Political frictions and public policy outcomes

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A B S T R A C T

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We study the role of political frictions in public 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 that 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 leads 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 data on political instability combined with the data on public rent-seeking explain 25% of the variation in public debt levels. *Journal of Comparative Economics* **44**(3) (2016) 484–495. Department of Economics, Middlesex University London, Business School, Hendon Campus, The Burroughs, London NW4 4BT, UK.

1. Introduction

The political nature of public decision-making implies that fiscal policy is not necessarily set by a benevolent government, and thus might not be efficient. Even in Western Europe and North America, considered the most developed regions in the world, many countries suffer from imperfections in political institutions. A number of recent studies in political economy have analyzed the impact of political frictions in the form of political turnover, political polarization, or public rent-seeking on economic outcomes. Each of these frictions has a specific influence on fiscal variables. Political turnover (uncertainty about the prospects of reelection) makes the party in power short-sighted relative to the households, leading to inefficient assets management, such as over-accumulation of public debt (Persson and Svensson, 1989; Alesina and Tabellini, 1990) or under-investment in physical capital (Azzimonti, 2011). Political polarization (disagreement in society about how the fiscal policy should be conducted) leads to over-spending by the party in power, which, in turn, crowds out private investment (Azzimonti, 2011; Azzimonti and Talbert, 2014). The presence of public rent-seeking results in higher taxes and higher public debt compared to an economy in which this friction is absent (Battaglini and Coate, 2008; Yared, 2010).

The purpose of this paper is to estimate the importance of these political frictions for fiscal policy outcomes using macroeconomic data and data on political institutions. To that end, we formulate a dynamic political economy model that combines several political frictions studied in the literature and evaluate how much of the variation in public debt, government spending, and taxes can be explained by measures of political stability, public rent-seeking, and political polarization

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in a sample of developed countries. Quantifying the impact of political distortions is important from economic and policy perspectives. If these distortions 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 instead of imposing restrictions on spending or borrowing on their fiscal authorities, as has recently occurred 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 related studies, our analysis is based on Lucas and Stokey (1983) type economic model with a lack of commitment by the government. We consider government policy in a differentiable Markov perfect equilibrium, assuming that the reputational mechanisms are not operative. We add the following political frictions: political turnover (to which we also refer to as political uncertainty or instability) 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 household. We discuss two interpretations of this second political friction. First, there may be disagreement in the society about the composition of the public good, with the party in power providing only the public good that is preferred by its electorate. In this case, the political friction we refer to is political polarization (Alesina and Tabellini, 1990; Azzimonti, 2011). Second, the government can prefer rent-seeking and divert a fraction of public spending. In this 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 the government discount factor caused by political uncertainty leads to an increase in private consumption and a decrease in public consumption. In the data, the correlation of public debt and government spending is positive. Combining political turnover with political polarization or public rent-seeking allows us to replicate the public debt - public spending relationship by varying two parameters that govern political frictions.

The interplay between these frictions in the model is as follows. The incumbent enjoys extra utility when in power (either because of rent-seeking activities or because of implementing the policies on which the opposition parties do not agree) and optimally chooses to provide insurance for itself given the uncertain prospects of reelection: The incumbent leaves higher public debt to its successor, in this way reducing the amount that the opponent, which may become the government in the next period, can spend. Thus, higher political uncertainty leads to higher public debt and lower public spending, other things being equal. At the same time, higher preferences for rent-seeking or polarization increase public spending, other things being equal. The overall consequences for public debt, public spending, and taxes depend on the prevalence of each friction in the economy.

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 in 1995) and by the absence of significant economic fluctuations (the Great Recession that followed after 2007 had a significant impact on all economic variables that has not been mitigated by the complete recovery until day).

The data on political frictions is based on surveys and relies 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," respectively, from the Worldwide Governance Indicators), the Corruption Perception Index (from the Transparency International), and the Political Polarization measures from Lindqvist and Östling (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 are around 50% for public debt and around 30% for public spending and taxes).

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

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 the differences in society preferences and not of politician misconduct. Azzimonti (2011) endogenizes political turnover in a neoclassical growth setup 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 shows that political turnover and political polarization impair investment rates and economic growth rates, at the same time leading to excess government spending. Following these authors, we model political polarization as a disagreement about the composition of public goods; differently from these authors, we also consider the role of public rent-seeking in shaping economic outcomes.

If there is no disagreement in the society about the public policy, political turnover can be an instrument for disciplining politicians for misbehavior such as rent-seeking activities or pork-barrel spending. Battaglini and Coate (2008) build a political economy model with a legislature that can distribute revenues back to their districts through pork-barrel spending. Their theory predicts that public debt and taxes are higher than those in an 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 risks and who care about household welfare and private rents. They find that a rent-seeking government over-borrows and under-taxes along the equilibrium path relative to a benevolent government if the political risk is high relative to the economic uncertainty and over-saves and over-taxes if the economic volatility is sufficiently high relative to the political uncertainty. Yared (2010) studies optimal taxes and debt management in a stochastic economy in the presence of rent-seeking politicians who can be removed from office for misbehavior. He finds that taxes are volatile and persistent with a rent-seeking government, differently from the benevolent government case, and the 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 politicians in power creates political economy distortions. They demonstrate that if politicians are less patient than citizens, the best subgame perfect equilibrium is characterized by positive long-run capital taxation. In the setup we consider in this paper, we evaluate the role of public rent-seeking combined with political uncertainty in determination of public debt, spending, and taxes. Moreover, we compare the performance of the data on public rent-seeking and the data on political polarization in accounting for variation in public variables.

The impact of political distortions on fiscal outcomes depends on another important characteristic of public policy, which agrees 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 its policy every period. The fiscal outcomes under no commitment can differ from those that would occur under the full commitment by the government even in the absence of any political frictions. For example, (Klein et al., 2008) use the model of optimal fiscal policy with a balanced budget to show that the lack of commitment leads to less public spending compared to the full commitment environment. Debortoli and Nunes (2013) find that the lack of commitment results in zero public debt at the steady state, differently from the full commitment case, in which steady-state public debt is determined by the initial conditions. In this paper, similarly to Debortoli and Nunes (2013), we study the Markov perfect equilibrium fiscal policy using a version of the Lucas and Stokey (1983) economic model. We add political turnover and political polarization or rent-seeking to the framework considered by these authors and obtain positive public debt at the steady state, with its level and the level of public spending jointly determined by the magnitude of the political frictions.

A number of studies discuss 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 a 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 the 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, w_t, 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, $J \in \{N,S\}$; 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, $\sum_{t=0}^{\infty} \beta^t U(c_t, x_t, g_t^J)$, subject to their budget constraints and given government policy. The instantaneous utility function, $U(.)$, is increasing and concave in each of its arguments, 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, $\gamma > 0$ 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 $u(c_t, x_t) + \gamma \bar{v}$. Given that the agent utility function (3) is either separable in public consumption (under first interpretation), or independent of public consumption (under second interpretation), 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 optimality conditions:

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

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

The government announces its policy at the beginning of each period, after being elected or reelected and after observing the level of inherited debt, b_t, before the households make decisions about the variables they control. We use a 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, as follows:

$$u_c(c_t, x_t)c_t + \beta u_c(c_{t+1}, x_{t+1})b_{t+1} - u_x(c_t, x_t)(1 - x_t) - u_c(c_t, x_t)b_t = 0.\tag{6}$$

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. The government maximizes its value function subject to the implementability constraint (6) and the resource constraint (2), given the amount of public bonds to be repaid in the current period, the presence of political turnover, and the anticipated future policy. Denote as $\{\mathbf{C}(b_{t+1}), \mathbf{X}(b_{t+1})\}$ the policy that the current government anticipates will be followed in the future, so that $c_{t+1} = \mathbf{C}(b_{t+1})$, $x_{t+1} = \mathbf{X}(b_{t+1})$. For the remainder of the paper, we drop time subindices and denote next period variables with a prime. Then, given b, and the perception that future governments implement $\{\mathbf{C}(b), \mathbf{X}(b)\}$, the problem of the current government can be formulated as follows:

$$\max_{c,x,b'} u(c, x) + \gamma v(A(1 - x) - c) + \beta[pV(b') + (1 - p)W(b')],\tag{7}$$

$$s.t. : u_c(c, x)c + \beta u_c(\mathbf{C}(b'), \mathbf{X}(b'))b' - u_x(c, x)(1 - x) - u_c(c, x)b = 0,\tag{8}$$

where government spending has been substituted away using (2), $V(b')$ is the value function of the party in power, and $W(b')$ is the value function of the party out of power. In equilibrium, the anticipated policy functions will coincide with the actual policy functions. 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:*

$$\{\mathbf{C}(b), \mathbf{X}(b), \mathbf{B}(b)\} = \operatorname{argmax}_{c,x,b'} u(c,x) + \gamma v(A(1-x) - c) + \beta[pV(b') + (1-p)W(b')]$$

subject to (8); and the value functions are given by (9) and (10) as follows:

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

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

We assume the policy functions followed by future governments are differentiable.

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 (8) and the following equations (we economize on notation by suppressing the functional arguments):

$$u_c - \gamma v_g + \lambda \eta_c = 0, \tag{11}$$

$$u_x - \gamma A v_g + \lambda \eta_x = 0, \tag{12}$$

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

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

$$V_b' = -\lambda' u_c', \tag{14}$$

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

Eqs. (11) and (12) define the private-public consumption and consumption-leisure wedges caused by distortionary taxes. Eq. (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: By controlling the amount of public debt inherited next period, the current government can partially smooth the reduction in utility associated with its possible loss of power next period.

In the next section, we characterize the properties of the equilibrium government policy and household allocations in more detail.

4. Discussion

The consensus in the 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 leads 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 Eq. (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 a 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 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 A):

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

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.*

The intuition behind Lemma 1 is as follows. The public bonds represent government liabilities but private wealth. Therefore, a marginal increase in public debt induces negative co-movement between private and public consumption and increases leisure because of the wealth effect. The functional forms assumed result in private consumption being an increasing function of public debt. Thus, public consumption must be a decreasing function of public debt.

Without political turnover, the government has an incentive to manipulate the interest rate on the inherited debt (an inelastic asset of the households), in order to reduce the expenditure side of the budget. With private consumption increasing in public debt, this leads to a gradual reduction in the absolute value of public debt until the steady state with zero public debt is reached (this can be seen from (5) with utility separable in consumption and leisure: The choice of new public bonds b' influences the current interest rate–inversely proportional to the bond price q–in the direction beneficial to the government whenever this period consumption increases more than the next period consumption, or whenever $b' < b$ for $b > 0$, $b' > b$ for $b < 0$).

With political turnover, the current government can partially insure itself against a possible loss of power in the next period. If not re-elected, the government will experience a reduction in the utility by losing access to public goods that the government enjoys (and that are not provided by the incumbent to the opposition). By issuing extra public bonds, the party in power reduces the spending ability of the next period government and increases the next period private consumption, thus partially smoothing the negative effect of possible non-reelection. This "tying opposition hands" strategy results in positive public debt at the steady state with political uncertainty.

The weight on public consumption, γ, defines the importance of public consumption relative to private consumption for the current government. Thus, higher γ leads to higher public spending and, therefore, lower private consumption and lower number of new public bonds issued in the current period, other things equal.

Thus, varying the parameters γ and p can potentially produce any combination of public spending and public debt (and the taxes are determined as a residual from the government budget constraint).

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. A description of the numerical algorithm is provided in the Appendix A. We consider the following utility of the party in power:

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

Fig. 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 (γ). 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 a reasonable range does not change the qualitative behavior of the variables depicted in Fig. 1).

The impact of political instability, p : Similar to the conclusions of related studies, we obtain that public debt increases with political instability. In uncertain reelection prospects, the party in power is short-sighted relative to its electorate and therefore is a net borrower in equilibrium. In our model, this short-sightedness is a consequence of the intertemporal insurance motives by the party in power, which accumulates extra public debt to reduce government spending by the opposition that may win the elections in the next period. If there is no political uncertainty, public debt is zero at the (stable) steady state. Private consumption is an increasing function of public debt; thus, private consumption 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; therefore, leisure increases with political turnover. Thus, the total output is lower when political instability is higher. However, 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 the gross domestic product, 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, γ: Similar to the conclusions of related studies, we obtain that public spending increases with political polarization (or rent-seeking). This is a straightforward consequence of polarization/rent-seeking being modeled as a value of marginal utility from government spending. Higher public spending is financed through income taxes that also increase with polarization.

At the same time, given the level of political uncertainty, higher polarization or preference for rent-seeking activities reduces the equilibrium public debt level. This is a feature of the model economy: Government consumption crowds
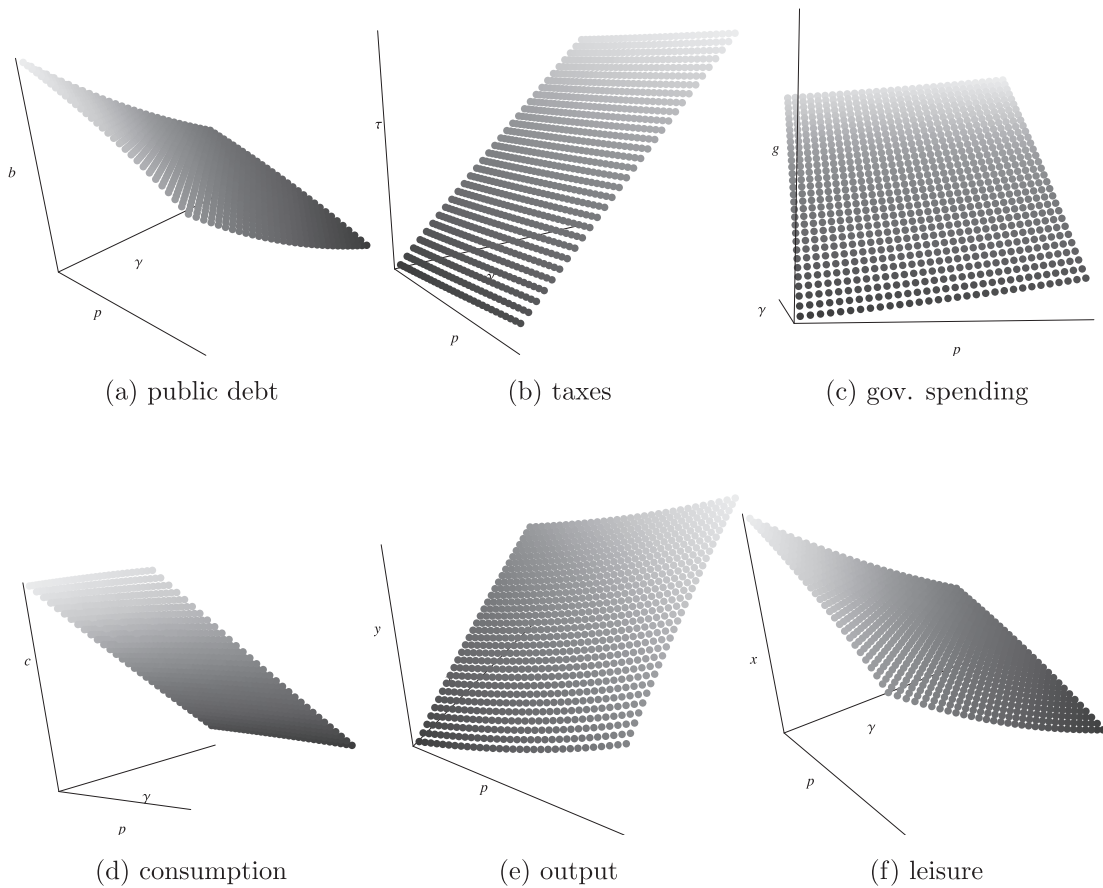
(a) public debt   (b) taxes   (c) gov. spending

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

Fig. 1. The variables as functions of p and γ.

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 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 an improvement in economic conditions. However, political polarization or political rent-seeking is usually among the main causes of political turnover. If there is no disagreement in 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. Therefore, the interplay between political polarization and political turnover 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 sample.

5. Reconciling theory and data

The aim of this section is to evaluate the contribution of political frictions to the 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 the data characteristics.

We use the following economic indicators (the data are from the World Bank and the OECD Statistics): 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 general government debt and central government debt to check the robustness of the results. All data are 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 in 1995) and by the absence of

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	2.555	2.294	0.804	0.403	0.239	0.175	0.236	0.578
Austria	1.106	0.491	0.127	2.569	2.101	0.928	0.699	0.647	0.191	0.282	0.543
Belgium	0.927	0.740	0.151	2.924	2.729	0.890	1.119	1.041	0.215	0.258	0.520
Canada	0.992	0.487	0.113	2.663	2.214	0.856	1.087	0.622	0.198	0.149	0.554
Denmark	1.221	0.409	0.104	2.148	2.238	1.188	0.507	0.406	0.243	0.318	0.485
Finland	1.539	0.406	0.104	2.583	2.086	0.901	0.443	0.571	0.210	0.221	0.496
France	0.567	0.738	0.145	2.978	2.219	0.853	0.715	0.639	0.226	0.174	0.549
Germany	0.973	0.523	0.127	2.284	2.704	0.870	0.626	0.412	0.187	0.107	0.569
Ireland	1.303	0.641	0.130	2.749	2.276	1.104	0.319	0.374	0.160	0.256	0.464
Italy	0.652	2.133	0.212	2.729	2.214	0.795	1.084	1.182	0.184	0.227	0.593
Japan	1.063	0.881	0.146	2.201	1.851	0.892	1.403	1.403	0.171	0.101	0.568
Luxembourg	1.411	0.518	0.118	2.606	2.468	1.861	0.066	0.043	0.154	0.251	0.388
Netherlands	1.174	0.465	0.113	2.025	1.860	1.011	0.610	0.561	0.218	0.211	0.487
Norway	1.299	0.467	0.113	2.264	1.906	1.603	0.436	0.351	0.204	0.317	0.450
Portugal	1.130	0.853	0.155	2.356	2.727	0.463	0.627	0.666	0.192	0.214	0.639
Spain	0.073	0.806	0.157	2.858	2.494	0.628	0.574	0.526	0.171	0.157	0.587
Sweden	1.319	0.445	0.108	2.221	1.924	1.004	0.640	0.535	0.251	0.258	0.463
Switzerland	1.314	0.469	0.114	3.073	2.381	1.353	0.537	0.259	0.111	0.091	0.577
The UK	0.563	0.496	0.117	2.547	2.186	0.941	0.436	0.473	0.186	0.259	0.635
The USA	0.392	0.616	0.132	2.567	2.239	1.053	0.738	0.449	0.147	0.112	0.663

Notation: p - political stability measure; γ_{c1} and γ_{c2} - public rent-seeking measures; γ_{p1} and γ_{p2} - political polarization measures; y - real GDP per capita (normalized); b_g/y -general government debt share of GDP; b_c/y - central government debt share of GDP; g/y - public consumption share of GDP; τ - taxes; c/y - private consumption share of GDP. Data Sources: the World Bank, the OECD Statistics, Transparency International, Lindqvist and Östling (2010).

significant economic fluctuations during that period. The levels of real GDP in every country in the sample are normalized by the average real GDP across all countries in the sample.

To reduce the consequences of the 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 the "SD_EQUALITY" and "SD_PRIVATE" variables from Lindqvist and Östling (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 variables are listed in Table 1.

Comparison of the data across countries suggests 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 the output and the political polarization measures). For example, Luxembourg has the highest 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 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. Given that we have several measures of political friction γ, we report the average correlation coefficient across γ_{c1}, γ_{c2}, γ_{p1}, and γ_{p2} and the variables of interest in Table 2 (the correlation coefficients are similar across different measures of γ for all the variables except for public debt).

The results reported in Table 2 suggest that in the model and in the data, government spending and taxes increase with political stability, are positively correlated among themselves, and are negatively correlated with private consumption; government debt and private consumption shares of the GDP decrease with political stability, are positively correlated among themselves, and are negatively correlated with taxes; and 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 measures in the data) with the GDP, taxes, and public debt and public spending shares of the GDP, and for the correlations of government spending with GDP and public debt share of the GDP. In order to evaluate the model's performance in capturing the relationship among fiscal variables, we should account for the existence of the relationship between p and γ, which are negatively correlated in the data (the average of the correlations between γ_{c1}, γ_{c2}, γ_{p1}, or γ_{p2} and p -0.42).

Therefore, we calibrate the model discussed in the previous sections to a sample of twenty 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 by the model at the *steady state*.

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

Corr.	Data	Model	Corr.	Data	Model
y, p	0.47	+	$b/y, y$	−0.48	−
$b/y, p$	−0.29	−	$g/y, y$	**−0.22**	+
$g/y, p$	0.13	+	$c/y, y$	−0.67	−
τ, p	0.34	+	τ, y	0.26	+
$c/y, p$	−0.67	−	$b/y, \tau$	−0.39	−
y, γ	**−0.30**	+	$g/y, \tau$	0.52	+
$b/y, \gamma$	**0.23**	−	$c/y, \tau$	−0.53	−
$g/y, \gamma$	**−0.29**	+	$g/y, b/y$	**0.13**	−
τ, γ	**−0.22**	+	$c/y, b/y$	0.39	+
$c/y, \gamma$	0.34	+	$c/y, g/y$	−0.32	−

Notation: the columns titled "Data" contain the correlation coefficients in the data. For the political polarization/rent-seeking measure γ, the correlation coefficients are the averages across the measures of political polarization/rent-seeking. The columns titled "Model" contain the signs of the correlation coefficients in the model. The exact values of the correlations in the model depend on the model parameters. The correlations that have opposite sign in the model and in the data are presented in bold.

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: $\sigma = 1, \ v = 1.$[2]

The political stability variable in the model, p, is interpreted as the 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. Moreover, political turnover can in general depend on public rent-seeking or political polarization and vice versa, as we discussed above. We proceed as follows. We choose two countries, characterized by the highest and lowest levels 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 political friction measures for Finland and Spain as $p^m_{Finland}, \ p^m_{Spain},$ and $\gamma^m_{Finland}, \ \gamma^m_{Spain}.$ 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 $\gamma^d_{Finland}, \ \gamma^d_{Spain}$:

$$p^m_{Finland} = 1 - 1/(\eta_1 p^d_{Finland} + \eta_2 \gamma^d_{Finland}), \tag{17}$$

$$p^m_{Spain} = 1 - 1/(\eta_1 p^d_{Spain} + \eta_2 \gamma^d_{Spain}). \tag{18}$$

$$\gamma^m_{Finland} = 1/(\mu_1 p^d_{Finland} + \mu_2 \gamma^d_{Finland}), \tag{19}$$

$$\gamma^m_{Spain} = 1/(\mu_1 p^d_{Spain} + \mu_2 \gamma^d_{Spain}). \tag{20}$$

The functional forms used in (17) and (18) restrict the probability of re-election in the model to lie between zero and one. The coefficients $\eta_1, \eta_2, \mu_1,$ and μ_2 determined by the systems of equations (17)-(18) and (19)-(20) can be used to re-scale the political frictions measures from the data to 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 the output of this country in the data.

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

Table 3 suggests that the World Bank Governance Indicators measure of rent-seeking (γ_{c1}) and the Transparency International measure of public rent-seeking (γ_{c2}) produce similar results (columns named "γ_{c1}" and "γ_{c2}"): The correlation coefficients between the model-generated variables and the data are around 50% for public debt and around 30% for public

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

Table 3

Calibration results: the correlation coefficients between the variables generated by the model with political frictions and the data.

Corr.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	γ_{c1}	γ_{c2}	γ_{p1}	γ_{p2}	γ_{c1}	γ_{c2}	γ_{p1}	γ_{p2}
(b^m, b^d)	0.521	0.532	0.140	0.051	0.437	0.433	0.132	−0.023
(g^m, g^d)	0.354	0.328	0.424	0.306	0.267	0.239	0.460	0.262
(τ^m, τ^d)	0.319	0.292	0.365	0.314	0.202	0.166	0.288	0.284
(y^m, y^d)	1	1	1	1	1	1	1	1

Notation: b - government debt; g - public consumption; τ - taxes; y - output; γ_{c1} and γ_{c2} - public rent-seeking measures; γ_{p1} and γ_{p2} - political polarization measures; (V^m, V^d) - denotes the correlation between variable V in the model and in the data. Columns (1)–(4) and (5)–(8) report the results when the central government debt and the general government debt is considered in the calibration, respectively.

spending and taxes, when we use the central government debt as a measure of public debt. When we use the general government debt, the correlation coefficients between the model-generated variables and the data are around 43% for public debt and around 20% for public spending and taxes. However, the political polarization measures from Lindqvist and Östling (2010), γ_{p1} and γ_{p2}, produce correlation coefficients of around 30% between the public spending generated by the model and public spending in the data, with similar result for income taxes, but insignificant correlation between the model-generated and empirically observed public debt. Given that political instability data combined with public rent-seeking data explain around 25% of the variation in public debt levels, we conclude that the public rent-seeking measures outperform the political polarization measures in explaining the variation in fiscal variables in the sample of developed 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 leads to higher public spending. When the measures of political frictions from a sample of twenty developed countries are incorporated into the model, political instability data combined with public rent-seeking data explain around 25% of the variation in public debt levels.

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 steady state of 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.

Acknowledgments

Appendix A. 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

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

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

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

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:

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

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) and (12) with the instantaneous utility considered in the example simplify as follows:

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

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

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

Eq. (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), $\mathbf{X}_b = \beta a/c^{2'} \mathbf{C}_b' b' \mathbf{B}_b' - \beta a/c_b' \mathbf{B}_b' + a/c - ab/c^2 \mathbf{C}_b$, 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 Eqs. (8), (11)–(15), the unknown policy functions are approximated by the Hermite polynomials of second 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 $n = 2$ 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 Eqs. (8), (11)–(13), with the derivatives of value functions substituted from (14) and (15) 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), (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.

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