Quantifying the Impact of Political Frictions on Public Policy

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Abstract

This paper evaluates the impact of political frictions on fiscal policy in a sample of developed countries. We use a model of fiscal policy that features 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. Political turnover increases public debt levels, while political polarization or public rent-seeking lead to higher public spending. We find that political frictions account for 67% of variation in government debt, 36% of variation in government spending, and 24% of variation in taxes in twenty two developed countries.

Keywords: fiscal policy; political turnover; political polarization; public rent-seeking.

JEL Classification Numbers: E61, E62, H21, H63.

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1 Introduction

It has been recognized 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 resulting, among other things, in prohibitively high public debt levels. A large 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. 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 quantify these theoretical findings by looking at the data. We ask how much of the variation in public debt, government spending, and taxes can be explained by the presence of political frictions 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 can-

not explain the pattern of public debt and government spending in developed countries. This is caused by the properties of the model at the stable steady state. 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/rent-seeking allows to replicate public debt - public spending relationship by varying two parameters governing political frictions.

The data on political frictions is based on surveys and rely on perceptions. Therefore, some caution should be taken when interpreting the results. We use several indicators of political frictions in the data and rely on the regression estimates to summarize the common features of the data in the measures of political frictions in the model. In this way we avoid possible shortcomings of using any particular indicator. In addition, the calibration strategy we use allows to achieve the best possible performance of the model in generating fiscal variables directly affected by political frictions, given empirical data on these frictions.

For calibration, we first estimate the country-specific frictions which are required by the model to replicate the public debt and government spending, averaged over the period 1995-2012, in each of the twenty two developed economies considered in this paper. Then, we regress these model-generated political frictions on their counterparts in the data. Finally, we use the predicted values from the regression to map the political frictions data into the model and check the model predictions about the fiscal variables.

We find that the model with political frictions explains 67% of variation in public debt

levels, 36% of variation in public spending, and 24% of variation in income taxes in twenty two developed countries. The calibration strategy based on the combination of the best fit model estimates and empirical data suggest that the political economy model of optimal fiscal policy is able to account for a significant fraction of pattern in fiscal variables.

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 compares the predictions of the model to the data in a sample of twenty two developed countries. Section 6 concludes.

2 Related Literature

This paper aims at evaluating the predictions of the political economy models about 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 (2014) 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 p_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:

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

The agents maximize their life-time utility, $\sum_{t=0}^{\infty} \beta^t U(c_t, x_t, g_t^J)$, where U, the instan-

taneous 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:

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

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

First, following Azzimonti (2011, 2014), we can assume that g_t^J is indexed by region, J∈{N,S}, and (3) coincides with the instantaneous utility function of the agents from region J, $U(c_t, x_t, g_t^J) = u(c_t, x_t) + \rho v(g_t^J)$. 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 ρ defines the importance of public good in overall utility of the agent and measures the *degree of polarization* in the country (the higher ρ, 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 ρ measures the degree of *public rent-seeking* (the higher ρ, 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 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 two optimality conditions:

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

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

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:

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

$s.t.$:

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

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*

i) $\{\mathbf{C}(b),\ \mathbf{X}(b),\ \mathbf{B}(b)\} = \arg\max_{c,x,b'} \; u(c,x) + \rho v(G(c,x)) + p\beta V(b') + (1-p)\beta W(b')$ *subject to (6) and (8); and*

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

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

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:

$$u_c - \rho v_g - \lambda\eta_c = 0, \tag{9}$$

$$u_x - \rho A v_g - \lambda\eta_x = 0, \tag{10}$$

$$\beta\lambda' u'_c + (1-p)\beta\rho v'_g(\mathbf{C}'_b + A\mathbf{X}'_b) - \lambda\eta_{b'} = 0, \tag{11}$$

where the last equation contains the derivatives of the value function with respect to the state variable (simplified using the optimality conditions (9)-(10)):

$$\begin{aligned} V_b &= \lambda u_c, \\ W_b &= \lambda u_c + v_g(\mathbf{C}_b + A\mathbf{X}_b), \end{aligned}$$

forwarded one period.

Equations (9) and (10) define the private-public consumption and consumption-leisure wedges caused by distortionary taxes. Equation (11) 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 $(1-p)\beta\rho v_g'(\mathbf{C}_b' + A\mathbf{X}_b')$ 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 general consensus in theoretical literature 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), (9)-(11), 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 $\rho > 1$, respectively; assume that the utility is logarithmic in consumption (3) with weight a, $0 < a < (\rho - 1)/\rho$, $\bar{v} = 0$, and normalize A to 1.[1]

We obtain the following characterization of this economy at the steady state:

At the steady state of the economy characterized by $u(c_t, x_t) = a \ln c_t + x_t$ *and* $\rho v(g_t) = \rho g_t$, *with* $\rho > 1$, $0 < a < (\rho - 1)/\rho$, *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,* ρ, *leads to higher public spending, lower public debt and private consumption, and higher taxes.*

Proof: The optimality conditions (8), (9)-(11) with the instantaneous utility considered in the example simplify as follows:

$$a + \beta a/c'b' - 1 + x - ab/c = 0, \tag{12}$$

$$a/c - \rho - \lambda ab/c^2 = 0, \tag{13}$$

$$1 - \rho - \lambda = 0, \tag{14}$$

$$(1-p)\rho/(1-\rho)(\mathbf{C}'_b + \mathbf{X}'_b) + a/c^{2\prime}c'_b b' = 0. \tag{15}$$

Equation (13) is quadratic in consumption and can be solved for consumption as a function of public debt. The following root features positive consumption: $\mathbf{C}(b) = a(1 + (1 + 4(\rho -$

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

$1)b\rho/a)^{0.5})/(2\rho)$, from where $\mathbf{C}_b > 0$. From (12), $\mathbf{X}_b = \beta a/c^{2\prime}\mathbf{C}_b' b'\mathbf{B}_b' - \beta a/c_b'\mathbf{B}_b' + a/c - ab/c^2\mathbf{C}_b$, 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 (15) 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 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

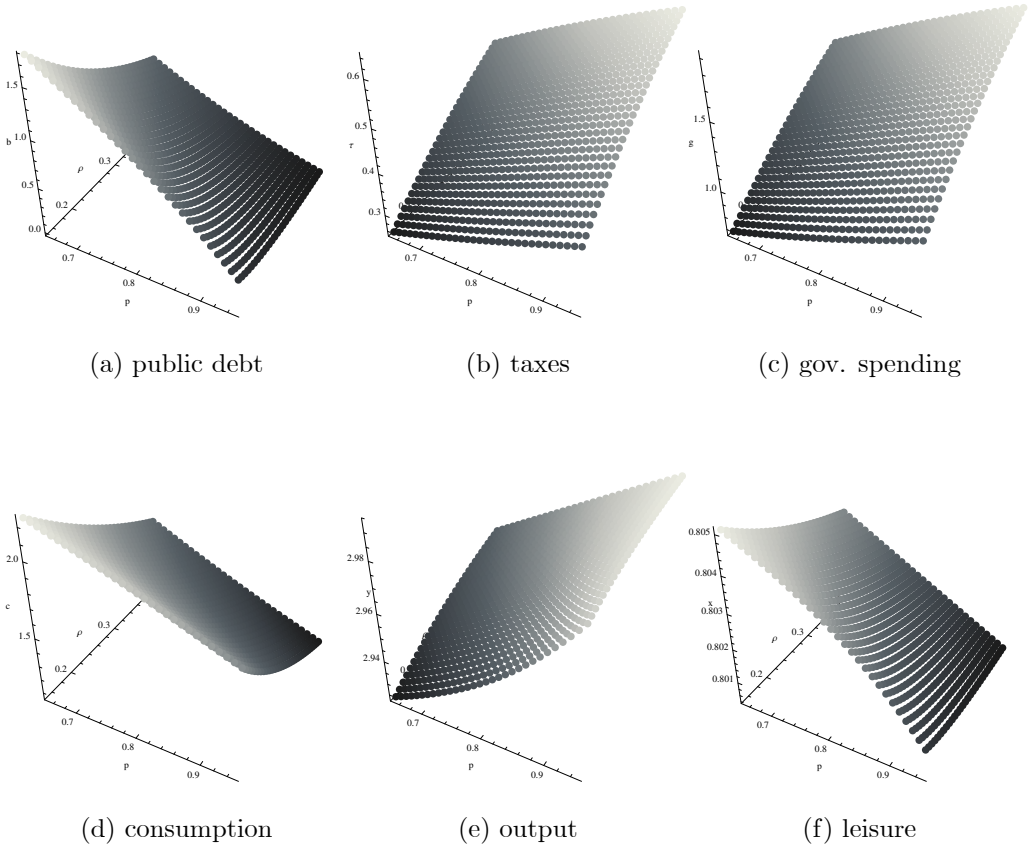
We refer to numerical analysis to characterize the impact of political frictions on fiscal policy and on economic outcomes for more general utility functions. Description of the numerical algorithm is provided in the appendix. We consider the following utility of the party in power:

$$U = \frac{(c^a x^{1-a})^{1-\sigma}}{1-\sigma} + \rho\frac{g^{1-\nu}}{1-\nu},\ \bar{v} = 0. \tag{16}$$

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: $\beta = 0.98$, $a = 0.5$, $\sigma = 1$, $\nu = 1$, $A = 10$ (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 ρ.



(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. At the steady state, the households can enjoy higher consumption from interest income on their savings. On the other hand, public consumption is a decreasing function of public debt. Thus, contrary to the conclusions of some of the studies that find that higher political uncertainty leads to public

overspending, we obtain that government consumption is lower when political turnover is larger.

From the optimality conditions of the household problem, the tax rate set by the government is proportional to the marginal utility of private consumption. Therefore, the income tax (and, in this economy, the tax revenues as a share of GDP) decreases with political instability. The government shifts from tax to debt-financed spending.

The total output is lower when political instability is higher. Similar to private consumption, leisure is an increasing function of public debt, thus, it increases with political turnover.

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, these 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 Table 1 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.[2]

Table 1: The sign of the correlation coefficients between political variables and economic outcomes in the model and in the data.

	p	ρ	y	b/y	g/y	τ	c/y	x
y	+/-	+/-	1	-/-	+/-	+/+	-/-	-/+
b/y	-/-	-/+		1	-/+	-/-	+/+	+/-
g/y	+/+	+/-			1	+/+	-/-	-/+
τ	+/+	+/-				1	-/-	-/+
c/y	-/-	-/+					1	+/-
x	-/+	-/-						1

Notation: each row of the table contains the sign of the correlation coefficient in the model and the sign of the respective correlation coefficient in the data, separated by "/".

Both in the model and in the data, government spending and taxes increase with political stability, are positively correlated among themselves and negatively correlated

[2]The data sources and more detailed analysis of the data are provided in the next section.

with private consumption; government debt and private consumption as shares of GDP decrease with political stability, are negatively correlated among themselves and 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 correlations of the measure ρ and of x with all of the variables. The signs of the correlations between public spending and output or public debt are also opposite to those in the data. Thus, the model captures some of the qualitative features of the data, but no all of them. In order to evaluate the model performance in capturing the quantitative features, we should account for the existence of relationship between p and ρ, which are correlated in the data. In the next section, we analyze the political and economic data in more detail, and use the model to characterize the joint influence of political uncertainty and political polarization/rent-seeking on economies in a sample of developed countries.

5 Reconciling Theory and Data

The aim of this section is to analyze whether a stylized model of optimal fiscal policy with political frictions outlined in this paper is able to account for the pattern of relationship among the fiscal variables in developed countries. First, we discuss the properties of the data on political and economic variables in a sample of twenty two developed countries. Second, we use the model to map the data on government spending and government debt into the estimates of political frictions. Third, we evaluate the relationship of the model-generated political frictions with their counterparts in the data. Finally, we project the data on political frictions from the data into the model to calculate the fiscal and economic variables in the model and compare the results with characteristics of the data.

The data on political frictions is limited to indicators based on surveys and has been

criticized for a number of possible shortcomings. The main criticism is that the measures of political frictions rely on perceptions, and therefore, can depend on the economic performance of the country being evaluated. Other points of criticism include reliance on the opinions of a small group of people in constructing the data and narrowness of the existing measures. To reduce the consequences of data limitations, we consider several indicators of political frictions and we rely on the average correlation coefficients between the political and economic variables. We use the data from the Quality of Government Dataset (Teorell et al., 2015) except for the measures of political polarization which are taken from Lindqvist and Ostling (2010). Table 2 summarizes the measures of political frictions which we consider in this study and the correlation coefficients among them.[3] Some of these measures are more related to political turnover (p), others to public rent-seeking or political polarization (ρ) or their inverse ($1/\rho$). Note that although the variables come from different original sources and reflect slightly different dimensions of political frictions, the correlation coefficients are very similar across different variables and always of the same sign. In particular, the indicators corresponding to p and ρ are negatively correlated, those corresponding to p and $1/\rho$ are positively correlated, and different indicators of p are positively correlated among themselves, as well as different indicators corresponding to ρ or $1/\rho$.

We use the following economic indicators: central government debt, government consumption, and private consumption shares of gross domestic product (GDP); real GDP, taxes on income and profits, and labor hours. All data is averaged over the time period 1995-2012. The levels of real GDP in every country in the sample are normalized by the level of real GDP in the USA, average over 1995-2012. The labor hours (equivalent of

[3] More detailed description of these variables can be found in Teorell et al. (2015).

Table 2: The correlation coefficients for the data on political frictions.

Variable	$p1$	$p2$	$p3$	$p4$	$p5$	$p6$	$p7$	$p8$	$p9$
$p1$. Political Stability Estimate (p)	1								
$p2$. Freedom House/Imputed Polity (p)	0.4	1							
$p3$. World Institutional Quality (ρ)	-0.7	-0.7	1						
$p4$. Corruption Perceptions Est. (ρ^{-1})	0.7	0.7	-1	1					
$p5$. Corruption Perceptions Max (ρ^{-1})	0.7	0.7	-1	1	1				
$p6$. ICRG Indicator of Gov. Quality (ρ^{-1})	0.7	0.7	-1	-1	1	1			
$p7$. Functioning of Government (ρ^{-1})	0.5	0.8	-0.9	-0.9	0.9	-0.8	1		
$p8$. Independence of the Judiciary (ρ^{-1})	0.4	0.7	-0.8	-0.8	0.8	-0.7	0.8	1	
$p9$. Political Polarization Equality (ρ^{-1})	-0.2	-0.4	0.3	0.3	-0.3	0.4	-0.2	-0.1	1
$p10$. Political Polarization Private (ρ^{-1})	-0.3	-0.3	0.5	0.5	-0.4	0.5	-0.3	-0.1	0.3

Data Sources: Teorell et al., (2015), Lindqvist and Ostling (2010).

$1-x$ in the model) are average hours actually worked normalized by 12*365. The data is from the Quality of Government Dataset (Teorell et al., 2015). The list of the countries and the data are presented in Table 5 in the appendix.

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 the highest level of political stability combined with the lowest level of public rent-seeking and public debt. Greece is the last but one in the ranking by the level of GDP per capita and has the highest level of public debt; at the same time, it is the most politically unstable and has the highest

public rent-seeking, according to the Transparency International corruption perceptions index. Table 3 reports the correlation coefficients among economic and political variables in the sample of twenty two countries considered in this study. For political variables, the reported correlations are the mean values of the correlation coefficients between each of the political variables listed in Table 2 and respective economic variable.

Table 3: The correlation coefficients between political variables and economic outcomes in the data.

	p	ρ	y	b/y	g/y	τ	c/y	x
p	1							
ρ	-0.6	1						
y	0.4	-0.3	1					
b/y	-0.6	0.6	-0.6	1				
g/y	0.1	-0.3	-0.2	0.2	1			
τ	0.3	-0.4	0.1	-0.2	0.4	1		
c/y	-0.4	0.5	-0.7	0.5	-0.3	-0.4	1	
x	0.4	-0.4	0.3	-0.5	0.4	0.2	-0.6	1

The model analyzed in this paper has public debt as the only state variable and features $\mathbf{C}_b > 0$, $G_b < 0$, $\mathbf{X}_b > 0$ (as discussed in the previous section); all the resources are allocated either to private or to public consumption, so that $corr(c, g) = -1$. In the data, both public and private consumption are positively correlated with public debt share of GDP (the correlation coefficients are 0.2 and 0.5, respectively), while leisure is negatively correlated with public indebtedness (the correlation coefficient is -0.5). By varying only one parameter of political frictions, either p or ρ, the model generates public

debt perfectly negatively correlated with public consumption and taxes and perfectly positively correlated with private consumption and leisure. Thus, the model-generated public debt or taxes and public spending move in the opposite direction to that of their data counterparts in the case of varying only ρ or only p, respectively. Moreover, in the data, the political frictions are correlated (the average correlation coefficient between the variables associated with p and ρ is -0.6).

Therefore, as noted earlier, we should consider the interplay of political turnover and political polarization/rent-seeking in conceptualizing the relationship among the political, fiscal and macroeconomic indicators. To that end, we proceed with the calibration of the model in the attempt to quantitatively account for the effect of the political frictions on public outcomes in the data.

For calibration, we fix the discount factor and the utility parameters for all countries and assign them the following values: $\beta = 0.98$, $a = 0.5$, $\sigma = 1$, $\nu = 1$. There are many ways the data on political frictions can be mapped into the measures of political frictions in the model, p and ρ; the success of the model depends on the chosen mapping. Moreover, there are many variables which can be interpreted as either p or ρ (see Table 2). Therefore, we use a mapping which combines a number of political indicators in the data to generate p and ρ in the model and which potentially helps the model to better replicate the fiscal outcomes. We proceed as follows.

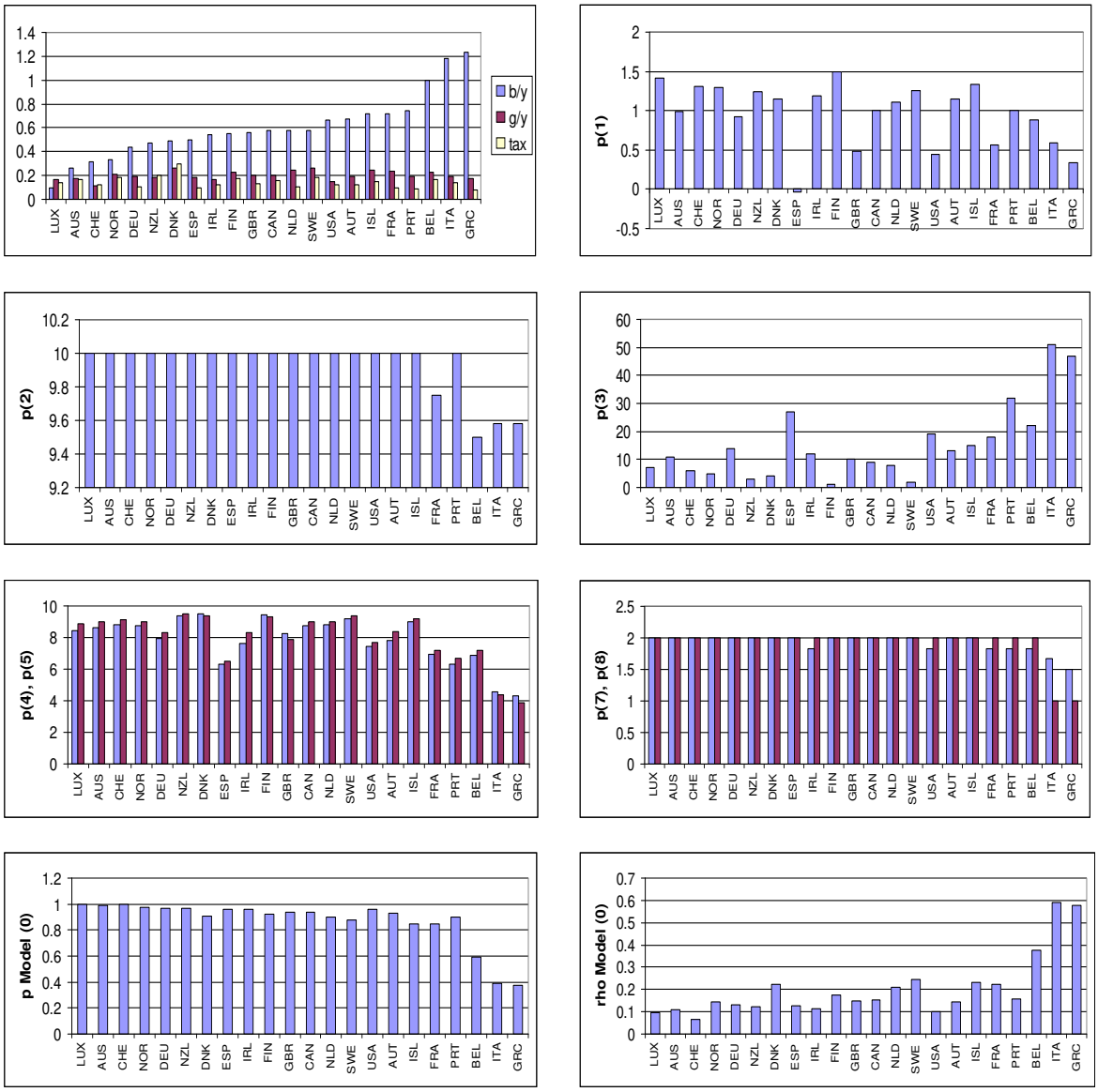
First, we estimate the country-specific values of p, ρ, and A in the model, which match the public debt levels, government spending, and GDP, in each of the countries in the sample. We refer to this estimation as "Model (0)" and summarize the results in column "Model (0)" of Table 4. The first ten rows of the data of Table 4 are the correlation coefficients between the variables generated by the model and the correlation

coefficients between the respective variables in the data. The last five rows of the data are the correlation coefficients between the variables generated by the model and the data. The model does replicate the correlation between public debt and spending and predicts correctly the sign of the correlations among a number of other variables of interest (i.e., the correlation of government spending with the remaining economic variables; the correlation between private consumption and taxes, private consumption and leisure, leisure and taxes). However, the correlations between public debt and taxes, consumption, or leisure are opposite to those in the data. This is caused by the properties of the model discussed in the previous section. In the model, the factors which increase public debt (such as political turnover) also increase consumption and leisure, and this ensures stability of the steady state (see Debortoli and Nunes, 2013). Model (0) perfectly replicates public debt and spending by construction, and explains about 10% of variation in taxes and private consumption in the considered sample of countries.

To understand the strong and weak sides of the model in replicating the data, we plot the fiscal variables and several indicators of political frictions in the data, along with the measures of political frictions generated by Model (0), with all variables sorted by the public debt levels in the considered sample of countries. The results are presented on Figure 2.

From the plots it is easy to see that the public debt levels and most of the measures of political frictions in the data follow similar patterns. Moving from the least indebted country to the most indebted country, public debt increases steadily at a relatively low rate with a sharp rise in debt levels for the most indebted countries (the top left plot on Figure 2). For that reason, these highly indebted developed countries are frequently considered as outliers. Most of the measures of political frictions listed in Table 2 follow the pattern

Figure 2: The pattern of fiscal and political variables in the data.



The data and notation: p(1) - Political Stability Estimate; p(2) - Freedom House/Imputed Polity; p(3) - World Institutional Quality; p(4) - Corruption Perceptions Estimate; p(5) - Corruption Perceptions Max; p(6) - ICRG Indicator of Gov. Quality; p(7) - Functioning of Government; p(8) - Independence of the Judiciary; p Model(0) - political stability generated by Model (0); rho Model (0) - political polarization/rent-seeking generated by Model (0). Data Source: Teorell et al., (2015).

similar to that of public debt levels: very low (or absent) levels of frictions for the least indebted countries with a sharp rise for the highly indebted countries (the top right plot and the second and third row plots on Figure 2). Thus, political frictions potentially have

high explanatory power in explaining public debt levels. On the contrary, the pattern of public spending and taxes does not show any particular dependence on political frictions. The measures of political polarization do not exhibit any significant correlation with any fiscal variable, and therefore are not shown on the graph. The political frictions generated by the Model (0), presented by the bottom plots on Figure 2, follow similar pattern to the political indicators in the data (except for the measure of political stability (p1) and the measures of political polarization (p9) and (p10)).

Second, we calibrate the model to evaluate its performance in explaining fiscal and economic variables given the measures of political frictions in the data. Table 2 suggests that different indicators of political frictions can potentially be used as an input accounting for political frictions in the model. Instead of relying on one particular indicator, we combine information contained in different indicators by regressing them on p and ρ from Model (0). We use the predicted values obtained from the estimated regression to map the data on political frictions into the political frictions in the model and check the predictions of the model about the remaining variables. We refer to this model as Model (1).

The regressions we estimate and the coefficients with standard errors in parenthesis are the following (only significant coefficients are left):

$$p^{Model} = \underset{(1.133)}{-7.383} + \underset{(0.112)}{0.832}p3 - \underset{(0.004)}{0.013}p4 + \underset{(0.330)}{0.916}p5, \ R^2 = 0.91; \tag{17}$$

$$\rho^{Model} = \underset{(1.184)}{6.746} - \underset{(0.117)}{0.658}p3 + \underset{(0.004)}{0.012}p4 \underset{(0.345)}{-0.923}\, p5, \ R^2 = 0.84. \tag{18}$$

We assess the model by comparing the correlation coefficients generated by the model with those in the data. Column "Model (1)" of Table 4 presents the results.

The signs of the correlation coefficients between the variables from the model and from the data are the same as those generated by Model (0). The model explains 67% (0.82^2)

Table 4: Calibration results.

Correlation	Model (0)	Model (1)	Model (2)	Data
$(b/y, g/y)$	0.20	0.61	0.32	0.20
$(b/y, \tau)$	0.33	0.72	0.48	-0.28
$(b/y, c/y)$	-0.20	-0.61	-0.32	0.54
$(b/y, x)$	0.99	1.00	1.00	-0.48
$(g/y, \tau)$	0.99	0.99	0.98	0.43
$(g/y, c/y)$	-1.00	-1.00	-1.00	-0.33
$(g/y, x)$	0.29	0.64	0.38	0.37
$(\tau, c/y)$	-0.99	-0.99	-0.98	-0.43
(τ, x)	0.41	0.76	0.53	0.22
$(c/y, x)$	-0.29	-0.64	-0.38	-0.63
$(b^m/y, b^d/y)$	1.00	0.82	0.82	
$(g^m/y, g^d/y)$	1.00	0.38	0.60	
(τ^m, τ^d)	0.37	-0.01	0.49	
$(c^m/y, c^m/y)$	0.33	-0.39	0.11	
(x^m, x^d)	-0.43	-0.38	-0.39	

Notation: b/y - central government debt as a share of GDP; g/y - public consumption as a share of GDP; c/y - private consumption as a share of GDP; y - real GDP per capita; τ - taxes; x - leisure hours. (V^m, V^d) - denotes the correlation between variable V in the model and in the data.

of variation in public debt levels and 14% (0.38^2) of variation in public spending, but fails to explain any fraction of taxes or consumption.

The plots on Figure 2 suggests that the sample of considered countries consists of two groups: relatively low indebted countries with low political frictions and highly indebted countries characterized by high political frictions. To account for this heterogeneity we

repeat the estimations as in Model (1) but including an indicator of political frictions to the square, and refer to the results as Model (2). The corresponding regression results are as follows:

$$p^{Model} = \underset{(0.794)}{-6.176} + \underset{(0.079)}{0.703}p3 - \underset{(0.003)}{0.006}p4 - \underset{(0.246)}{1.454}p5 + \underset{(0.442)}{2.146}(p5)^2,\ R^2 = 0.96; \quad (19)$$

$$\rho^{Model} = \underset{(0.837)}{5.491} - \underset{(0.084)}{0.523}p3 + \underset{(0.003)}{0.005}p4 + \underset{(0.259)}{1.482}\,p5 - \underset{(0.466)}{2.231}(p5)^2,\ R^2 = 0.93, \quad (20)$$

and corresponding correlation coefficients are presented in column "Model (2)" of Table 4.

The signs of the correlation coefficients are the same as those generated by Model (0) and Model (1). In addition, Model (2) explains 67% of variation in public debt levels, 36% of variation in public spending, and 24% of variation in income taxes.

The model outlined in this paper captures the essence of the relationship between fiscal variables and political frictions. However, the correspondence between the fiscal policy and economic outcomes in the model does not comply with the data. 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. The message of the calibration performed in this paper is that political frictions alone can account for a significant fraction of variation in the public debt levels, confirming political economy

theories of public debt determination.

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).

6 Conclusions

In this paper we analyzed the performance of the optimal fiscal policy model with political frictions. We compared the correlations among the fiscal, macroeconomic, and political variables generated by the model with those in the data from a sample of twenty two developed countries. We conclude that the model predicts the relationship between fiscal variables and political frictions consistent with the correlations among these variables in the data. The model accounts for 67% of variation in government debt, 36% of variation in government spending, and 24% of variation in taxes, given the measures of political frictions in the data.

The analysis in this paper suggests several directions for further research. First, incorporation of physical capital accumulation in the type of model economy discussed in this paper could improve the performance of the model in replicating macroeconomic variables. It could break the direct interconnection between public debt and private and public consumption, characterizing the model discussed in this paper, by allowing the households to save both in physical and financial assets. Second, 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. Finally, 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.

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Appendix

Numerical algorithm

To solve the system of equations (6), (8), (9)-(11), the unknown policy functions are approximated by the Hermite polynomials of the third order. That is,

$$\begin{aligned} \mathbf{C}(b) &= \textstyle\sum_{i=0}^{n} a_{c,i} H_i(b), \\ \mathbf{X}(b) &= \textstyle\sum_{i=0}^{n} a_{x,i} H_i(b), \\ \mathbf{B}(b) &= \textstyle\sum_{i=0}^{n} a_{b,i} H_i(b), \end{aligned} \tag{21}$$

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 (21), the solution to the original system with λ substituted away, consists of finding $3{*}n$ unknown coefficients

$$\{a_{c,i}, a_{x,i}, a_{b,i}\}_{i=1}^{n}. \tag{22}$$

The system of equations (8), (9)-(11), with government spending defined by (6) and λ substituted away by combining (9) and (10), 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 (22).

As a by-product of this numerical algorithm, the stability of the system (8), (6), (9)-(11) 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.

Table 5: The Data.

Country/Variable	y	b/y	g/y	τ	c/y	$1-x$	p	ρ
Australia	0.796	0.263	0.176	0.166	0.569	0.397	0.984	0.135
Austria	0.832	0.671	0.190	0.124	0.548	0.407	1.150	0.221
Belgium	0.788	0.998	0.226	0.164	0.528	0.358	0.884	0.314
Canada	0.824	0.580	0.203	0.158	0.554	0.399	1.006	0.123
Denmark	0.824	0.494	0.265	0.295	0.489	0.357	1.147	0.052
Finland	0.755	0.549	0.226	0.171	0.520	0.393	1.491	0.058
France	0.721	0.720	0.237	0.099	0.569	0.346	0.565	0.307
Germany	0.765	0.434	0.191	0.107	0.579	0.331	0.922	0.209
Greece	0.581	1.240	0.177	0.077	0.716	0.473	0.344	0.566
Iceland	0.816	0.717	0.242	0.153	0.564	0.411	1.341	0.099
Ireland	0.893	0.545	0.169	0.119	0.483	0.383	1.194	0.235
Italy	0.704	1.180	0.193	0.140	0.593	0.417	0.587	0.544
Luxembourg	1.680	0.093	0.162	0.138	0.378	0.375	1.409	0.159
Netherlands	0.863	0.580	0.246	0.104	0.484	0.322	1.109	0.120
New Zealand	0.622	0.473	0.183	0.198	0.596	0.411	1.240	0.060
Norway	1.132	0.335	0.209	0.187	0.444	0.328	1.293	0.127
Portugal	0.520	0.742	0.195	0.085	0.646	0.408	1.006	0.367
Spain	0.662	0.499	0.185	0.099	0.585	0.389	-0.032	0.367
Sweden	0.813	0.582	0.266	0.182	0.485	0.371	1.251	0.080
Switzerland	0.961	0.317	0.113	0.126	0.595	0.378	1.303	0.120
United Kingdom	0.765	0.563	0.202	0.134	0.646	0.385	0.486	0.174
United States	1.000	0.662	0.152	0.122	0.669	0.413	0.442	0.253

Data Source: Teorell et al. (2015).