table 3
Fiscal benefits from optimal p * and delegation budgeting

year	Liberal fiscal planner		Conservative fiscal planner	
(1)	*(2)*	*(3)*	*(4)*	*(5)*
1984	5.484	4.18%	9.424	7.18%
1985	9.366	6.96%	13.405	9.96%
1986	6.866	5.07%	10.925	8.07%
1987	6.373	4.82%	10.341	7.82%
1988	9.634	6.99%	13.772	9.99%
1989	12.400	8.66%	16.695	11.66%
1990	14.945	10.44%	19.240	13.44%
1991	9.692	6.57%	14.120	9.57%
1992	11.155	7.51%	15.614	10.51%
1993	12.415	8.49%	16.802	11.49%
1994	7.366	4.94%	11.842	7.94%
1995	12.100	7.94%	16.669	10.94%
1996	9.554	6.10%	14.255	9.10%
1997	6.009	3.67%	10.920	6.67%
1998	5.882	3.46%	10.984	6.46%
1999	5.364	3.06%	10.624	6.06%
2000	2.027	1.11%	7.493	4.11%
2001	4.678	2.47%	10.369	5.47%
2002	5.962	3.02%	11.876	6.02%
2003	10.075	4.83%	16.332	7.83%
2004	12.770	5.83%	19.344	8.83%
2005	7.027	3.19%	13.641	6.19%
2006	6.861	2.95%	13.848	5.95%
2007	8.916	3.71%	16.132	6.71%
2008	17.202	7.18%	24.394	10.18%
2009	27.868	12.15%	34.750	15.15%
2010	17.774	8.20%	24.280	11.20%
2011	14.342	7.28%	20.253	10.28%

year	Liberal fiscal planner		Conservative fiscal planner	
(1)	*(2)*	*(3)*	*(4)*	*(5)*
2012	10.713	5.87%	16.193	8.87%
2013	17.947	10.15%	23.249	13.15%
2014	0.992	0.56%	6.333	3.56%
2015	4.635	2.61%	9.953	5.61%
2016	2.678	1.51%	4.447	2.51%
2017	2.297	1.28%	4.093	2.28%
2018	1.852	1.01%	3.682	2.01%
Average	**9.178**	**5.25 %**	**14.180**	**8.08 %**

Notes: (a) The relationship $B^e = B^*$ that is extracted from the substitution of optimal detection probability into the equation of the expected fiscal result (6), holds irrespective of the weights that the government assigns to each sector. That is the fiscal benefits remain the same for every choice of the weight á. (b) Columns (2), (4) refer to the fiscal benefits in absolute terms (billion euros) for the case of liberal and conservative fiscal planner respectively, (c) Columns (3), (5) refer to the ratio of the fiscal benefit to GDP for the case of liberal and conservative fiscal planner respectively

For the biggest part of the fiscal consolidation period, when the key objective of the Greek governments was to achieve high primary surpluses (3.5% of GDP), the emphasis shifted to increasing the tax burden than to cutting public expenditure, with few exceptions. The macroeconomic effects of fiscal consolidation have been studied extensively (Alesina et al., 2015a, 2015b and 2017 and Guajardo et al., 2014). There is also a plethora of studies examining the causal relationship between government revenues and expenditures for Greece (Hondroyiannis and Papapetrou 1996; Athanasenas et al. 2014). A well-founded result of the macroeconomic effects of fiscal consolidation is that revenues-based consolidation tends to be more harmful for output than expenditure-based consolidations. Consistently, several studies have documented a negative relationship of positive shocks to revenues with output growth (Romer and Romer, 2010). From the inspection of Table 3, it becomes evident that if the Greek governments had implemented a reform in the fiscal sector, thus adopting the proper measures to fight corruption and introducing a budget framework with delegation, the country would have secure significant fiscal gains. Specifically, according to our optimal probability of corruption detection rule, the gains for the case of a liberal fiscal planner are on average 9.178 bil. euros, per year, implying a fiscal benefit of 5.25% of GDP, while for the case of a conservative fiscal planner the gains are on average 14.180 per year, implying a fiscal benefit of 8.08%. Therefore, if the Greek authorities had chosen, instead of a revenues-based fiscal consolidation, a fiscal reform to increase the quality of the corruption detection mechanism and of the budget institutional framework, then the harmful effects for the economy would be less and the fiscal consolidation faster.

4.3. The Impact of the Political and Institutional Environment

In this section we examine the impact of the political and institutional environment on the optimal rule of corruption detection probability. Taking the first derivative of the (31) with respect to the political and institutional factors (BUREAU, SOCIO, STAB, SHADOW), we are able to examine the impact of each variable on the probability of corruption detection. The aim of the analysis is to determine how the optimal level of detection probability is affected by changes in the political and institutional variables. The first derivatives of the optimal detection probability with respect to each of the above factors are the following:

$$\frac{d\pi^*}{dBUREAU} = \frac{\dfrac{a_2}{BUREAU}G_{ec}[T(1+aF)+(1-a)B^*]}{\delta[(1-a)G+a(F+1)T]^2} \tag{32}$$

$$\frac{d\pi_{opt}}{dSOCIO} = \frac{\dfrac{a_2}{SOCIO}G_{ec}[T(1+aF)+(1-a)B^*]}{\delta[(1-a)G+a(F+1)T]^2} \tag{33}$$

$$\frac{d\pi_{opt}}{dSTAB} = \frac{\dfrac{a_2}{STAB}G_{ec}[T(1+aF)+(1-a)B^*]}{\delta[(1-a)G+a(F+1)T]^2} \tag{34}$$

$$\frac{d\pi_{opt}}{dSHADOW} = \frac{\dfrac{a_2}{SHADOW}G_{ec}[T(1+aF)+(1-a)B^*]}{\delta[(1-a)G+a(F+1)T]^2} \tag{35}$$

In eqs. (32)-(35) it holds that $T(1+aF)+(1-a)B^* > 0$. Consequently, the sign of the impact for each political-institutional factor depends on the parameters a_2, a_3, a_4, a_5, respectively, which we have estimated as in Table 1. Substituting (19) into (30), we get:

$$\pi_{opt} = \frac{\left(\hat{a}_1\,BUREAU^{\hat{a}_2}\,SOCIO^{\hat{a}_3}\,STAB^{\hat{a}_4}\,SHADOW^{\hat{a}_5} + u + G_r\right) - T - B^*}{\delta\left[(1-a)\left(\hat{a}_1\,BUREAU^{\hat{a}_2}\,SOCIO^{\hat{a}_3}\,STAB^{\hat{a}_4}\,SHADOW^{\hat{a}_5} + u + G_r\right) + a(F+1)T\right]} \tag{36}$$

Where:

$$\hat{a}_1 = 0.220, \quad \hat{a}_2 = 0.786 \quad \hat{a}_3 = 0.511 \quad \hat{a}_4 = 0.377 \quad \hat{a}_5 = -1.448$$

Consequently, we take the first derivative of (36) with respect to the political and institutional variables *(BUREAU, SOCIO, STAB, SHADOW)*.

$$\frac{d\pi_{opt}}{dBUREAU} = \frac{\left(\hat{a}_1 BUREAU^{\hat{a}_2} SOCIO^{\hat{a}_3} STAB^{\hat{a}_4} SHADOW^{\hat{a}_5}\right)\dfrac{a_2}{BUREAU}[T(1+aF)+(1-a)B^*]}{\delta\left[a(F+1)T+(1-a)\left(\hat{a}_1 BUREAU^{\hat{a}_2} SOCIO^{\hat{a}_3} STAB^{\hat{a}_4} SHADOW^{\hat{a}_5}+u+G_r\right)\right]}$$

$$(37)$$

It also holds:

$$G_{ec} = \hat{a}_1 BUREAU^{\hat{a}_2} SOCIO^{\hat{a}_3} STAB^{\hat{a}_4} SHADOW^{\hat{a}_5} + u \qquad (38)$$

Substituting (38) and the fitted values of the parameters a_2, a_3, a_4, a_5 into (37), we get:

$$\frac{d\pi_{opt}}{dBUREAU} = \frac{G_{ec}\dfrac{0.786}{BUREAU}[T(1+aF)+(1-a)B^*]}{\delta[a(F+1)T+(1+a)G]^2} > 0 \qquad (39)$$

$$\frac{d\pi_{opt}}{dSOCIO} = \frac{G_{ec}\dfrac{0.511}{SOCIO}[T(1+aF)+(1-a)B^*]}{\delta[a(F+1)T+(1+a)G]^2} > 0 \qquad (40)$$

$$\frac{d\pi_{opt}}{dSTAB} = \frac{G_{ec}\dfrac{0.377}{STAB}[T(1+aF)+(1-a)B^*]}{\delta[a(F+1)T+(1+a)G]^2} > 0 \qquad (41)$$

$$\frac{d\pi_{opt}}{dSHADOW} = \frac{G_{ec}\dfrac{-1.448}{SHADOW}[T(1+aF)+(1-a)B^*]}{\delta[a(F+1)T+(1+a)G]^2} < 0 \qquad (42)$$

Equations (39)-(41) show that the marginal impacts of bureaucratic quality, socioeconomic condition and political stability on the optimal probability of detection are, as expected, positive. The results imply that an improvement in these factors would lead to an improvement in the probability of corruption detection. On the contrary, the marginal impact of shadow economy is, as expected, negative (eq. 42). Our results can be interpreted as follows. A more stable political environment signals a commitment of the political system to transparency and discourages possible illegal actions. It also signals less political fragmentation and less political polarization, factors that also add to transparency and increase detection probability. As expected, the same occurs when it comes to the socioeconomic condition, for similar reasons. A higher level of bureaucracy quality contributes to the effectiveness of the audit

services, of the expenditure officers and of the tax collectors, thus increasing the probability of corruption detection. On the contrary, shadow economy, as expected, worsens the detection probability. As before, our results confirm the impact of both the weak government approach and political stability approach on the optimal rule of corruption detection probability.

5.   Conclusions and policy implications

In the present study we analyze the interactions between the corruption, the fiscal performance and the political-institutional framework in Greece, during the period 1984-2018. The innovation of our study is that the interaction between the above variables is tested empirically using an optimization procedure. A main finding of our study is that if the Greek authorities had chosen, instead of a revenues-based fiscal consolidation, a fiscal reform to increase the quality of the corruption detection mechanism and of the budget institutional framework, then the fiscal benefits would be high, thus reducing possible harmful effects for the economy due to the consolidation. Under the delegation form of budget process, a conservative fiscal policy leads to a higher probability of corruption detection, regardless of the weights that the government assigns to the revenues and the expenditures detection mechanism. The higher the weight the government assigns to the revenue's detection mechanism, the higher the probability of corruption detection. However, the difference in relation to the weights assigned remains small. The relative fiscal benefits are higher for the case of a conservative budget planner, than of a liberal.

Despite the delegation form of budgeting, ideology remains a central factor in determining the fiscal targets that have been set at the planning stage of the budget process and, consequently, the probability of corruption detection. As a result, the argument that the greater centralization of the budget process leads to greater fiscal discipline, holds only partially.

A more stable political environment, a better socioeconomic condition and a higher level of bureaucracy quality contribute to a stronger and more stable government, thus increasing its ability to confront with the pressure of the interest groups for an underfunded detection mechanism. On the other hand, a higher level of shadow economy implies a weaker government, thus allowing interest groups and lobbies to change the status quo, that is to impose their will for a weak detection mechanism. We also find that the general political framework, namely political stability and the strength of the government (weak government hypotheses), determine the evolution of the optimal detection probability. Specifically, our estimation results show that a more stable political environment signals a commitment to transparency and discourages possible illegal actions, thus increasing the optimal probability of detection. As expected, the same occurs when it comes to the socioeconomic condition, for similar reasons. A higher level of bureaucracy quality contributes

to the effectiveness of the audit services, the expenditure officers and the tax collectors, thus increasing the probability of corruption detection. On the contrary, shadow economy, as expected, worsens the optimal probability of detection.

The result presented in our paper have strong policy implications for the fiscal authorities. First, reducing corruption yields significant fiscal benefits for the government, regardless of the political orientation of the budget planner in office. Consequently, the government should apply the proper reform to reduce corruption in order to sustain or achieve a consolidated fiscal performance. Second, the funding of the services of finance ministry is of vital importance for the detection of corruption. The channel through which its expenditures affect the expected fiscal deficit are the audits. Third, as the fiscal target plays a major role in determining the optimal level of detection probability, the planning stage of the budgeting process significantly affects the probability of corruption detection. A fiscal target that allows a high level of deficit is a clear message to the interest groups and the fiscal audit services for a low commitment to transparency and to fiscal discipline, thus generating incentives for lower performance on behalf of the detection mechanisms, which results in lower detection probability. Forth, as, despite delegation, ideology affects the fiscal target set by the budget planner and, consequently, the level or detection probability, there is the need for deficit ceilings coming from supranational and national arrangements, to restrict political bias. Fifth, a stronger government and a more stable political environment with less polarization signal a commitment of the political system to transparency and discourages possible illegal actions.

Overall, our analysis has established a more solid understanding of the linkages between corruption, fiscal performance and political-institutional factors and has contributed towards a profounder understanding of the need for accountability and transparency, as solutions to internalizing the common pool externalities and, thus, reduce corruption.

Acknowledgements

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