Quantifying the Impact of Political Frictions on Public Policy

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Abstract

We study the role of political frictions in fiscal policy outcomes. We propose a simple model of fiscal policy that combines a lack of commitment by the government, political turnover, and another political friction which can be interpreted either as political polarization or as public rent-seeking. We show that political turnover increases public debt levels, while political polarization or public rent-seeking lead to higher public spending. We evaluate the importance of different political frictions for fiscal policy outcomes using a sample of twenty developed countries. We find that the presence of political turnover is crucial for accounting for the variation in public debt levels and that public corruption measures outperform the political polarization measures in explaining the variation in fiscal variables.

Keywords: fiscal policy; political turnover; political polarization; public rent-seeking.
JEL Classification Numbers: E62; H11; K42; P26.

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1 Introduction

The political nature of public decision-making imply that fiscal policy is not necessarily set by benevolent government, and thus might not be efficient. Even in Western Europe and North America, considered to be the most developed regions in the world, many countries suffer from imperfections in political institutions. A number of theoretical studies have shown that political frictions are the main cause of public debt, high distortionary taxes, and government overspending, lead to lower levels of output and investment and impair the long run welfare in the economy (see, for example, Alesina and Tabellini, 1990; Battaglini and Coate, 2008; Yared, 2010; Azzimonti, 2011). The main political frictions analyzed by the theoretical studies are the lack of commitment by the government to the long-term fiscal plan and political uncertainty or political turnover. The evidence suggests that both of these frictions are present to some extent in the modern economies. Indeed, the government budget plan is updated on annual basis and the composition of the government changes over time. The lack of government commitment induces the party in power to re-optimize on its fiscal policy every time period and leads to distortionary taxation of inelastic assets (i.e., interest rate on public debt or tax on physical capital). Uncertainty about the prospects of reelection reduces the effective discount factor of the government, making the party in power short-sighted relative to the households and leading to overborrowing and overspending by the public sector. The main potential causes of political turnover – rent-seeking activities by the politicians and political polarization in the society – further reinforce production distortions.

The aim of this work is to summarize these political frictions in a simple model and to use the model to quantify the impact of political frictions on fiscal policy by looking at the data. We ask how much of the variation in public debt, government spending, and taxes can be explained by the measures of political stability, public rent-seeking, and political polarization in a sample of developed countries. This question is important both from economic and from the policy perspective. If the political frictions account for a significant fraction of variation in fiscal variables, it may be more efficient to reform the political system in the worst performing countries rather than to impose restrictions on spending or borrowing on their fiscal authorities, as has been done recently in the European Union. We consider developed countries which allows us to concentrate on the role of political frictions alone and at the steady state, abstracting from various other

institutional and economic frictions that characterize economies in transition.

Following the related studies, our analysis is based on the Lucas and Stokey's (1983) type economic model with a lack of commitment by the government. We consider differentiable Markov perfect equilibrium government policy, assuming that the reputational mechanisms are not operative. We discuss two political frictions: political uncertainty (to which we also refer to as political turnover) and non-alignment of government and citizen preferences. The former friction implies that the governments are short-sighted; the latter friction implies that the government does not maximize the utility of the representative households. We discuss two interpretations of this second political friction. First, there may be disagreement in the society about the composition of public good, with the party in power providing only the public good which is preferred by its electorate. In such case the political friction we refer to is political polarization (Alesina and Tabellini, 1990, Azzimonti, 2011). Second, the government can have preferences for rent-seeking and divert a part of public spending. In such case the political friction is public rent-seeking (Yared, 2010). In the considered framework, one parameter captures political uncertainty and another parameter can be interpreted as capturing either political polarization or public rent-seeking.

We find that political turnover or political polarization/public rent-seeking alone cannot explain the pattern of public debt and government spending in developed countries. Without political turnover, public debt is zero at the steady state, regardless of the magnitude of the other political friction. Without political polarization/rent-seeking, an increase in public debt due to a reduction in effective discount factor of the government caused by political uncertainty leads to an increase in private consumption and a decrease in public consumption. In the data, correlation of public debt and government spending is positive. Combining political turnover with political polarization or public rent-seeking allows to replicate public debt - public spending relationship by varying two parameters governing political frictions.

Further, we calibrate the model to the data from twenty developed countries and evaluate the contribution of the variation in political frictions to the variation in fiscal variables in these countries. For every country in the sample, we consider the economic indicators and the measures of political frictions averaged over the period 1995-2007. This time period is dictated by the data availability (the common measures of public

rent-seeking are available starting from 1995) and by the absence of significant economic fluctuations (the Great Recession followed after 2007 had a significant impact on all economic variables which has not been mitigated by the complete recovery up to day).

The data on political frictions is based on surveys and rely on perceptions. In order to avoid possible shortcomings of using any particular indicator, we use several measures of political frictions in the data as follows: the World Bank measure of political stability, the World Bank measure of public rent-seeking (the variables "Political Stability and Absence of Violence" and "Control of Corruption" from the Worldwide Governance Indicators, respectively), the Corruption Perception Index (from Transparency International), the Political Polarization measure from the Quality of Government Dataset (by Teorell et al. 2015), and the Political Polarization measures by Lindqvist and Ostling (2010). We conclude that the World Bank measures of political stability and public rent-seeking produce the best model results (the correlation coefficients between the model-generated variables and the data of around 40% for public debt and around 20% for public spending, and taxes). The political polarization measures produce negative correlation coefficients between the model-generated variables and the data and are outperformed by the public rent-seeking measures.

The paper proceeds as follows. Section 2 briefly reviews some of the related literature. Section 3 describes the fiscal policy model featuring the lack of commitment by the government, political uncertainty, and another political friction, which can be interpreted either as political polarization or as political rent-seeking. Section 4 discusses the properties of the model. Section 5 evaluates the impact of political frictions on fiscal variables in a sample of twenty developed countries. Section 6 concludes.

2 Related Literature

This paper aims at evaluating the consequences of political frictions for fiscal policy in developed economies. To that end, we formulate a dynamic political economy model which collects several key features from the models with political frictions studied in the literature. These features are: political turnover or political uncertainty, public rent-seeking or political polarization, and the lack of government commitment (thus, we consider the fiscal policy in a time-consistent setup).

Persson and Svensson (1989) and Alesina and Tabellini (1990) were among the first to show theoretically that political turnover in the presence of political polarization leads to higher public debt levels in a time-consistent setup. In their work, as well as in the works of their followers, political polarization is defined as disagreement in the society about the desired composition of public goods. Thus, political turnover is a consequence of difference in preferences of the society and not of politician misconduct. Azzimonti (2011) endogenized political turnover in a neoclassical growth model with political polarization via a voting model in which the outcome of the election is dictated by political preference shock as well as voters' expectations about the economic outcomes. She showed that both political turnover and political polarization impair investment rates and economic growth rates, at the same time leading to excess government spending. In this paper, we evaluate the role of political turnover and political polarization in public policy defined as government decisions about public debt, public spending, and income taxes.

If there is no disagreement in the society about the public policy, political turnover can be an instrument to discipline the politician for misbehavior such as rent-seeking activities or pork-barrel spending. Battaglini and Coate (2008) built a political economy model with legislature who can distribute revenues back to their districts through pork-barrel spending. Their theory predicts that public debt and taxes are higher than those in the economy without political frictions. Caballero and Yared (2010) characterize the equilibrium transition path of an economy managed by a sequence of politicians who face political risk and who care about both household welfare and private rents. They find that the rent-seeking government overborrows and under-taxes along the equilibrium path relative to a benevolent government if political risk is high relative to economic uncertainty and over-saves and over-taxes if economic volatility is sufficiently high relative to political uncertainty. Yared (2010) studies optimal taxes and debt management in a stochastic economy in the presence of rent-seeking politicians which can be removed from office for misbehavior. He finds that taxes are volatile and persistent with rent-seeking government, differently from the benevolent government case, and rise in debt is efficient in the sense that it precludes excessive rent-seeking. Acemoglu et al. (2008a, 2008b, 2011a, 2011b), similarly to Yared (2010), show that the need to provide incentives to politician in power creates political economy distortions. They demonstrate that if politicians are characterized by lower patience level than the citizens, the best subgame

perfect equilibrium is characterized by positive long-run capital taxation. In the setup we consider in this paper, we are able to evaluate the role of public rent-seeking combined with political uncertainty in determination of public debt, spending, and taxes. We find that public rent-seeking data performs better that political polarization data in accounting for variation in public variables.

Political distortions depend on another important characteristic of public policy, which accords with the presence of political turnover: the lack of commitment by the government to its fiscal plan. As a consequence of the absence of commitment, the government reoptimizes on its policy every period. The fiscal outcomes under no commitment can be different from those that would occur under the full commitment by the government even in the absence of any political frictions (see, for example, Klein et al., 2008; Debortoli and Nunes, 2013). On the other hand, as shown by Debortoli and Nunes (2010), political frictions can lead to inefficiencies even if the government is completely benevolent and commits to its fiscal plan while in power. We consider a time-consistent setup in which the government reoptimizes on its fiscal plan every period. It has been shown that the interactions between the government and the households in the case of absence of government commitment can give rise to multiple equilibria supported by trigger strategies and reputation mechanisms. The literature takes different stands on which solution method to apply and which set of equilibria to characterize. A number of studies characterize the entire set of Pareto-efficient allocations subject to incentive constraints faced by politicians. Another approach is to restrict a set of equilibria to those that are defined only by payoff-relevant states, that is, to consider Markov-perfect equilibria. We follow the second approach and consider differentiable Markov equilibrium.

A number of studies have discussed the consequences of political frictions for economic fluctuations. For example, Ales et al. (2014) demonstrate how economic and political cycles can be jointly determined and production distortions result if policymakers are non-benevolent, cannot commit to policies, and have private information about the government budget and rents. Azzimonti (2015) obtains economic fluctuations due to asymmetries in reelection probabilities across parties that compete for the office. Aguiar et al. (2009) and Aguiar and Amador (2011) show how political frictions lead to economic distortions in small open economy. In this paper, we consider the long-run consequences of political frictions. Therefore, we analyze economic outcomes in developed countries and use the

predictions of the model at the steady state.

3 Description of Economic Environment

Consider an infinite-horizon economy populated by agents of measure 1, a half of which live in region N, and a half on which live in region S of the country. Agents work in the production sector for a competitive wage and enjoy the consumption of private goods, c_t, public goods, g_t^J, and leisure, x_t. Agent preferences over public good may be region-specific (in such case, $J \in \{\text{N,S}\}$; more on this below). Every period, the agents have time endowment of 1, purchase one-period public bonds from the government, b_{t+1}, at price q_t, pay taxes on their income, τ_t, and receive income from previous period public bonds, b_t. Their budget constraint in period t is given by:

$$c_t + q_t b_{t+1} = (1 - \tau_t) w_t (1 - x_t) + b_t. \tag{1}$$

The agents maximize their life-time utility, $\sum_{t=0}^{\infty} \beta^t U(c_t, x_t, g_t^J)$, where U, the instantaneous utility function, is increasing and concave in each of its arguments, subject to their budget constraints and given government policy, and β is the discount factor. The resource constraint in this economy is given by:

$$C_t + G_t = A(1 - X_t) = y_t, \tag{2}$$

where C_t is aggregate consumption, G_t is total public spending, $1 - X_t$ denotes total labor, y_t is the total output, and A is the technology parameter.

3.1 Government Policy

There are two political parties that compete for the office. The incumbent party cannot follow a long-term fiscal plan due to the lack of commitment technology. Moreover, with probability p the incumbent party will stay in the power in the following period, and with probability $1 - p$ it will be replaced by its political opponent. Under such conditions, the party in power plays a game against the opposition taking their policy as given. To characterize government policy, we adopt the notion of Markov-perfect equilibrium, where policy functions depend only on fundamentals.

Every period, the party in power decides on the issues of public bonds and the levels of taxes to finance public spending and to repay previous period public debt (previous debt

obligations are always honored because default is very costly) to maximize its objective. The incumbent makes decisions about its policy taking into account anticipated next period policies of itself, if re-elected, or its opponent, if not re-elected. We assume that p is exogenous. Azzimonti (2011) provides microfoundations for the determinants of p; in her work, under particular assumptions, endogenously determined p is independent of economic state variables in equilibrium.

Consider the following instantaneous utility function of the incumbent party:

$$u(c_t, x_t) + \gamma v(g_t^J), \tag{3}$$

where u and v are increasing and concave in their arguments, $\gamma \in [0, 1]$ and $v(0) = \bar{v}$. We refer to two interpretations of this utility function.

First, following Azzimonti (2011, 2015), we can assume that g_t^J is indexed by region, J$\in${N,S}, and (3) coincides with the instantaneous utility function of the agents from region J, $U(c_t, x_t, g_t^J) = u(c_t, x_t) + \gamma v(g_t^J)$. In this case, there is disagreement in the population over the desired composition of public expenditures and the party in power provides only its region-specific public good. The parameter γ defines the importance of public good in overall utility of the agent and measures the *degree of polarization* in the country (the higher γ, the more important the utility derived from the public good relative to the utility from the private consumption and leisure and, because agents enjoy utility only from their region-specific public good, the higher political polarization in the country). Under such interpretation, political turnover is a natural consequence of preference heterogeneity in the society.

Second, we can assume that the first term in (3) coincides with the instantaneous utility of the households while the second term represents utility derived from the private rent of politicians in power, so that $U(c_t, x_t, g_t^J) = u(c_t, x_t)$. The parameter γ measures the degree of *public rent-seeking* (the higher γ, the more weight is put by the politicians in power on rent-seeking activities relative to the maximization of welfare of the electorate). In this case, the public policy of both parties is the same and the political turnover is defined by political preferences unrelated to economic outcomes (for example, moral, ethnic, or religious).

Under both interpretations, the party out of power enjoys instantaneous utility $u(c_t, x_t)+\bar{v}$. Given that the agent utility function (3) is either separable in public consumption (under first interpretation), or independent of public consumption (under second inter-

pretation), and given that both regions are taxed at the same rate, agent decisions about private consumption, labor supply, and purchases of public bonds are independent of their region of residence. Therefore, $C_t = 1/2c_t + 1/2c_t = c_t$, $X_t = x_t$, $G_t = g_t^J$. The agents consumption, work, and saving decisions are determined by (1) and the following two optimality conditions:

$$u_x(c_t, x_t)/u_c(c_t, x_t) = (1 - \tau_t)w_t, \tag{4}$$

$$q_t u_c(c_t, x_t) = \beta u_c(c_{t+1}, x_{t+1}). \tag{5}$$

We use primal approach and express the problem of the government in terms of choosing household allocations and savings that implement optimal fiscal policy. In particular, we combine (1), (4), and (5) into one implementability constraint by substituting away taxes and prices. We can express public spending from the resource constraint as follows:

$$G(c_t, x_t) = A(1 - x_t) - c_t, \tag{6}$$

The government maximizes its value function subject to the optimality conditions of the households (4), (5), and the resource constraint (6), given anticipated future policies. It announces its policy, $\pi_t = \{c_t,\ x_t,\ b_{t+1}\}$, at the beginning of each period, after being elected or reelected and after observing the level of inherited debt, b_t. Given the sequence of events and the separability between the economic and political dimensions, the only payoff-relevant state variable for the government is the level of inherited debt. Denote anticipated future policy as $\Pi(b_{t+1}) = \{\mathbf{C}(b_{t+1}), \mathbf{X}(b_{t+1}), \mathbf{B}(b_{t+1})\}$.

The problem of the party in power takes the form:

$$\max_{c,x,b'} \ u(c, x) + \gamma v(G(c, x)) + p\beta V(b') + (1 - p)\beta W(b'), \tag{7}$$

$$s.t. \quad :$$

$$u_c c + \beta u_c' b' - u_x(1 - x) - u_c b = 0, \tag{8}$$

where prime denotes next period, $V(b')$ is the value function of the party in power, and $W(b')$ is the value function of the party out of power.

Government policy in equilibrium is defined as follows.

A Markov-perfect equilibrium is a set of policy functions $\{\mathbf{C}(b), \mathbf{X}(b), \mathbf{B}(b)\}$ *and value functions* $V(b)$ *and* $W(b)$, *such that the policy functions solve:*

$\{\mathbf{C}(b),\ \mathbf{X}(b),\ \mathbf{B}(b)\} = \arg\max_{c,x,b'}\ u(c,x) + \gamma v(G(c,x)) + p\beta V(b') + (1-p)\beta W(b')$ *subject to (6) and (8); and the value functions are given by (9) and (10) as follows:*

$$V(b) = u(\mathbf{C}(b), \mathbf{X}(b)) + \gamma v(G(\mathbf{C}(b), \mathbf{X}(b))) + p\beta V(\mathbf{B}(b)) + (1-p)\beta W(\mathbf{B}(b)), \quad (9)$$

$$W(b) = u(\mathbf{C}(b), \mathbf{X}(b)) + \gamma\bar{v} + (1-p)\beta V(\mathbf{B}(b)) + p\beta W(\mathbf{B}(b)). \quad (10)$$

We assume the policy functions followed by future governments are differentiable and concentrate on the symmetric policies by the parties in power.

Denote the implementability constraint (8) as $\eta(c, x, b, b')$ and let λ be the Lagrange multiplier associated with this constraint. The optimality conditions associated with the government problem consist of (6), (8), and the following equations:

$$u_c - \gamma v_g + \lambda\eta_c = 0, \quad (11)$$

$$u_x - \gamma A v_g + \lambda\eta_x = 0, \quad (12)$$

$$p\beta V_b' + (1-p)\beta W_b' + \lambda\eta_{b'} = 0, \quad (13)$$

where the last equation contains the derivatives of the value functions given by the following expressions (see derivations in the appendix):

$$V_b' = -\lambda' u_c', \quad (14)$$

$$W_b' = u_c'\mathbf{C}_b' + u_x'\mathbf{X}_b' + \beta\left[(1-p)(-\lambda'' u_c'') + p\frac{-\lambda''\eta_{b'}'' + \beta p\lambda'' u_c''}{\beta(1-p)}\right]\mathbf{B}_b'. \quad (15)$$

Equations (11) and (12) define the private-public consumption and consumption-leisure wedges caused by distortionary taxes. Equation (13) specifies the optimal choice of public debt to balance the current and next-period wedges taking into account the effects of future policy on public debt accumulation. The term $(1-p)\beta W_b'$ captures the additional cost of political polarization/public rent-seeking. It reflects the effect of current government policy on future public spending if the current incumbent is not reelected.

4 Discussion

The consensus in theoretical literature (outlined in Section 2) is that political uncertainty reduces the discount factor of the government compared to the households, leading to

positive debt and higher taxes in equilibrium while political polarization or political rent-seeking lead to overspending by the government.

In this section we analyze whether these properties hold in the version of the economy described in the previous section. The system of equations (6), (8), (11)-(15), which describes the optimal solution to the government problem, is highly non-linear and does not have analytical solution in general. First, we consider a particular example of utility function that allows closed-form solution to form an idea about the relationship among the variables in the model. Then, we discuss the properties of the model in a more general case with the help of numerical analysis.

4.1 An Example of Economy with Analytical Solution

Consider the utility function of the party in power which is linear in leisure and public spending with weights 1 and $\gamma > 1$, respectively; assume that the utility is logarithmic in consumption (3) with weight a, $0 < a < (\gamma - 1)/\gamma$, and normalize A to 1.[1]

We obtain the following characterization of this economy at the steady state (proof is in the appendix):

Lemma 1: *At the steady state of the economy characterized by* $u(c_t, x_t) = a \ln c_t + x_t$ *and* $\gamma v(g_t) = \gamma g_t$, *with* $\gamma > 1$, $0 < a < (\gamma - 1)/\gamma$, *private consumption and leisure are increasing in public debt, public consumption is decreasing in public debt, public debt is zero if there is no political turnover* ($p = 1$) *and positive if there is political turnover* ($p < 1$); *higher weight on public consumption,* γ, *leads to higher public spending, lower public debt and private consumption, and higher taxes.*

Numerical analysis suggests that the properties of the variables in the particular example considered in this subsection also hold for more general utility functions, as discussed below.

4.2 A More General Case

We refer to numerical analysis to characterize the impact of political frictions on fiscal policy and on economic outcomes for more general utility functions. Description of the

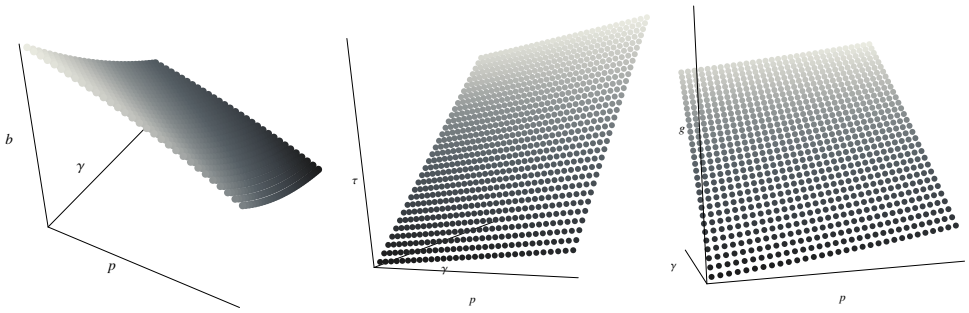
[1] This example has been considered by Debortoli and Nunes (2013) in the economy without political turnover.

numerical algorithm is provided in the appendix. We consider the following utility of the party in power:

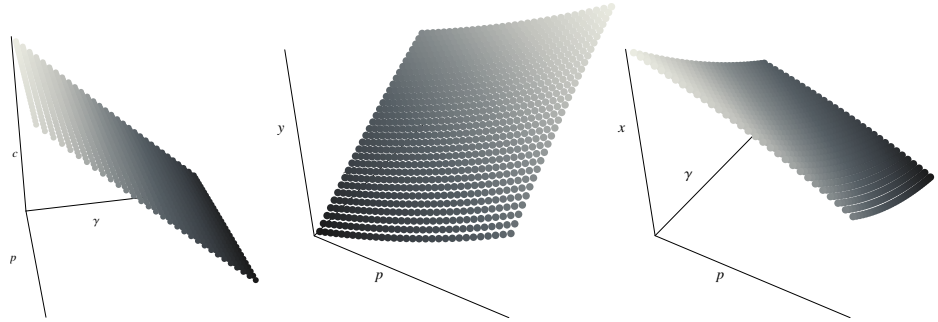
$$U = \frac{(c^a x^{1-a})^{1-\sigma}}{1-\sigma} + \gamma \frac{g^{1-\nu}}{1-\nu}. \tag{16}$$

Figure 1 shows the steady state public debt, government spending, taxes, and private consumption as functions of political turnover (p) and political polarization or public rent-seeking (ρ). We use the following parameters to construct the plots: $\beta = 0.98$, $a = 0.3$, $\sigma = 1$, $\nu = 1$, $A = 1$ (changing any of the parameter values within the reasonable range does not change the qualitative behavior of variables depicted on Figure 1).

Figure 1: The variables as functions of p and γ.



(a) public debt (b) taxes (c) gov. spending



(d) consumption (e) output (f) leisure

The impact of political instability, p: Similar to the conclusions of the related studies, we obtain that public debt increases with political instability. In uncertain prospects of reelection, the party in power is short-sighted relative to its electorate and therefore is a net borrower in equilibrium. If there is no political uncertainty, public debt is zero at the (stable) steady state. Private consumption is an increasing function of public debt, so it also increases with political turnover. This is because the households

can enjoy higher consumption from interest income on their savings in the form of public bonds. Similar to private consumption, leisure is an increasing function of public debt, thus, it increases with political turnover. Thus, the total output is lower when political instability is higher. On the other hand, public consumption is a decreasing function of public debt as the total resources available for public spending are lower under higher political instability. The tax rate set by the government is proportional to the marginal utility of private consumption (from the optimality conditions of the household problem). Therefore, the income tax (and, in this economy, the tax revenues as a share of GDP) decreases with political instability. Under higher political uncertainty, the government prefers to finance spending by issuing debt rather than by increasing taxes.

The impact of political polarization and/or political rent-seeking, ρ: Similar to the conclusions of the related studies, we obtain that public spending increases with political polarization (or rent-seeking). This is a straight-forward consequence of polarization/rent-seeking being modelled as a value of marginal utility from government spending. Higher public spending is financed through income taxes which also increase with polarization.

At the same time, given the level of political uncertainty, higher polarization or preference for rent-seeking activities reduce equilibrium public debt level. This is a feature of the model economy: government consumption crowds out savings by the households in equilibrium, leading to lower levels of public debt and private consumption. The labor supply increases (it is a decreasing function of public debt) and therefore the total output also increases with the degree of polarization (rent-seeking).

At a first glance, the predictions of the model regarding the role of political polarization (or political rent-seeking) seem controversial. Except for reducing private consumption, this political friction leads to higher output and lower public debt, and both are usually considered as an improvement of economic conditions. However, political polarization or political rent-seeking are usually among the main causes of political turnover. If there is no disagreement in the society about the composition of public goods and if the government in power is completely benevolent, there would be no reason to throw the politicians out of power. It is therefore the interplay between political polarization and political turnover what defines the final impact of these political frictions on fiscal variables and economic outcomes.

In the next section, we compare the data on political frictions and economic indicators in a sample of twenty developed countries, and use the model to characterize the joint influence of political (in)stability and political polarization/rent-seeking on fiscal variables in the considered sample.

5 Reconciling Theory and Data

The aim of this section is to evaluate the contribution of political frictions to variation in fiscal variables in developed economies. First, we discuss the properties of the data on political and economic variables in a sample of twenty developed countries (the sample size is dictated by the availability of all necessary data). Second, we project the data on political frictions into the model to calculate the fiscal and economic variables in the model and compare the results with characteristics of the data.

We use the following economic indicators (the data is from the World Bank): general government debt (b_g/y), central government debt (b_c/y), government consumption (g/y), and private consumption (c/y) shares of GDP; real GDP (y); and taxes on income and profits (τ). We consider both general government debt and central government debt to check the robustness of the results. All data is averaged over the time period 1995-2007. This time period is dictated by the data availability (the common measures of public rent-seeking are available starting from 1995) and by the absence of significant economic fluctuations during that period. The levels of real GDP in every country in the sample are normalized by the average level of real GDP across all the countries in the sample.

To reduce the consequences of data limitations, we consider several indicators of political frictions. We use the inverse of the Worldwide Governance Indicators variable "Control of Corruption" and the inverse of the Transparency International Corruption Perception Index as measures of public rent-seeking (we denote these variables as γ_{c1} and γ_{c2}, respectively). We use "dpi_polariz" variable from the Quality of Government Dataset (Teorell et al. 2015), and the average of variables "SD_EQUALITY" and "SD_PRIVATE" from Lindqvist and Ostling (2010) to measure political polarization (we denote these variables as γ_{p1} and γ_{p2}, respectively). Finally, we use the Worldwide Governance Indicators variable "Political Stability and Absence of Violence" as a measure of political stability (we denote it as p). All the variables are listed in Table 1.

Table 1: The Data.

Country	p	γ_{c1}	γ_{c2}	γ_{p1}	γ_{p2}	y	b_g/y	b_c/y	g/y	τ	c/y
Australia	1.023	0.517	0.115	1.385	2.425	0.804	0.403	0.239	0.175	0.236	0.578
Austria	1.106	0.491	0.127	2.000	2.335	0.928	0.699	0.647	0.191	0.282	0.543
Belgium	0.927	0.740	0.151	2.000	2.827	0.890	1.119	1.041	0.215	0.258	0.520
Canada	0.992	0.487	0.113	0.462	2.439	0.856	1.087	0.622	0.198	0.149	0.554
Denmark	1.221	0.409	0.104	2.000	2.193	1.188	0.507	0.406	0.243	0.318	0.485
Finland	1.539	0.406	0.104	1.538	2.335	0.901	0.443	0.571	0.210	0.221	0.496
France	0.567	0.738	0.145	1.231	2.599	0.853	0.715	0.639	0.226	0.174	0.549
Germany	0.973	0.523	0.127	2.000	2.494	0.870	0.626	0.412	0.187	0.107	0.569
Ireland	1.303	0.641	0.130	1.154	2.513	1.104	0.319	0.374	0.160	0.256	0.464
Italy	0.652	2.133	0.212	0.385	2.472	0.795	1.084	1.182	0.184	0.227	0.593
Japan	1.063	0.881	0.146	0.308	2.026	0.892	1.403	1.403	0.171	0.101	0.568
Luxembourg	1.411	0.518	0.118	1.000	2.537	1.861	0.066	0.043	0.154	0.251	0.388
Netherlands	1.174	0.465	0.113	2.000	1.943	1.011	0.610	0.561	0.218	0.211	0.487
Norway	1.299	0.467	0.113	2.000	2.085	1.603	0.436	0.351	0.204	0.317	0.450
Portugal	1.130	0.853	0.155	1.538	2.542	0.463	0.627	0.666	0.192	0.214	0.639
Spain	0.073	0.806	0.157	1.385	2.676	0.628	0.574	0.526	0.171	0.157	0.587
Sweden	1.319	0.445	0.108	2.000	2.073	1.004	0.640	0.535	0.251	0.258	0.463
Switzerland	1.314	0.469	0.114	0.000	2.727	1.353	0.537	0.259	0.111	0.091	0.577
The UK	0.563	0.496	0.117	0.000	2.367	0.941	0.436	0.473	0.186	0.259	0.635
The USA	0.392	0.616	0.132	0.923	2.403	1.053	0.738	0.449	0.147	0.112	0.663

Data Sources: the World Bank, Teorell et al. (2015).

Comparison of the data across countries suggest that countries characterized by higher output per capita and lower consumption per capita are also characterized by higher political stability, lower public rent-seeking and lower public debt levels (though, there is no clear relationship between output and political polarization measures). For example, Luxembourg has the highest level of GDP in the sample and one of the highest levels of political stability combined with one of the lowest levels of public rent-seeking and the lowest level of public debt in the sample. Italy has one of the lowest levels of political stability combined with one of the highest levels of political polarization and the highest

level of public rent-seeking in the sample. At the same time, Italy is characterized by one of the highest levels of public debt, relatively high public consumption and relatively low output as compared with other countries in the sample.

In Table 2 we summarize the signs of the correlation coefficients among the fiscal, economic, and political variables in the model, keeping one of the two political frictions fixed, and in the data. For the measures of political friction γ (γ_{c1}, γ_{c2}, γ_{p1}, and γ_{p2}) Table 2 reports the average correlation coefficient across different measures of γ (the correlation coefficients are similar across different measures of γ and always of the same sign).

Table 2: The sign of the correlation coefficients among political and economic variables in the model and in the data.

	p	γ	y	b/y	g/y	τ	c/y
p	1	N/A	+	-	+	+	-
γ	-0.33	1	+	-	+	+	+
y	0.47	**-0.25**	1	-	+	+	-
b/y	-0.29	**0.14**	-0.48	1	-	-	+
g/y	0.13	**-0.27**	**-0.22**	**0.13**	1	+	-
τ	0.34	**-0.20**	0.26	-0.39	0.52	1	-
c/y	-0.67	0.32	-0.67	0.39	-0.32	-0.53	1

Notation: the upper diagonal contains the signs of the correlation coefficients in the model; the lower diagonal contains the correlation coefficients in the data. For the political polarization/rent-seeking measure γ the correlation coefficients are the averages across the considered measures of political polarization/rent-seeking.

The results reported in Table 2 suggest that both in the model and in the data, government spending and taxes increase with political stability, are positively correlated among themselves and negatively correlated with private consumption; government debt and private consumption as shares of GDP decrease with political stability, are positively correlated among themselves and negatively correlated with taxes; output is positively correlated with taxes and negatively correlated with public debt and consumption shares. The signs are opposite in the model and in the data for the correlations of γ (averages across the considered measures in the data) with the GDP, taxes, and public debt and public spending as shares of GDP, and for the correlations of government spending with

GDP and public debt share of GDP. In order to evaluate the model performance in capturing the relationship among fiscal variables, we should account for the existence of relationship between p and γ, which are correlated in the data.

Therefore, we calibrate the model discussed in the previous sections to the sample of considered economies. The sample based on developed countries and the data based on the averages over a relatively long period of time justify the approximation of these economies using the *steady state* of the model.

We fix the discount factor to match the average return on government bonds in the considered economies, $\beta = 0.98$, and we choose the utility parameters to match the average public spending share of GDP across all countries in the sample: $a = 0.3$. We assume separable utility, logarithmic in all arguments: $\sigma = 1,\ \nu = 1$.[2]

The political stability variable in the model, p, is interpreted as probability that the incumbent will stay in power in the given period of time; this variable must lie in the interval [0,1]. The World Bank measure of political stability varies in the range [-2.5; 2.5]. Therefore, we need to re-scale the data on p in order to be able to use this variable in the model. We proceed as follows. We choose two countries, characterized by the highest and the lowest level of political stability (Finland and Spain, see Table 1) and compute the values of A, p and γ necessary to replicate the GDP, public debt and public consumption in these countries. Let us denote the resulting measures of political frictions for Finland and Spain as $p^m_{Finland}$, p^m_{Spain}, and $\gamma^m_{Finland}$, γ^m_{Spain}. Then, we can state the following relationship between these model-generated variables and corresponding measures from the data, $p^d_{Finland}$, p^d_{Spain}, and $\gamma^d_{Finland}$, γ^d_{Spain}:

$$p^m_{Finland} = \eta_1 + \eta_2 p^d_{Finland}, \tag{17}$$

$$p^m_{Spain} = \eta_1 + \eta_2 p^d_{Spain}. \tag{18}$$

$$\gamma^m_{Finland} = \mu_1 + \mu_2 \gamma^d_{Finland}, \tag{19}$$

$$\gamma^m_{Spain} = \mu_1 + \mu_2 \gamma^d_{Spain}. \tag{20}$$

[2]We should note that the results of calibration discussed in this section are robust to changes in the parameters β, a, σ, υ, and hold for different forms of the utility function $u(c, x)$ (e.g., the utility function separable in consumption and leisure and GHH utility function).

The coefficients η_1, η_2, μ_1 and μ_2 determined by the systems of equations (17)-(18) and (19)-(20) can be used to re-scale the political friction measures from the data into the political frictions in the model.

Finally, we calculate the values of the fiscal variables (public debt, government spending, and taxes) predicted by the model given the re-scaled measures of political frictions from the data and choosing the parameter A for each country so, that the output generated by the model is the same as output of this country in the data.

The estimation results are summarized in Table 3 which reports the correlation coefficients between the variables generated by the model and the data, for different measures of γ.

Table 3: Calibration results. Correlations between the variables generated by the model with political frictions and the data.

Corr \ γ measure	γ_{c1}	γ_{c2}	γ_{p1}	γ_{p2}
$(b_g^m/y^m, b_g^d/y^d)$	0.368	0.357	-0.133	0.423
$(b_c^m/y^m, b_c^d/y^d)$	0.494	0.460	-0.110	0.373
$(g^m/y^m, g^d/y^d)$	0.182	0.184	-0.027	-0.247
(τ^m, τ^d)	0.172	0.262	-0.223	-0.016
(y^m, y^d)	1	1	1	1

Notation: b_g/y -general government debt as a share of GDP; b_c/y - central government debt as a share of GDP; g/y - public consumption as a share of GDP; τ - taxes; y - output. (V^m, V^d) - denotes the correlation between variable V in the model and in the data.

Table 3 suggests that the World Bank measure of rent-seeking (γ_{c1}) Transparency International measure of public rent-seeking (γ_{c2}) produce very similar results (columns named "γ_{c1}" and "γ_{c2}"): the correlation coefficients between the model-generated variables and the data of around 40% for public debt and around 20% for public spending, and taxes. On the other hand, the political polarization measure from the Quality of Government Dataset (γ_{p1}) produces negative correlation coefficients between all the model-generated variables and the data. The political polarization measure from Lindqvist and Ostling, 2010 (γ_{p2}) produces the correlation coefficient of around 40% between the public debt levels generated by the model and from the data, but negative correlation coefficients for the model-generated and empirical public spending and taxes. Thus, the public

rent-seeking measures outperform the political polarization measures in explaining the variation in fiscal variables in the considered economies.

6 Conclusions

In this paper we evaluated the role of political frictions for public policy outcomes, using a parsimonious model of fiscal policy. We conclude that political turnover (or political uncertainty/instability) increases public debt levels while political polarization or public rent-seeking lead to higher public spending. When the measures of political frictions from a sample of twenty developed countries are incorporated into the model, public corruption measures outperform the political polarization measures in explaining the variation in fiscal variables.

The analysis in this paper suggests several directions for further research. One important variable through which public policy affects economic variables and which is missing from the model is capital formation. Political frictions can distort investment (Azzimonti, 2011), which in turn has consequences for private consumption and leisure. However, in many attempts to solve the economy model with both physical capital and public debt we did not succeed in finding stationary solutions to the model; related discussion on the problems of such models can be found in Ortigueira et al. (2012). Moreover, there may be other factors influencing fiscal variables in developed countries, such as, for example, the interest rate (which in the model is fixed at $1/\beta$ for all the countries), financial markets, openness to trade, or prolonged economic shocks. Extending the model to include other frictions, such as imperfect financial markets and default risk, or exogenous economic shocks, could help to clarify the importance of political frictions in comparison to other major factors affecting public policy and economic performance in developed countries. Finally, additional investigation on the determinants of political polarization, public rent-seeking, and their connection with political uncertainty could give more insights on the main political drivers of fiscal distortions.

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Appendix

Derivation of the Government Optimality Conditions

The first order conditions associated with the government problem are the following:

$$u_c - \gamma v_g + \lambda \eta_c = 0, \tag{21}$$

$$u_x - \gamma A v_g + \lambda \eta_x = 0, \tag{22}$$

$$p\beta V_b' + (1-p)\beta W_b' + \lambda \eta_{b'} = 0, \tag{23}$$

where

$$\begin{aligned} \eta_c &= u_{cc}c + u_c - u_{xc}(1-x) - u_{cc}b, \\ \eta_x &= u_{cx}c - u_{xx}(1-x) + u_{xx} - u_{cx}b, \\ \eta_{b'} &= \beta(u_{cc}' b' \mathbf{C}_b + u_{cx}' b' \mathbf{X}_b + u_c'). \end{aligned}$$

In order to find V_b, totally differentiate the value function $V(b)$ given by (9) with respect to b :

$$V_b = u_c \mathbf{C}_b + u_x \mathbf{X}_b - \gamma v_g \mathbf{C}_b(b) - \gamma A v_g \mathbf{X}_b + \beta(pV_b' + (1-p)W_b')\mathbf{B}_b.$$

Substituting (21) - (23) in the last expression and simplifying using the fact that $\eta_c \mathbf{C}_b + \eta_x \mathbf{X}_b + \eta_b + \eta_{b'} \mathbf{B}_b = 0$, obtain the following expression for V_b:

$$V_b = -\lambda u_c. \tag{24}$$

In order to find W_b, totally differentiate the value function $W(b)$, given by (10), with respect to b :

$$W_b = u_c \mathbf{C}_b + u_x \mathbf{X}_b + \beta((1-p)V_b' + pW_b')\mathbf{B}_b.$$

Using (23) and (24) to express W_b' and V_b' and substitute them into (24), obtain the following expression for W_b:

$$W_b = u_c \mathbf{C}_b + u_x \mathbf{X}_b + \beta \left[(1-p)(-\lambda' u_c') + p \frac{-\lambda' \eta_{b'}' + \beta p \lambda' u_c'}{\beta(1-p)} \right] \mathbf{B}_b. \tag{25}$$

The expressions (14) and (15) in the text are equations (24) and (25) updated one period.

Proof of Lemma 1

The optimality conditions (8), (11)-(12) with the instantaneous utility considered in the example simplify as follows:

$$a + \beta a/c'b' - 1 + x - ab/c = 0, \tag{26}$$

$$a/c - \gamma + \lambda ab/c^2 = 0, \tag{27}$$

$$1 - \gamma + \lambda = 0, \tag{28}$$

Equation (27) is quadratic in consumption and can be solved for consumption as a function of public debt. The following root features positive consumption: $\mathbf{C}(b) = a(1+(1+4(\gamma-1)b\gamma/a)^{0.5})/(2\gamma)$, from where $\mathbf{C}_b > 0$. From (26), $\mathbf{X}_b = \beta a/c^{2\prime}\mathbf{C}'_b b'\mathbf{B}'_b - \beta a/c'_b\mathbf{B}'_b + a/c - ab/c^2\mathbf{C}_b$, which, evaluated at the stable steady state is equal to $(1-\beta\mathbf{B}'_b)a/c(1-b/c\mathbf{C}_b) > 0$, because $0 < b/c\mathbf{C}_b < 1$.

Then, from the resource constraint (1), $G_b < 0$. Increasing the weight on public spending increases g, thus b, x, and c decrease. From the optimality condition of the household problem, taxes are negatively related to private consumption, so they increase when private consumption decrease.

Finally, from (12) evaluated at the steady state and given that $\mathbf{X}_b$ and $\mathbf{C}_b$ are positive for any b, $b = 0$ if $p = 1$ and $b > 0$ if $0 < p < 1$.‖

Numerical algorithm

To solve the system of equations (6), (8), (11)-(15), the unknown policy functions are approximated by the Hermite polynomials of the third order. That is,

$$\begin{aligned} \mathbf{C}(b) &= \textstyle\sum_{i=0}^{n} a_{c,i} H_i(b), \\ \mathbf{X}(b) &= \textstyle\sum_{i=0}^{n} a_{x,i} H_i(b), \\ \mathbf{B}(b) &= \textstyle\sum_{i=0}^{n} a_{b,i} H_i(b), \end{aligned} \tag{29}$$

where $n = 3$ and $H_i(b)$ denotes the Hermite polynomial of order i, and $a_{Y,i}$ denotes the coefficient of the policy function Y associated with the Hermite polynomial of order i. Given the functional forms in (29), the solution to the original system with λ substituted away, consists of finding $3*n$ unknown coefficients

$$\{a_{c,i}, a_{x,i}, a_{b,i}\}_{i=1}^{n}. \tag{30}$$

The system of equations (8), (11)-(13), with the derivatives of value functions substituted from (14)-(15), government spending defined by (6) and λ substituted away by

combining (11) and (12), contains only three equations; the additional equations can be obtained by differentiating the original system with respect to the state of the economy, b. The first and second differentials of each of the three original equations, together with the original equations, all evaluated at the steady state, can be solved for the unknown coefficients (30).

As a by-product of this numerical algorithm, the stability of the system (8), (6), (11)-(15) at the steady state can be analyzed: if the first derivative of the policy function $\mathbf{B}(b)$ has an absolute value of less than 1, corresponding steady state of the system is asymptotically stable. The results reported in the main text are associated with the stable steady state of the model.