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30 April 2006

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JOB MARKET PAPER

November, 2008

Abstract

Several empirical studies have found that government expenditures are procyclical in developing countries, unlike the countercyclical expenditures observed in high-income countries. We develop a dynamic political economy model to explain this phenomenon. In the model, governments provide public insurance to uninsured households, and Pareto-efficient and time-consistent redistributive policies are countercyclical. The introduction of a political friction, in which alternating governments disagree on the desired redistributive policy, can lead to procyclical transfer policies. In numerical simulations, the model successfully captures the cyclicality of government expenditures, tax revenues, and deficits observed in the data for both high-income and developing countries. Simulations also allow a quantitative comparison with other common explanations for fiscal procyclicality. We find that without the political friction, borrowing constraints and differences in macroeconomic volatility cannot account for the differences in fiscal policy across countries in this setting.

Keywords: Fiscal Procyclicality, Fiscal Policy in Developing Countries, Political Distortions.

JEL Codes: F41, E62, D72

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†I am greatly indebted to my advisor, Allan Drazen, for his advice and encouragement. My dissertation comittee Boragan Aruoba, Carmen Reinhart, John Shea, and Carlos Végh also went beyond the call of duty in their support. I also thank Micael Castanheira, Anton Korinek, Robert Kollman, Enrique Mendoza, Virgiliu Midrigan, John Wallis, and Philippe Weil for their helpful suggestions. Discussants and participants in several conferences and workshops also provided useful comments. Graciella Kaminsky, Carmen Reinhart, and Carlos Végh kindly shared their dataset and Michel Strawczynski kindly shared his data on social security transfers.

Fiscal policies in almost all high-income countries are countercyclical, reflected in countercyclical government expenditures and deficits, and procyclical tax revenues.[1] Fiscal policies in developing countries are quite different. Whether in Latin America (Gavin and Perotti, 1997) or elsewhere in the developing world (Kaminsky, Reinhart and Végh, 2004), governments tend to spend and borrow more as economic conditions improve. That is, developing countries conduct procyclical fiscal policies. The objective of this paper is to propose a theory that can account for the difference between fiscal policy in high-income and developing countries.

We begin by refining the observations of the existing literature on the cyclicality of fiscal policy. We document that fiscal policy differs across countries mainly in the cyclicality of government expenditures, not revenues. Specifically, there are indications that government transfers are the main countercyclical component of spending in high-income countries.

We then propose a model that captures these stylized facts. Because social-insurance programs make up a large share of government transfers in high-income countries, we model the cyclical component of government expenditure as the public insurance of uninsured households, making fiscal policy countercyclical. We prove that under certain conditions, Pareto-efficient redistributive policies are countercyclical, with countercyclical transfers and deficits, and procyclical tax rates.

To explain why fiscal policy differs in developing countries, we introduce a political distortion, similar to the one studied by Alesina and Tabellini (1990), where alternating governments disagree on the desired redistributive policy. We find that as the degree of political polarization increases, i.e. the disagreement between successive governments increases, fiscal policy becomes more procyclical.

The intuition for these results is simple. Alesina and Tabellini (1990) used a political-economy model of alternating governments with divergent preferences to show that governments may over-accumulate debt due to this political friction. If the political environment is sufficiently polarized, the governing party's constituency benefits from government spending, but does not fully internalize the cost of the (current or future) tax burden needed to finance

[1] Throughout this paper, countercyclicality or fiscal countercyclicality will refer to the combination of countercyclical government expenditures, procyclical or acyclical tax rates, and countercyclical deficits. Procyclicality or fiscal procyclicality will refer to a deviation of any one of these variables from the countercyclical definition. The assertions in the introduction and Section 1 are based on data from the International Monetary Fund's World Economic Outlook database from 1970 to 2003.

these transfers, because it is borne by the entire polity. We take this logic a step further and study the cyclical policies arising from this political structure. In our model, a social planner would choose countercyclical policies: all households prefer to receive countercyclical transfers to procyclical transfers of the same magnitude, because transfers are valued more in economic downturns. When the political friction is introduced, the incumbent is uncertain as to whether his successor will value the same constituency that he does. Thus any savings a government passes on to its successor may be used to benefit a different political faction. This induces governments to save less and spend more when more tax revenues are available, making fiscal policy procyclical. Governments do so even though their own constituents would prefer to receive transfers during downturns.

Quantitative simulations of the model show that as the political structure becomes more polarized, government expenditures become more procyclical and deficits less countercyclical, while tax revenues remain highly procyclical. This captures some cross-sectional features of the data. In the data, government expenditures are countercyclical in high-income countries, but procyclical in developing countries. Deficits are countercyclical in high-income countries, but acyclical in the average developing country. Tax revenues are procyclical in both high-income and developing countries.

Other explanations have been suggested for the phenomenon of fiscal procyclicality in developing countries. The most common is that developing countries face tight borrowing constraints, which limits borrowing during recessions. We question the role of borrowing constraints on two counts. First, our model predicts that borrowing constraints are binding and affect the cyclicality of government expenditure mainly in business cycle downturns. If borrowing constraints were the cause for fiscal procyclicality, we would expect this phenomenon to be particularly pronounced in economic downturns. In fact, the cyclicality of government expenditure observed in the data appears to be symmetric in peaks and troughs. Second, simulations of the model show that borrowing constraints have no effect on the cyclicality of fiscal policy, when the political friction is not present. This result holds although borrowing constraints are binding in half of the simulation periods.

Others have suggested that fiscal policy may differ across income lines because developing countries face more volatile income shocks or a more volatile tax base. In contrast, our model predicts that fiscal policy will be more countercyclical in more volatile macroeconomic environments, all else equal. This is because the need for intertemporal insurance is greater where the business cycle is more volatile.

Section 1 of this paper presents the basic stylized facts on the cyclicality of fiscal policy in high-income and developing countries. A review of the literature follows in Section 2. The model is presented in Section 3 and is simulated in Section 4, which presents the paper's main results. Section 5 concludes.

1 Stylized Facts

We begin by documenting the stylized facts on the cyclicality of fiscal policy in high-income and developing countries. Kaminsky, Reinhart and Végh (2004) have shown that government expenditures are countercyclical in high-income countries, but procyclical in developing countries. Alesina, Campante and Tabellini (2008) also show that expenditures and deficits differ greatly in their cyclical properties across countries. This section refines these stylized facts. Figures I-III present the main differences in fiscal policies across countries. The most striking difference between fiscal policies in developing and high-income countries is in government expenditure, as shown in Figure I. The graph plots the correlation between the cyclical component of real government expenditures and the cyclical component of real GDP between the years 1970 and 2003, against PPP GDP per capita in 1970. Cyclical components are measured as deviations from the trend, using a Hodrick-Prescott (HP) filter. The negative correlation between the degree of procyclicality and income per capita is apparent and is statistically significant.

It is difficult to assess the cyclicality of tax policies, because time-series data on tax *rates*–the relevant policy variable–are unavailable for most developing countries. While there is anecdotal and indirect evidence that tax rates may be countercyclical in a number of developing countries (see for example Kaminsky, Reinhart and Végh, 2004), this does not translate into a difference in the cyclicality of tax revenues. As Figure II shows, the cyclicality of tax revenues is not correlated with GDP per capita. In fact, the correlation between the cyclical components of tax revenues and GDP is roughly the same in high income countries (.44) and developing countries (.43).[2]

[2] Income classifications by the World Bank began only in 1989, so that it is difficult to assess who would have qualified as a developing country in 1970 under its classification. In 2007, the World Bank classified countries with per-capita GDPs of over $11,115 in PPP terms as high-income. Countries meeting this criterion in 2007 are considered high-income countries in this discussion. In interpreting figures I-III, note

In high-income countries, the combination of countercyclical government expenditures and procyclical tax revenues generates unambiguously procyclical surpluses, with an average correlation of .43 between their cyclical component and the cyclical component of GDP. Developing countries, whose expenditures and revenues are both procyclical, show great variance in the cyclicality of their surpluses, as shown in Figure III. Surpluses in developing countries are acyclical on balance.

The differences in fiscal policies across income lines appear to be mainly due to variations in government spending patterns. So far, we have looked at total government expenditure, which includes government consumption, investment, transfers, and interest payments. It is interesting to consider the cyclicality of these components. Table I presents the basic stylized facts. Government investment and consumption are both procyclical in high-income countries, with correlation coefficients not much different than in developing countries.[3] Interest payments are acyclical, on average, in both income groups.[4] The main remaining component of total government expenditure is transfer payments. Transfer payments would appear to be the main driver of high-income countries' countercyclical spending patterns. While data on transfers are unavailable for most developing countries, the last line of Table I gives some anecdotal evidence. Comparing the cyclicality of social security transfers in high-income countries to their cyclicality in a number of Latin American economies, we find that social security transfers are countercyclical in high-income countries, but procyclical in Latin America. While social security transfers may not be representative of other types of transfer payments, it is nevertheless interesting that unlike the other budgetary components listed in Table I, the cyclicality of social security transfers differs substantially across countries.

Focusing on developing countries, Table II compares the cyclicality of total government spending during periods that are above the HP filter trend to those that are below the trend.

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that countries with per-capita PPP GDPs of over $3000 in 1970 are (with minor exceptions) high-income countries today.

[3] This contrasts with Talvi and Vegh's (2005) finding that high-income countries' government consumption is acyclical. In any case, their findings are consistent with the view that transfers are the main countercyclical component of government spending in high-income countries. Note also that the correlations reported here are simple bivariate relations. A more sophisticated empirical analysis shows that government consumption is more procyclical in developing countries than in high-income countries. See Ilzetzki and Végh (2008) for detailed evidence.

[4] Data on interest payments is available for only a subset of countries, and for only a subset of the time period, differing from country to country. The data is also from a different source, the International Monetary Fund's Government Finance Statistics.

The difference between these two correlations is not statistically significant, indicating that government spending is no less correlated with the business cycle in good times than it is in bad times. We also look at the correlation of the cyclical components of real government expenditure and real GDP when excluding crisis years, defined as those years when cyclical output dropped by more than two standard deviations. As shown in Table II, the procyclicality of government expenditure drops by a statistically insignificant margin. In fact, during several recent output drops of this magnitude (e.g. Turkey in 2001 and Argentina in 2002) government spending was above-trend, reflecting these countries' ability to conduct countercyclical policies during some deep recessions. There is no evidence that the procyclicality of government expenditure is restricted to cyclical downturns, or particularly driven by these episodes.

So far, we have classified countries based on their per-capita income. The theory that follows predicts that fiscal policy will be more procyclical in more polarized political environments. Using the index of ethnic fractionalization of Alesina et al (2003), Figure IV shows that government expenditures are more procyclical in countries with more ethnically fragmented societies. The correlation between the cyclicality of government expenditures and ethnic fractionalization is .36 and is statistically significant at the 99 percent confidence level. Similar results hold when using the linguistic fractionalization index, or Easterly and Levine's (1997) measure of ethno-linguistic fragmentation. While there are many other dimensions along which a polity can be divided: e.g. regional, ideological, religious, or income, it is noteworthy that the cyclicality of fiscal policy is correlated with existing measures of political polarization.[5] Table III presents this stylized fact differently: countries where fiscal policy is procyclical are more fragmented along ethnic lines than those conducting countercyclical policies. The difference is sizable and statistically significant at the 99 percent confidence level.

2 Literature Review

Gavin and Perotti (1997) and Kaminsky, Reinhart and Végh (2004) provide evidence of the procyclicality of fiscal policies in developing countries. Additional empirical work by Lane

[5] Fiscal policy does not appear to be related to religious fractionalization–an additional measure in the Alesina et al (2003) database.

(2003) and Alesina, Campante and Tabellini (2008) shows that political distortions play a role in explaining fiscal procyclicality. Studying OECD countries, the former shows that fiscal policy is more procyclical in more fragmented political systems. The latter show that after controlling for a measure of corruption, fiscal policy's cyclicality is no longer correlated with income per capita. They also show that financial market frictions have little explanatory power for the cyclicality of fiscal policies. We complement this literature by documenting that the primary fiscal variable that differs across countries is government expenditure, and that government transfers appear to be the main source of variation across countries.

A number of explanations have been proposed for the phenomenon of fiscal procyclicality. Three factors are prominent in discussions on this topic. First, Gavin and Perotti (1997) suggest that borrowing constraints in developing countries are the cause for fiscal procyclicality. When borrowing constraints are binding, governments may have no choice but to rely entirely on tax revenues to finance expenditures. This forces governments to either cut expenditures or increase taxation in bad times, yielding procyclical fiscal policies. Riascos and Végh (2003) and Mendoza and Oviedo (2006) formalize the role of financial market imperfections in theoretical models.

Second, it has been suggested that the procyclicality of fiscal policy in developing countries may be an optimal reaction to the different stochastic environments confronting developing countries. Talvi and Végh's (2005) political-economy model, for example, requires an interaction between a political distortion and a volatile tax base to generate fiscal procyclicality. In Mendoza and Oviedo (2006), incomplete financial markets interact with volatile tax revenues to yield procyclical expenditure policies.

Third, a number of theories suggest that political distortions may cause fiscal procyclicality. The theory in this paper falls into this category. Talvi and Végh (2005) show that political distortions based on Tornell and Lane's (1999) "voracity effect" may cause procyclical policies. In their Ramsey model of taxation, governments that are unable to run fiscal surpluses due to political factors may diverge from the common tax-smoothing prescription. In contrast to their model, which focuses on the cyclicality of tax policy, our model predicts differences in government expenditure policies, consistent with the stylized facts presented in Section 1.

Alesina, Campante and Tabellini (2008) develop a voting model, in which fiscal procyclicality is a side effect of voters' attempts to discipline rent-seeking officials. In their model, households demand higher transfers at business cycle peaks, knowing that the government will extract rents if resources are left idle. The political mechanism underlying the Alesina, Campante and Tabellini (2008) result is a de-facto dynamic contract between the polity and rent-seeking politicians. The political structure in our model is different. There is no conflict of interest between the government and its constituency. Instead, it is successive governments that disagree on how to target expenditures. This paper also differs from Alesina, Campante, and Tabellini (2008) in that we provide a quantitative assessment of our theory.

Battaglini and Coate (2008a, 2008b) study the cyclical properties of fiscal policy in a dynamic version of Baron and Ferejohn's (1989) legislative bargaining model. Azzimonti, Battaglini and Coate (2008) analyze this framework quantitatively. In their real business cycle (RBC) framework, Battaglini and Coate (2008b) predict procyclical fiscal policies. While the political structure we study is different from theirs, the underlying political mechanism is similar. In both cases, the political inefficiency is a dynamic common pool problem. In our paper, successive governments do not fully internalize the costs of transfers to their constituency, while in Battaglini and Coate (2008a, 2008b) it is legislative coalitions that do not take in account the social costs of pork barrel spending. Our theory differs from theirs in two ways. First, Battaglini and Coate's (2008a, 2008b) theory is primarily geared to explaining fiscal policies in the United States and countries with similar political structures. Here, we are interested in comparisons of fiscal policy across countries. Also, in Battaglini and Coate (2008a, 2008b), households are risk neutral, so that their framework gives no reason why fiscal policies may ever be countercyclical. In fact, in Battaglini and Coate (2008b), government expenditures are procyclical regardless of whether the political distortion is present or not. In our model, the ruling party faces a trade-off between its constituents' desire for countercyclical policies with its desire to discipline its successors.

This paper provides a political economy explanation for fiscal procyclicality, but also makes a unique contribution to the literature by presenting a macroeconomic model that allows for all three proposed explanations for fiscal procyclicality and that lends itself to a comparative quantitative analysis of the three theories.

3 The Model

Consider a small open economy consisting of a measure-one continuum of households. Households are indexed by i, and each household permanently belongs to one of two groups, A and B, of measures ψ and $1-\psi$, respectively. Households are identical in every other respect. They value consumption, c_t^i, and dislike supplying hours worked, h_t^i. The only source of exogenous uncertainty is the wage process w_t, with support $[\underline{\mathrm{w}}, \bar{\mathrm{w}}]$. Wages follow a Markov process, so that the probability of a wage draw w_{t+1} is a function of w_t alone.

Consumers choose their labor contribution and consumption in each period. They do not have access to capital markets. This is a simple way to motivate government insurance for the private sector. The government uses its ability to borrow and save in international capital markets to provide intertemporal insurance for consumers.

Modeling fiscal policy in such a way has several advantages. First, we have seen that the main source of countercyclicality in the spending behavior of governments in high-income countries is government transfers, of which social insurance programs are a large component. Second, fiscal policy used for this purpose will tend to be countercyclical. This biases the model against procyclical policies, a bias the political distortion we introduce will need to overcome. Finally, as documented in Claessens (2006), lack of access to financial markets is both prevalent and an important source of vulnerability in developing countries.[6]

The government chooses a uniform, proportional tax rate τ_t. It cannot discriminate between the two groups A and B in its tax policy. It can, however, provide group-specific transfers $T_t^i \geq 0$ to one or more of the groups. It must also spend an exogenously fixed and constant amount on government consumption g.[7] Since government consumption is acyclical by assumption, total government expenditure, $G_t = g + \psi T_t^A + (1-\psi)\, T_t^B$, is perfectly correlated with total transfers in the model. The government enters a period inheriting a level of non-state-contingent debt b_{t-1} and chooses $\left\{\tau_t, \{T_t^i\}_{i\in\{A,B\}}, b_t\right\}$ to maximize the weighted welfare of consumers, depending on the government's social welfare function, which

[6] Claessens (2006) reports that less than half of the population uses formal financial institutions to save in most developing countries. The proportion of the population with savings accounts is in some cases lower than 10%. Even in the United States, close to 10% of the population reported not holding any type of transaction account in 2001.

[7] Government consumption plays no role in this model and setting $g = 0$ does not affect any of the results herein. It is useful to include g for quantitative simulations of the model, where g is chosen to match the average level of government consumption observed in the data.

varies between specifications of the model. The government can borrow and save freely in international capital markets at an exogenous and constant interest rate r.[8] Debt contracts are fully enforceable; we abstract from the question of sovereign default in this discussion.

3.1 Households

A representative household in group i chooses consumption and hours worked in each period to maximize lifetime utility. Its preferences over consumption and hours worked are:

$$E_0 \sum_{t=0}^{\infty} \beta^t \tilde{u}\left(c_t^i, h_t^i\right),$$

where period utility takes the form proposed by Greenwood, Hercowitz and Huffman (1988).

$$\tilde{u}\left(c, h\right) = \frac{\left(c - \frac{h^{1+1/\varepsilon}}{1+1/\varepsilon}\right)^{1-\gamma}}{1-\gamma}.$$

These preferences are useful for our purposes. Labor supply decisions are not dependent on households' wealth, which increases analytical tractability. This also implies that transfers T_t^i are not distortionary, while taxes τ_t affect the labor supply decisions of households in both groups.

Household i chooses c_t^i and h_t^i in each period to maximize its lifetime utility subject to its budget constraint:

$$c_t^i = \left(1 - \tau_t\right) w_t h_t^i + T_t^i \tag{1}$$

Given that households have no access to credit markets, their optimization problem is static in each period, yielding the following labor-supply schedule:

$$h_t = h_t^i = \left[\left(1 - \tau_t\right) w_t\right]^{\varepsilon} \quad \forall i. \tag{2}$$

The first equality reflects that labor contributions are uniform across household types.

Substituting (1) and (2) into households' preferences, we obtain the following indirect

[8]Introducing a time-varying interest rate may in itself affect the cyclicality of fiscal variables, depending on the cyclicality of government's borrowing rate. Allowing for an interest rate schedule that is increasing in the government's outstanding debt does not affect any of the paper's results.

period utility function:

$$u\left(T_t^i,\tau_t\right)=\frac{\left[\frac{\left[(1-\tau_t)w_t\right]^{\varepsilon+1}}{\varepsilon+1}+T_t^i\right]^{1-\gamma}}{1-\gamma}.$$

The marginal utility of the transfer payment is equal to the marginal utility of consumption, which we denote

$$\lambda_t^i\equiv\tilde{u}_c^i=u_T^i=\left[\frac{\left[(1-\tau_t)\,w_t\right]^{\varepsilon+1}}{\varepsilon+1}+T_t^i\right]^{-\gamma}. \tag{3}$$

The marginal (dis-) utility of taxes is

$$u_\tau^i=-w_t^{\varepsilon+1}\left(1-\tau_t\right)^{\varepsilon}\lambda_t^i. \tag{4}$$

3.2 Pareto Frontier

We now explore fiscal policy set by a government with an infinite horizon and preferences that are constant over time. Let ϕ and $1-\phi$ denote the weights that the government places on the welfare of group A and B, respectively. By altering the value of ϕ, we can map the economy's Pareto frontier. Different preference weights may reflect different redistributive motives for fiscal policy. We are not interested here in the possible motivations for fiscal redistribution. Rather, we show that Pareto-efficient redistributive policies will yield countercyclical fiscal policies in this framework, regardless of the redistributive motivation. In Section 3.3 we will look at a political friction that may explain the procyclical fiscal patterns observed in some countries. The analysis of this section indicates that such procyclical policies are inefficient in the Pareto sense.

Pareto-efficient policies are characterized by the following maximization problem:

$$\max_{\left\{T_t^i\right\}_{i\in\{A,B\}},\tau_t,b_t} E_t\sum_{s=t}^{\infty}\beta^s\left[\phi u\left(T_s^A,\tau_s\right)+(1-\phi)\,u\left(T_s^B,\tau_s\right)\right]$$

s.t.

$$b_t+w_t^{\varepsilon+1}\tau_t\left(1-\tau_t\right)^{\varepsilon}\geq\psi T_t^A+(1-\psi)\,T^B+(1+r)\,b_{t-1}+g, \tag{5}$$

where $\tau_t w_t h_t=w_t^{\varepsilon+1}\tau_t\left(1-\tau_t\right)^{\varepsilon}$ are government revenues. This maximization problem is also subject to the following non-negativity constraint on transfers,

$$T_t^i \geq 0 \quad \forall i, \tag{6}$$

imposed to ensure that the government does not use negative transfers as targeted lump-sum taxes. Finally, the government faces a borrowing constraint. This constraint may be an exogenous constraint on borrowing, or one that limits the government to borrow no more than it can repay almost surely–an adaptation of Aiyagari's (1994) natural debt limit. The natural debt limit constrains the government to hold no more debt than can be repaid if it faces the lowest possible wage realization in every subsequent period, while taxing at the peak of the Laffer curve. The revenue-maximizing tax rate is the constant:

$$\tau_{Laffer} \equiv \frac{1}{\varepsilon + 1}.$$ [9]

It is never optimal for the government to to choose a tax rate that exceeds this rate, as there is always a lower tax rate that generates the same amount of revenues at a lower utility cost to all households. Using this result, the borrowing constraint can be written as:

$$b_t \leq \min \left\{ \bar{b}, \underline{\mathrm{w}}^{\varepsilon+1} \frac{\varepsilon^{\varepsilon}}{r\left(\varepsilon+1\right)^{\varepsilon+1}} \right\}, \tag{7}$$

where $\bar{b}$ is an ad-hoc exogenous borrowing constraint and the second term is the natural debt limit.

The first order conditions of the government's maximization problem yield two conditions. The first is an intratemporal optimality condition reflecting the trade-off between taxes and transfers:

$$\frac{1 - \tau_t - \varepsilon\tau_t}{1 - \tau_t} = 1 - \sum_{i \in \{A,B\}} \frac{\mu_t^i}{\Lambda_t}, \tag{8}$$

where Λ_t is the multiplier on the government's budget constraint and μ_t^i are the multipliers on the two non-negativity constraints for transfers, T_t^i. The left hand side of this equation

[9] This is the solution to the unconstrained revenue maximization problem:

$$\max_{\tau} w^{\varepsilon+1} \left(1-\tau\right)^{\varepsilon} \tau.$$

gives the reciprocal of the marginal cost of public funds.[10] Raising one unit of revenues costs the private sector $\frac{1-\tau_t}{1-\tau_t-\varepsilon\tau_t} \geq 1$ units of private consumption, due to the taxes' distortionary effect on the supply of labor. The right hand side gives the reciprocal of the marginal benefit of total transfers. When both groups receive transfers, the marginal benefit of one unit of transfers is equal to one. When $\mu_t^i = 0\ \forall i$, (8) gives $\tau_t = 0$, giving the intuitive result that it is inefficient to use distortionary taxation to provide lump-sum transfers to both groups simultaneously. The second optimality condition is a standard Euler equation, written here for a period when the borrowing constraint is slack:

$$\Lambda_t = \beta\left(1+r\right)E_t\Lambda_{t+1} \tag{9}$$

Pareto efficient policies can be characterized by dividing the state-space into three regions, reflecting three possible fiscal regimes. First, whenever $\mu_t^i = 0\ \forall i$, we have a government that can finance its required level of public consumption g and achieve its desired income distribution without resorting to taxation ($\tau_t = 0$). This occurs only when the government's assets are sufficiently high ($b << 0$) and could represent a government that has accumulated a large *Sovereign Wealth Fund (SWF)*. From a theoretical perspective, this resembles the asymptotic results in Aiyagari et al (2002), where the government eventually accumulates sufficient assets to finance required expenditures without the need for distortionary taxation. Indeed, if $\beta\left(1+r\right) = 1$, fiscal policy converges almost surely to this regime.

Second, if $\mu_t^i > 0\ \forall i$, the government does not provide transfers to either group. This could represent a government in a *Fiscal Crisis*: if debt is sufficiently high, the government uses all its tax revenues to service its debt and to finance required government consumption, and does not provide transfers to either of the two groups ($T_t^i = 0\ \forall i$).[11]

Third, we refer to states of nature where $\exists i$ such that $\mu_t^i = 0$ and $\mu_t^{-i} > 0$ (with $-i$ representing the group other than i) as the *Redistributive Fiscal Policy* regime. Without loss of generality, let A be the recipients of the transfer payment, and let $T_t^B = 0$. The first

[10] See Battaglini and Coate (2008b) for further discussion on the marginal cost of public funds.

[11] The transfer payments may both also be zero if the government has no redistributive objective, so that $\phi = \psi$.

order conditions of the government's maximization problem then imply:

$$\frac{\lambda^A}{\lambda^B}\left[1-\frac{\varepsilon\tau}{(1-\tau)(1-\psi)}\right]=\frac{(1-\phi)/(1-\psi)}{\phi/\psi} \tag{10}$$

Recalling that λ_t^i is the marginal utility of consumption for a household in group i, this equation states that the government can fully obtain its desired income distribution only when $\tau = 0$. When $\tau > 0$ the government provides less of the transfer T_t^A than would be necessary to achieve its desired income distribution, as it internalizes the welfare cost of distortionary taxation.

We now turn to the main result of this section, namely that Pareto-efficient fiscal policy exhibits a countercyclical pattern, with countercyclical transfers and debt and procyclical tax rates. The proof of this proposition is in Appendix 6.1.

Proposition 1 (Pareto-efficient fiscal policy) *Assuming i.i.d. shocks and* $\beta(1+r) < 1$,*Pareto-efficient fiscal policy is countercyclical in the following sense:*
(1) Debt is decreasing in wages in all three regimes
(2) Transfers are decreasing in wages in the SWF regime.
(3) Tax rates (and revenues) are increasing in wages in the Fiscal Crisis regime.
(The results are comparative statics results.)

We are unable to provide a general proof on the cyclicality of taxes and transfers for the Redistributive regime as well, but we were unable to find parametrizations where fiscal policy is not countercyclical in this regime. We now provide intuition why one might expect fiscal policy to be countercyclical in the Redistributive regime. Similar intuition holds in the other two regimes, for which a formal proof is given in Proposition 1.

As before, let A be the recipients of the transfer payment. Observe that the Euler equation (9) contains Λ_t–the multiplier on government's budget constraint. But the government's first order conditions also combine to give:

$$\lambda_t^A=\beta(1+r)E_t\lambda_{t+1}^A, \tag{11}$$

so that the government uses transfers to smooth transfer recipients' marginal utility of consumption. For group B, matters are more complicated. Households in this group do not receive transfers, so consumption smoothing can only be achieved by altering the tax rate. This conflicts with the government's desire to smooth distortionary taxes over time. The following equation, resulting from the government's first order conditions, reflects this tension:

$$\lambda_t^B \frac{(1-\tau_t)}{(1-\tau_t)(1-\psi)-\varepsilon\tau_t} = \beta(1+r)E_t\left[\lambda_{t+1}^B \frac{(1-\tau_{t+1})}{(1-\tau_{t+1})(1-\psi)-\varepsilon\tau_{t+1}}\right]. \tag{12}$$

Smoothing tax distortions ($\frac{1-\tau_t}{(1-\tau_t)(1-\psi)-\varepsilon\tau_t}$) requires acyclical tax rates, but smoothing the marginal utility of consumption $\lambda_t^B = \left[\frac{[(1-\tau_t)w_t]^{\varepsilon+1}}{\varepsilon+1}\right]^{-\gamma}$ requires procyclical taxes rates. The resulting policy will be of mildly procyclical tax rates, compromising between smoothing the tax rate and smoothing the marginal utility of consumption for households in group B. Given that tax policy alone does not fully smooth marginal utility, (11) requires that transfers T^A be countercyclical, where recall that $\lambda_t^A \equiv \left[\frac{[(1-\tau_t)w_t]^{\varepsilon+1}}{\varepsilon+1} + T_t^A\right]^{-\gamma}$.

These results highlight the mystery of procyclical fiscal policies observed in some countries. Abstracting from any Keynesian motivation for countercyclical fiscal policies, we still find that Pareto-efficient redistributive policies are countercyclical. Section 3.3 presents a dynamic political economy model that attempts to explain why inefficient redistribution policies may occur. First, however, we explore the role of borrowing constraints. It has been conjectured that financial market frictions, such as borrowing constraints, could be the cause for procyclical policies. It is worth determining whether a simple borrowing constraint could generate fiscal procyclicality before resorting to political economy explanations for the phenomenon.

Borrowing Constraints

Could borrowing constraints explain the procyclicality of fiscal policy? In this framework, it appears that borrowing constraints are at best a partial answer. The following proposition, whose proof is in Appendix 6.2, states that borrowing constraints will be binding for low realizations of the wage shock.

Proposition 2 (Borrowing Constraints) *Assume that shocks are i.i.d. For a given level of inherited debt b_{t-1}, if borrowing constraints are binding for some wage realizations, and slack for other wage realizations, there exists a cutoff wage $\tilde{w}(b_{t-1})$, below which borrowing constraints are binding and above which borrowing constraints are slack.*

Thus, if borrowing constraints are the main cause of fiscal procyclicality, we would expect fiscal procyclicality to be observed mainly during economic downturns. The stylized facts of Section 1 show that the procyclicality of government expenditure is not restricted to economic downturns. It is hard to explain the procyclicality of fiscal policy during economic booms with borrowing constraints alone.

Simulations of the model in Section 4 show that in a dynamic context, the presence of borrowing constraints does not appear to affect the cyclicality of fiscal policy, unless the political distortion of the following section is also present. Even when borrowing constraints frequently bind, procyclical government expenditures are not observed.

3.3 Political Economy Distortions

We now consider a political friction where two political factions disagree on the weights they place on the welfare of different groups in the economy. The control of the government evolves stochastically over time, with p denoting the probability that an incumbent remains in power in the following period and $1 - p$ that the incumbent is replaced with the other political faction or party. This alternating-government structure has been used in a number of political economy models. Alesina and Tabellini (1990) study how political distortions affect steady state deficits. They find that both the frequency of political turnover and the degree of political polarization increase the steady state level of debt. Amador (2003) uses this framework to show that political distortions may help sustain agreement between a sovereign debtor and international creditors. Azzimonti (2005) uses this framework to explain the under-accumulation of capital in developing countries. Her study also contributes to this literature by showing that this simple alternating-government framework follows from a model with political microfoundations based on Lindbeck and Weibull's (1993) probabilistic voting model. She shows that as long as neither party has a structural electoral advantage, the probability of re-election p will be constant across time, even if voters take the state of the economy into consideration in their electoral decisions. While the terminology used here implies a democratic transition of government, transitions of power between conflicting ethnic, ideological, or interest groups occur in non-democracies as well, so that the theory presented here need not restrict our discussion to democracies alone.

There are two political parties A and B. Each values the welfare of half the population.

The two parties alternate in power, with p denoting the probability that the incumbent remains in power in the following period. Each party maximizes a social welfare function that places an equal weight on the welfare of each member of its constituency.[12] The constituencies of the two parties may be partially overlapping, with $\alpha \in [0,1]$ denoting the fraction of each constituency that also belongs to the constituency of the other party. In other words, the constituency of a given party is of measure $\frac{1}{2}$, with measure $\frac{\alpha}{2}$ also included in the constituency of the other party, while measure $\frac{1-\alpha}{2}$ is uniquely in the constituency of the first party. A measure $1-\frac{\alpha}{2}$ of the population is unrepresented. There is disagreement between the two parties as to the desired redistributive policy, with α reflecting the degree of agreement or cohesion between the two political factions. Conversely, we can think of $(1-\alpha)$ as the degree of political polarization.[13]

The governing party maximizes a social welfare function that puts equal weights on each constituent household. The welfare function is normalized by the size of the constituency. $V(b_{t-1}, w_t)$ represents the highest value that the governing party can achieve when entering period t with an inherited debt stock of b_{t-1} and a wage rate of w_t:

$$V(b,w) = \max_{\tau,T,b'} u(T,\tau) + \beta\left[pEV(b',w') + (1-p)EW(b',w')\right] \tag{13}$$

subject to

$$b' + w^{\varepsilon+1}\tau(1-\tau)^{\varepsilon} = \frac{T}{2} + (1+r)b + g, \tag{14}$$

$$T \geq 0, \tag{15}$$

where T represents the units of the consumption good transferred to a household in the ruling party's constituency. $b \equiv b_{t-1}$, $b' \equiv b_t$, and $w' \equiv w_{t+1}$. Time t subscripts have been suppressed elsewhere. The value of being in opposition, with the opposition's welfare

[12] The measure 1/2 constituency size is without loss of generality. Simulations of the model show that increases in constituency size and increases in political cohesion, to be discussed shortly, have similar effects.

[13] This is similar, but not identical to the definition of polarization in Alesina and Tabellini (1990). There, both parties place a positive weight on the welfare of all households, but disagree on the weights. $\alpha \in \left[\frac{1}{2}, 1\right]$ is the weight a party puts on its preferred constituency, with $1-\alpha$ giving the weight on the opposition's constituency. The closer α is to 1, the more polarized is the polity. In our setting, $\alpha \in [0,1]$ is the percentage of the incumbent's constituency that is also in the opposition's constituency. Here, political polarization is decreasing in α. Both structures yield qualitatively similar results. However the notation used here simplifies analysis by eliminating the "Sovereign Wealth Fund" regime described in the previous section. It also simplifies notation since each incumbent only transfers to its own constituency and we do not have to keep track of the value of two transfer payments.

function defined similarly, is

$$W(b,w) = \alpha u(T^*(b,w), \tau^*(b,w)) + (1-\alpha) u(0, \tau^*(b,w)) + \beta [(1-p) EV(b^*(b,w), w') + pEW(b^*(b,w), w')], \tag{16}$$

where $T^*(b,w)$, $\tau^*(b,w)$ and $b^*(b,w)$ are the transfer, tax, and debt policies, respectively, chosen by the incumbent. This equation reflects that a measure $\frac{\alpha}{2}$ of the opposition's constituency also belongs to the incumbent's constituency, while the remaining portion $\frac{1-\alpha}{2}$ receives no transfer.

The first order conditions of the government's maximization problem can be reduced to two equations. The first reflects intratemporal optimization in the choice of the tax rate and transfer payment:

$$\frac{1}{2} = \frac{1-\tau-\varepsilon\tau}{1-\tau} + \frac{\mu}{\Lambda}, \tag{17}$$

where Λ and μ are the Lagrange multipliers on the government's budget constraint and the non-negativity constraint on transfers, respectively. This equation implies a baseline tax rate τ^T whenever the transfer payment is provided (so that $\mu = 0$):

$$\tau^T \equiv \frac{1}{1+2\varepsilon}.$$

(17) makes it clear that the tax rate may exceed its baseline level during a fiscal crisis, when $\mu > 0$. The second equation is an intertemporal optimality condition, reflecting the optimal choice of government debt:

$$\Lambda + \beta [pEV_b(b', w') + (1-p) EW_b(b', w')] = 0, \tag{18}$$

where intratemporal optimality implies that

$$\Lambda = \frac{1-\tau}{1-\tau-\varepsilon\tau} \left[\frac{[(1-\tau) w]^{\varepsilon+1}}{\varepsilon+1} + T \right]^{-\gamma}. \tag{19}$$

It is tempting at this stage to use the envelope theorem to solve for $EV_b(b', w')$ and $EW_b(b', w')$ in (18). However, note that (16) is not a maximization problem, so that the envelope theorem cannot be applied to this equation.

To make further progress in analyzing the dynamics of the model, we need to refine the equilibrium concept used in the solution. Amador (2003) shows that a similar political structure resembles a the consumption-savings problem of a hyperbolic consumer. Krusell and Smith (2003) show that the savings-consumption problem of a hyperbolic consumer may have multiple equilibria, or even a continuum of equilibria. To address this problem, we follow Krusell, Kuruscu and Smith (2002) in focusing on a specific type of equilibrium path. First, we restrict attention to Symmetric Markov Perfect Equilibria, where governments' policy choice is a function only of the current state $\{b_{t-1}, w_t\}$ and both parties choose the same policy (except for the identity of transfer recipients) in a given state of nature. Second, we restrict attention to differentiable policy functions. In our context this implies a differentiable function $b' = f(b, w)$, giving a government's choice of debt.[14] We can now define the Differentiable Equilibrium.

Definition 1 (Differentiable Equilibrium) *A Differentiable Equilibrium is defined as two value functions: $V(b, w)$ and $W(b, w)$ and three policy functions: $T(b, w)$, $\tau(b, w)$, and $f(b, w)$, such that given a stochastic process for $\{w_t\}_{t=0}^{\infty}$:*
(1) Given $V(b, w)$ and $W(b, w)$, $T(b, w)$, $\tau(b, w)$, and $f(b, w)$ solve the maximization problem in equations (13) to (15), for the variables T, τ, and b', respectively.
(2)Given $T(b, w)$, $\tau(b, w)$, and $f(b, w)$, $V(b, w)$ and $W(b, w)$ satisfy the functional equations (13) and (16), respectively.
(3) $f(b, w)$ is differentiable in its first argument for $\forall \{b, w\}$ for which $T(b, w) = 0$ and $\tau(b, w) = \tau^T$, do not both hold.

We now characterize the Differentiable Equilibrium. The analysis proceeds as follows. We differentiate the value functions $V(b, w)$ and $W(b, w)$ with respect to b. Rather than using the envelope theorem in this differentiation, we have each party taking as given the policy function $f(b, w)$ of next period's incumbent when evaluating the marginal (dis-)utility of debt accumulation. This gives us the following Generalized Euler Equation (GEE), whose

[14] There is a subtle difference between our problem and that of Krusell, Kuruscu and Smith (2002). It is unclear whether a policy function $f(b, w)$ that is differentiable over the entire state space exists. It is apparent, for example, that the policy functions $T(b, w)$ and $\tau(b, w)$ are non-differentiable at the transition from the Redistributive regime to the Fiscal Crisis regime. It is sufficient for our purposes to assume a policy function $f(b, w)$ that is differentiable everywhere except in the set on $\{b, w\}$ that results in $T = 0$ and $\tau = \tau^T$.

derivation is given in Appendix 6.3.

$$\Lambda = \beta (1+r) \left[\int_{w'|T'=0} \Lambda' dw' + (p + \alpha (1-p)) \int_{w'|T'>0} \Lambda' dw' \right] \tag{20a}$$

$$+\beta (1-p) \left[\begin{array}{c} (1-p) \beta (1+r) E [\Lambda'' f_b (b', w')] - \\ \left(\alpha \int_{w'|T'>0} f_b (b', w') \Lambda' dw' + \int_{w'|T'=0} f_b (b', w') \Lambda' dw' \right) \end{array} \right] \tag{20b}$$

$$-\beta p \left\{ p \beta (1+r) E [\Lambda'' f_b (b', w')] - E [\Lambda' f_b (b', w')] \right\}, \tag{20c}$$

where the integrals are over values of w', for which $T' = 0$ (Fiscal Crisis)or $T' > 0$ (Redistributive Regime). The intuition of this intertemporal condition is as follows. Recalling that Λ is the Lagrange multiplier on the government's budget constraint, Λ is the marginal cost of reducing government debt by one unit, as valued by the incumbent. The benefit of this extra unit of savings is given by the right hand side of (20a). This extra unit of savings will be available to next period's incumbent. In all states of nature for which $T' = 0$ there is no disagreement between the two parties and the marginal dollar saved will be used optimally from the perspective of the current government, regardless of who his successor is. On the other hand, in all states of nature for which $T' > 0$ these savings will have no marginal benefit for households who do not receive transfers. With probability p the incumbent will be in office in the following period. With probability $1 - p$ the incumbent is out of office in the following period, and only a fraction α of the incumbent's constituency (those who also belong to the opposition's constituency) will benefit from the marginal dollar saved. This explains (20a).

However, the incumbent and his successor disagree on the optimal choice of debt two periods ahead: $f(b', w')$. In case the incumbent loses office, he would like to influence his successor's borrowing choice. This effect is captured by (20b). With probability $1 - p$ the incumbent loses power. $f_b(b', w')$ is the extent to which a additional dollar saved by the period t incumbent influences his successor in period $t + 1$ to save an additional dollar for period $t + 2$. With probability $(1 - p)^2$ the incumbent will regain power two periods from now. And to the extent that an additional dollar of savings today induces the successor to roll over some of the savings to the following period–giving a return to savings of $f_b(b', w')$– this gives the period $t+2$ government a marginal benefit of Λ''. At the same time, these induced savings come at the expense of transfer recipients (or of the entire population in a Fiscal Crisis) in period $t+1$. Thus, the incumbent takes into the account the cost of inducing his successor to increase savings at time $t+1$, in terms of transfer losses to a fraction α of his constituency in the Redistributive regime, or his entire constituency in a fiscal crisis.

There are also higher order effects. The incumbent's attempt to influence his successor distorts his own decisions in the following period, if he retains power. (20c) gives the costs of self-induced over-saving if incumbent remains in power, caused by his attempts to influence his successor's behavior, in turnover does occur.

Making further progress in analyzing the cyclicality of fiscal policy in this model requires numerical methods, to which we turn in Section 4. However, the basic intuition of the source of fiscal procyclicality is simple. While both parties' constituencies would prefer to receive countercyclical transfers, the parties cannot rely on their successors to allocate savings in a way that benefits them. This conflict of interests exists to the extent that both (1) there is government turnover ($p < 1$) and (2) there is disagreement as to who should receive transfers ($\alpha < 1$). It is easy to see that the GEE is consistent with a standard Euler equation like (9), when either $\alpha = 1$ or $p = 1$. If disagreement between the parties is sufficiently small, the likelihood of reelection is high, or the likelihood of being in a fiscal crisis in the following period is sufficiently high, the government uses the high revenue income resulting from a positive productivity shock to decrease the outstanding stock of debt. It also decreases the magnitude of the transfer payment to households, as their income is positively affected by the shock. This gives the government fiscal room to increase transfer payments during economic downturns. However, if the government is unlikely to retain power and there is significant disagreement between the parties, the government will not find it as beneficial to reduce the stock of outstanding debt, because the fiscal room provided by the lower debt stock will mainly benefit a constituency other than its own. The government then finds it optimal to transfer a significant fraction of this period's high revenues to its constituents, fearing that the opposition will do the same if in power in the following period.

4 Numerical Simulation

This section conducts a quantitative analysis of the model's dynamics. The time inconsistency inherent in the political structure of the model poses some computational challenges. In the previous section we follow Krusell, Kuruscu and Smith (2002) and Klein, Krusell and Rios-Rull (2003) in restricting attention to equilibrium paths with differentiable policy functions. As in these papers, standard computational methods do not perform well, presumably due to the models' multiple equilibria. The government's optimization problem is not a contraction, and iterations on the value function do not necessarily converge. On the other hand, the perturbation method suggested by Krusell, Kuruscu and Smith (2002) cannot be applied in our context, because the non-negativity constraint on transfers creates kinks in the policy functions. The computational algorithm, described in Appendix 6.3, therefore uses finite-horizon backward induction. We solve a finite-horizon variant of the model with $\bar{t} = 10,000$ periods (years). Increasing the time horizon up to one million periods did not affect simulation results. There is no guarantee that this finite-horizon analysis resembles the Differentiable Equilibrium that was analyzed in Section 3.3. However, Krusell, Kuruscu and Smith (2002) show that the Differentiable Equilibrium is the limit of a finite horizon problem, in their context. We therefore expect that the numerical solution presented in this section would yield an accurate approximation of Differentiable Equilibrium at the infinite horizon limit.

4.1 Parametrization

It is easy to show that the introduction of a constant-returns-to-scale firm using labor as its only input would have wages perfectly correlated with an exogenous productivity shock. We assume that the productivity shock follows a lognormal process, so that $w_t = e^{z_t}$, where z_t is a random variable, following an AR(1) process:

$$z_t - \bar{z} = \rho\left(z_{t-1} - \bar{z}\right) + \epsilon_t. \tag{21}$$

Here $\bar{z}$ is the trend level of productivity, which is normalized to 0; ρ is the autocorrelation coefficient; and ϵ_t is an i.i.d shock normally distributed with mean 0 and variance σ^2.

The model is simulated in three environments. First, parameter values are chosen to match the business cycle features of the United States. Second, the model is simulated with the business cycle features of the United States and with borrowing constraints. An extreme borrowing limit is imposed: the government may only save, and may not hold any amount of external debt, so that $\bar{b} = 0$. In other simulations, $\bar{b}$ is set to the natural debt limit, as in (7). Third, we parametrize the model to match the business cycle features of Argentina, as an example of an emerging market economy.

Parameter values are summarized in Table IV. For the U.S., we choose the values of $\{\rho, \sigma^2\}$ typically used in the RBC literature, in order to isolate the effects of political phenomena. Given that the model is simulated at annual frequency, this yields $\rho = 0.81$ and $\sigma = 0.0144$. As is common in the RBC literature for developing countries, and as suggested by Mendoza (1995), we parametrize the model with Argentina's business cycle features using terms of trade as the exogenous shock. Using the International Monetary Fund's (IMF) World Economic Outlook (WEO) data for the period 1970-2003, Argentina's shock process can be thus be represented as $\rho = 0.56$ and $\sigma = 0.079$. These values are also very similar to estimates obtained when looking at the actual output process of Argentina, as in Arellano (2008), for example. This implies a business cycle that is significantly more volatile than in the U.S. We find that the other differences between the values of economic parameters of the U.S. and Argentina do not have significant effects on the cyclicality of fiscal policy in the model, so that the main role of the "Argentina" simulations is to assess the role of differences in business cycle volatility.

We set risk aversion to $\gamma = 2$, as is common in the literature. The elasticity of labor supply is set to $\varepsilon = 1.7$. This is the value used in Greenwood, Hercowitz and Huffman (1988).

For our benchmark simulation, we set the real interest rate to $r = 2.4\%$, the average ex-post real return on 10-year Treasury bonds from 1970 to 2003 (nominal returns and inflation taken from the International Monetary Fund's International Financial Statistics). Determining an exogenous average borrowing rate for Argentina is trickier. Spreads on Argentine sovereign bonds have ranged from 300 to 6000 basis points in recent years. When rates are as prohibitive as at the higher end of this range, it is hard to separate the borrowing rate from a de-facto constraint on external borrowing. Moreover, borrowing rates are likely endogenous to the government's policy choices. Empirical evidence on sovereign spreads in Latin America show that 400 basis points is a typical spread (see for example Table 3 in

Eichengreen and Mody, 1998). Based on this evidence we set $r = 6.4\%$. We have simulated the model for a wide range of interest rates; none of the results presented here are particularly sensitive to the specific borrowing rate chosen, or to the introduction of a debt-elastic interest rate schedule.

While the political friction introduces a degree of myopia, the benchmark simulations without the political friction would be non-stationary if $\beta = 1 + r$. We therefore choose β to match the debt-to-GDP ratios of the United States and Argentina. This gives $\beta = .976$ for the U.S. and $\beta = .934$ for Argentina. We set the ratio of government consumption to average GDP g/GDP to its average level between 1970 and 2003, based on WEO data. This average ratio is 11% for the United States and 4.5% for Argentina.

Turning to political parameters, we leave political cohesion α as a free parameter. However, for ease of presentation, we choose benchmark values for p and look at the effects of changes in α for a given level of p. We later revisit the interaction between the two political parameters. We choose values of p that match the turnover rate in the two countries. In the United States, the observed likelihood that the incumbent party retains the presidency in an election year was 0.64 in the 20th century. Adjusting this to reflect the annual frequency of the model gives $p = 0.9$. In Argentina, government turnover is more irregular, and Argentina was a non-democracy for parts of the 20th century. Also, the volatile party structure in Argentina makes it difficult at times to determine whether a given party represents the same economic interests as its successors. A casual reading of Argentine presidential history indicates that the probability that a given political faction remains in power in a given year is approximately 0.8, whether the government is replaced through elections or force. As we will see, the simulation's qualitative results are not sensitive to the specific choice of p.

4.2 Results

Figures V-VII present the main simulation results. The solid curves represent the correlation between a given fiscal variable and GDP in three sets of simulations, each across a range of values of α (political cohesion). The correlations are computed using the deviations of the simulated time series from their HP filter trend. Simulations are of 1000 periods, with the first 900 discarded to minimize the effects of initial conditions.

The curves' intersection with the y axis are results of the benchmark specification, in which $\alpha = 1$, so that there is full agreement between political parties and no political distortion is present. To facilitate comparison with the data, the actual correlation between (the cyclical components of) GDP and government expenditure in the U.S. and Argentina are shown in dotted lines. Figure V gives results for the correlation between government expenditures and GDP. Figure VI shows the correlations between tax revenues and GDP. Figure VII shows the correlations between the deficit and GDP.

When parametrized with the business cycle features of the United States, the model predicts highly countercyclical government expenditures and deficits when no political distortion is present. The model requires only a small degree of political polarization (0.95 for expenditures and 0.8 for deficits) to match the features of U.S. data. Moving along the x axis, as political polarization increases, government spending becomes less countercyclical, and eventually procyclical. Deficits become less countercyclical, and eventually acyclical, as political polarization increases. The model can thus explain the fact that government expenditures and deficits are countercyclical in countries that are more politically cohesive, but procyclical and acyclical, respectively, in more polarized political environments.

Consistent with the data, the model shows highly procyclical revenues with little differences across countries. At the same time, the correlation of government revenues with GDP in the model is almost always very close to 1. This is a feature of many models with linear income taxes, because the tax base is highly procyclical. In this model, simulated tax rates do become more countercyclical as α decreases, but this does not have a sizeable effect on the cyclicality of revenues.

When the model is parametrized with the business cycle features of Argentina, the results are qualitatively similar. Without the political distortion, government expenditures are strongly countercyclical, as in the "U.S." simulation. In fact, except for extremely polarized political environments ($\alpha < 0.3$) the model predicts policies that are more *countercyclical* in the volatile Argentine environment. This is because the need for intertemporal insurance for households increases with higher business-cycle volatility. The model matches the observed correlation between government expenditure and GDP in the Argentine data for $\alpha = 0.6$. The model has greater difficulty in matching the observed cyclicality of deficits in Argentina. The conclusion emerging from this set of simulations is that we would expect more countercyclical fiscal policies in more volatile business cycle environments, all else equal.

In the third round of simulations, we tightened borrowing constraints, so that governments have no access to borrowing. They can, however, save freely at the exogenous interest rate r. Figures V-VII show that borrowing constraints have no effect on the cyclicality of fiscal policy unless the political friction is also present. In the benchmark simulations ($\alpha = 1$) government expenditures and deficits remain highly countercyclical, even though borrowing constraints were binding in 50% of the simulated periods. Interestingly, borrowing constraints do appear to reinforce procyclical expenditures and deficits, when the political friction is present. This indicates that political and financial market frictions might reinforce each other, but we do not find support for the idea that borrowing constraints alone play an important role in explaining fiscal procyclicality

Figure VIII shows the interaction between the two political parameters. It shows simulation results for "Argentina" for a variety of p values (the probability of the incumbent remaining in power in the following period), with α (political cohesion) changing along the x axis. According to the World Bank's Database of Political Institutions (Beck et al, 2001), few countries have had annual turnover rates higher than 30% in annual frequency, implying a value of $p \cong 0.7$. We look at values of p ranging from 0.5 to 0.95, keeping in mind that the lower end of this range implies unrealistically high turnover relative to the rates observed in the data. Not surprisingly, we find that higher turnover (lower p) causes fiscal policy to become more procyclical.

Figure VIII also demonstrates the utility of quantitative analysis in the understanding of political economy phenomena. Alesina and Tabellini (1990) predict that government indebtedness increases in both turnover $(1 - p)$ and political polarization $(1 - \alpha)$. Here, too, both parameters are necessary conditions for distorted policies to appear. However, model simulations highlight that while political polarization uniformly affects the cyclicality of government expenditures for any value of $p \in (0, 1)$, political turnover has little effect on the cyclicality of fiscal policy in cohesive political environments (high levels of α). Even with turnover more frequent than observed in reality, the cyclicality of government expenditures remains virtually unchanged for values of $\alpha > 0.9$. Thus a cohesive polity can expect to benefit from efficient fiscal policies even when turnover is frequent. At the same time, a dictator ruling over a polarized society might conduct distorted fiscal policies, as long as there is some positive probability that an opposing faction will seize power in the future. These are good news for proponents of democratic forms of government.

We can summarize the model's predictions arising from simulations as follows. Without the political distortion, fiscal policy is countercyclical, reflected in procyclical tax revenues, and countercyclical expenditures and deficits. This is true even in volatile macroeconomic environments, and even when borrowing constraints are frequently binding. The introduction of a the political distortion can match the procyclical policies observed in developing countries, when political polarization is sufficiently high (α is sufficiently low).

5 Conclusions

Imperfections in capital markets are frequently assumed to be the main culprit for the procyclicality of fiscal policy in developing countries. The volatile business cycle environment in developing countries is also often cited. The theory presented here raises questions regarding the power of these explanations. It provides an alternative political explanation and demonstrates that polarized political environments may yield procyclical fiscal policies. Quantitative simulations of the model are able to capture a number of the salient differences in the cyclicality of fiscal policy across countries.

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6 Appendix

6.1 Proof of Proposition 1

Proposition 1: *Assuming i.i.d. shocks and $\beta(1+r) < 1$,Pareto-efficient fiscal policy is countercyclical in the following sense:*

(1) Debt is decreasing in wages in all three regimes

(2) Transfers are decreasing in wages in the SWF regime.

(3) Tax rates (and revenues) are increasing in wages in the Fiscal Crisis regime.

(The results are comparative statics results.)

Proof. We write the problem in recursive form as follows:

$$V(b,w) = \max_{T^A,T^B,\tau,b'} \phi u\left(T_s^A,\tau_s\right) + (1-\phi)\, u\left(T_s^B,\tau_s\right) + \beta EV(b',w') \tag{A1.1}$$

s.t.

$$b' + w^{\varepsilon+1}\tau(1-\tau)^{\varepsilon} \geq \psi T^A + (1-\psi)\, T^B + (1+r)\, b + g$$

and

$$T^i \geq 0 \quad \forall i$$

If the value function $V(b,w)$ is to have the standard properties as in Stokey, Lucas and Prescott (1989) (pp. 84, theorem 4.11), the period return function $\hat{u}(b',b,w)$ implied by this problem must be continuously differentiable. There are several sets on $\{b,w\}$ where potential non-differentiabilities might be present. These are at the transitions between the three regimes. We can think of the function $V(b,w)$ as being a sum of three separate value functions, each for one of the fiscal regimes, with each non-zero only in the relevant subset of the state space. The function $V(b,w)$ is continuously differentiable if the limits of the differentials of these three functions are equal at all intersection points. The envelope theorem can be applied to each one of the three value functions, in the relevant region of the state space. In all three cases, we obtain:

$$V_b(b,w) = -(1+r)\,\Lambda, \tag{A1.2}$$

where Λ is the Lagrange multiplier on the government's budget constraint. Without loss of generality, let group A be the transfer recipient in the Redistributive regime. The first order conditions of the government's maximization problem (see below) imply:

$$\Lambda = w^{\varepsilon+1}(1-\tau)^{\varepsilon}\frac{1-\tau}{1-\tau-\varepsilon\tau}\sum_{i\in\{A,B\}}\phi^{i}\left[\frac{[(1-\tau)w]^{\varepsilon+1}}{\varepsilon+1}+T^{i}\right]^{-\gamma},$$

where $\phi^A \equiv \phi$ and $\phi^B \equiv 1-\phi$. This function is continuous at both $T^A = 0$ and $T^B = 0$. The function $V(b, w)$ is then continuously differentiable over the entire state space. There is no guarantee that $V(b, w)$ is twice differentiable. This is not a specific feature of this model. It is in general difficult to establish that the value function is twice differentiable in a large class of recursive models. The objective function is strictly concave and the set defined by the government's budget constraint is compact, so the value function is (decreasing in and) concave in b. In the analysis that follows, we will casually use the second derivatives of the value function. In doing so, we follow Sargent (1979), who argues that even if a concave value function is not differentiable, one can view such casual differentiation as a the limit of finite differences.

The first order conditions of (A1.1) with respect to T^i and τ are:

$$\phi^i\lambda^i - \psi^i\Lambda + \mu^i = 0, \tag{A1.3}$$

where $\psi^A \equiv \psi$ and $\psi^B \equiv 1-\psi$, and

$$\Lambda = \frac{1-\tau}{1-\tau-\varepsilon\tau}\sum_{i\in\{A,B\}}\phi^i\lambda^i, \tag{A1.4}$$

respectively, where

$$\lambda^i \equiv \left[\frac{[(1-\tau)w]^{\varepsilon+1}}{\varepsilon+1}+T^i\right]^{-\gamma}.$$

Here, Λ is the Lagrange multiplier on the government's budget constraint and μ^i are the Lagrange multipliers on the non-negativity constraints on T^i. The first order condition with respect to b' is:

$$\beta E V_b(b', w') + \Lambda = 0. \tag{A1.5}$$

In addition, applying the envelope theorem to (A1.1) gives (A1.2). Using the envelope theorem, (A1.5) can be rewritten as:

$$\Lambda = \beta\left(1+r\right)E\Lambda',$$

so that Λ follows a martingale. Thus if $\beta\left(1+r\right)=1$, the economy converges almost surely to the SWF regime and as is common in small open economy models assets grow without a bound. We assume that $\beta\left(1+r\right)<1$, so that assets remain bounded, but also assume that $\beta\left(1+r\right)$ is sufficiently close to 1 so that borrowing constraints are binding infrequently. In the current analysis, we focus on periods when the borrowing constraint is not binding.

We now analyze the comparative statics of the model, looking at the change in policy variables as w increases. We begin with the **SWF regime.** Here (A1.3) gives:

$$\begin{aligned}\phi\lambda^{A}+\psi EV_{b}\left(b',w'\right) &= 0\\ \left(1-\phi\right)\lambda^{B}+\left(1-\psi\right)EV_{b}\left(b',w'\right) &= 0,\end{aligned}$$

while the government's budget constraint can be rewritten as:

$$b' \geq \psi T^{A}+\left(1-\psi\right)T^{B}+\left(1+r\right)b+g.$$

Here $\lambda^{i}=\left[\frac{\left[\left(1-\tau\right)w\right]^{\varepsilon+1}}{\varepsilon+1}+T^{i}\right]^{-\gamma}$. The assumption of i.i.d shocks implies

$$\frac{\partial V_{b}\left(b',w'\right)}{\partial w}=0:$$

the current wage shock affects the future marginal value of wealth only through the accumulation or decumulation of debt. Comparative statics on these three equations give:

$$\frac{db'}{dw}=\frac{\gamma w^{\varepsilon}\left(1-\tau\right)^{\varepsilon+1}\left\{\left[\frac{1-\psi}{1-\phi}\left(\lambda^{A}\right)^{\frac{\gamma+1}{\gamma}}+\frac{\psi}{\phi}\left(\lambda^{B}\right)^{\frac{\gamma+1}{\gamma}}\right]\left(1-\psi\right)EV_{bb}\left(b',w'\right)-\gamma\left(\lambda^{A}\lambda^{B}\right)^{\frac{\gamma+1}{\gamma}}\right\}}{\Gamma_{SWF}}<0,$$

where

$$\Gamma_{SWF}\equiv\gamma\left(\lambda^{A}\right)^{\frac{\gamma+1}{\gamma}}\left[\gamma\left(\lambda^{B}\right)^{\frac{\gamma+1}{\gamma}}-\left(1-\psi\right)\frac{1-\psi}{1-\phi}EV_{bb}\left(b',w'\right)\right]-\psi\gamma\left(\lambda^{B}\right)^{\frac{\gamma+1}{\gamma}}\frac{\psi}{\phi}EV_{bb}\left(b',w'\right)>0.$$

Having determined that debt is countercyclical, differentiating the budget constraint with respect to w gives:

$$\frac{dT}{dw} = \psi \frac{dT^A}{dw} + (1-\psi)\frac{dT^B}{dw} = \frac{db'}{dw} < 0,$$

so that total transfers are countercyclical. This concludes the proof of part (2) of the proposition.

We now turn to the **Fiscal Crisis regime**. Here, (A1.4) can be rewritten as:

$$\frac{1-\tau}{1-\tau-\varepsilon\tau}\lambda + \beta E V_b(b', w') = 0,$$

where $\lambda^i = \lambda \equiv \left[\frac{[(1-\tau)w]^{\varepsilon+1}}{\varepsilon+1}\right]^{-\gamma}$ $\forall i$, while the budget constraint becomes:

$$b' + w^{\varepsilon+1}\tau(1-\tau)^{\varepsilon} = (1+r)b + g.$$

Comparative statics give

$$\frac{\partial \tau}{\partial w} = \frac{1}{\Gamma_{fc}}\left[\frac{\gamma(\varepsilon+1)\lambda}{w} - (\varepsilon+1)w^{\varepsilon}\tau(1-\tau)^{\varepsilon-1}(1-\tau-\varepsilon\tau)\beta E V_{bb}(b', w')\right] > 0,$$

where

$$\Gamma_{fc} \equiv \frac{\gamma(\varepsilon+1)\lambda}{1-\tau} + \frac{\varepsilon\lambda}{(1-\tau)(1-\tau-\varepsilon\tau)}$$
$$-\beta\varepsilon w^{\varepsilon}\tau(1-\tau)^{\varepsilon-1}(1-\tau-\varepsilon\tau)E V_{bb}(b', w') > 0.$$

Differentiating the budget constraint with respect to w then gives that

$$\frac{db'}{dw} < 0.$$

Thus tax policy is procyclical and debt countercyclical in the Fiscal Crisis regime. This concludes the proof of part (3) of the proposition.

We have seen that debt is countercyclical in the SWF and Fiscal Crisis regimes. To conclude the proof of part (1) of the proposition, we now look at the **Redistributive regime**. Here, the first order conditions can be rearranged to yield:

$$\phi\lambda^A + \beta\psi EV_b(b', w') = 0$$
$$(1-\phi)\lambda^B + \beta\left[\frac{1-\tau-\varepsilon\tau}{1-\tau} - \psi\right] EV_b(b', w') = 0 \tag{A1.6}$$
$$b' + \tau(1-\tau)^\varepsilon w^\varepsilon = \psi T^A + (1+r)b + g.$$

Comparative statics now give:

$$\frac{db'}{dw} = \frac{\gamma\phi\left(\lambda^A\right)^{\frac{\gamma+1}{\gamma}} w^\varepsilon (1-\tau)^\varepsilon}{\Gamma_R}\left[\gamma w^{\varepsilon+1}(1-\tau)^\varepsilon(1-\phi)\left(\lambda^B\right)^{\frac{\gamma+1}{\gamma}} - \frac{\beta\varepsilon}{(1-\tau)^2}(\varepsilon+1)\tau EV_b(b', w')\right]$$
$$-\frac{\psi}{\Gamma_R} w^\varepsilon (1-\tau)^{\varepsilon+1}\gamma\phi\left(\lambda^A\right)^{\frac{\gamma+1}{\gamma}}\frac{\beta\varepsilon}{(1-\tau)^2} EV_b(b', w') < 0,$$

where

$$\Gamma_R \equiv -\gamma\phi\left(\lambda^A\right)^{\frac{\gamma+1}{\gamma}}\left[\gamma(1-\phi)\left(\lambda^B\right)^{\frac{\gamma+1}{\gamma}} w^{\varepsilon+1}(1-\tau)^\varepsilon - \frac{\beta\varepsilon}{(1-\tau)^2} EV_b(b', w')\right]$$
$$+\gamma\phi\left(\lambda^A\right)^{\frac{\gamma+1}{\gamma}} w^{\varepsilon+1}(1-\tau)^\varepsilon\left(\frac{1-\tau-\varepsilon\tau}{1-\tau}\right)\left(\frac{1-\tau-\varepsilon\tau}{1-\tau} - \psi\right)\beta EV_{bb}(b', w')$$
$$+\psi\left[\gamma(1-\phi)\left(\lambda^B\right)^{\frac{\gamma+1}{\gamma}} w^{\varepsilon+1}(1-\tau)^\varepsilon - \frac{\beta\varepsilon}{(1-\tau)^2} EV_b\right]\beta\psi EV_{bb}(b', w').$$

$\Gamma_R < 0$. Note that the second line of this definition is negative because (A1.6) implies that $\frac{1-\tau-\varepsilon\tau}{1-\tau} > \psi$ in the Redistributive regime. This concludes part (1) of the proposition. ■

6.2 Proof of Proposition 2

Proposition 2: *For a given level of inherited debt b_{t-1}, if borrowing constraints are binding for some wage realizations, and slack for other wage realization, there exists a cutoff wage $\tilde{w}(b_{t-1})$, below which borrowing constraints are binding and above which borrowing constraints are slack.*

Proof. First note that the natural debt limit will never be binding in equilibrium. A binding natural debt limit puts a positive probability on a sequence where the government imposes a tax rate of $\tau = \frac{1}{1+\varepsilon}$ in every subsequent period. (A1.4) then gives $\Lambda \to \infty$.

We thus only consider the ad hoc borrowing constraint $b' \leq \bar{b}$. For a given level of inherited debt, b, define $\tilde{w}(b_{t-1})$ as either (1) the wage realization for which $b' = \bar{b}$ is the solution to the government's maximization problem, without the ad-hoc borrowing constraint; or (2) the wage lowest wage realization for which $b' < \bar{b}$, if there is no wage rate for which $b' = \bar{b}$ is the optimal choice. Proposition 1 shows that b' is decreasing in w. Thus $\forall w > \tilde{w}(b)$ it must be the case that $b' < \bar{b}$. In case (1), $\forall w < \tilde{w}(b)$, Proposition 1 implies that the optimal choice of b' is $b' > \bar{b}$, so that the borrowing constraint is binding. In case (2), $\forall w < \tilde{w}(b)$, the borrowing constraint is binding by the definition of $\tilde{w}$. Thus borrowing constraints are binding for all wage realizations $w < \tilde{w}(b)$, but slack for all $w > \tilde{w}(b)$. ■

6.3 Derivation of the Generalized Euler Equation

We begin by rewriting the two value functions, assuming a differentiable policy function $b' = f(b, w)$:

$$V(b,w) = \max_{\tau,T,b'} u(T,\tau) + \beta\left[pEV(b',w') + (1-p)EW(b',w')\right]$$

s.t.

$$b' + w^{\varepsilon+1}\tau(1-\tau)^{\varepsilon} = \frac{T}{2} + (1+r)b + g,$$

$$T \geq 0,$$

and

$$W(b,w) = \alpha u(T^*,\tau^*) + (1-\alpha)u(0,\tau^*) + \beta\left[(1-p)EV(f(b,w),w') + pEW(f(b,w),w')\right],$$

where T^*, τ^* and $f(b,w)$ are the solutions to the maximization problem above. We now differentiate the two functions, without applying the envelope theorem[15]. Beginning with $V(b,w)$,

$$V_b(b,w) = u_T(T,\tau)\frac{\partial T}{\partial b} + u_\tau(T,\tau)\frac{\partial \tau}{\partial b} + \beta\left[pEV_b(f(b,w),w') + (1-p)EW_b(f(b,w),w')\right]f_b(b,w).$$

[15] We do so although it is easy to see, and we will verify, that the envelope theorem does apply in the case of $V(b,w)$.

Using the definition (3) and equation (4) this reads:

$$V_b(b,w)=\lambda\left(\frac{\partial T}{\partial b}-w^{\varepsilon+1}(1-\tau)^{\varepsilon}\frac{\partial \tau}{\partial b}\right)+\beta\left[pEV_b\left(f(b,w),w'\right)+(1-p)EW_b\left(f(b,w),w'\right)\right]f_b(b,w). \tag{A3.1}$$

Next, differentiate the government's budget constraint with respect to b:

$$f_b(b,w)+w^{\varepsilon+1}(1-\tau)^{\varepsilon}\frac{1-\tau-\varepsilon\tau}{1-\tau}\frac{\partial \tau}{\partial b}=\frac{1}{2}\frac{\partial T}{\partial b}+(1+r).$$

Now note that whenever $T\geq 0$ is binding, $\frac{\partial T}{\partial b}=0$ and whenever $T>0$, $\frac{\partial \tau}{\partial b}=0$, and $\frac{1-\tau-\varepsilon\tau}{1-\tau}=\frac{1}{2}$ as (17) confirms. This last equation can then be written as

$$f_b(b,w)=\frac{1-\tau-\varepsilon\tau}{1-\tau}\left[\frac{\partial T}{\partial b}-w^{\varepsilon+1}(1-\tau)^{\varepsilon}\frac{\partial \tau}{\partial b}\right]+(1+r). \tag{A3.2}$$

Plugging this back into (A3.1) yields:

$$\begin{aligned}V_b(b,w) &= \lambda\frac{1-\tau-\varepsilon\tau}{1-\tau}\left[f_b(b,w)-(1+r)\right]\\ &\quad+\beta\left[pEV_b\left(f(b,w),w'\right)+(1-p)EW_b\left(f(b,w),w'\right)\right]f_b(b,w).\end{aligned}$$

Replacing (18) into the second line of this equation, and using (19) in the first gives:

$$V_b(b,w)=\Lambda\left[f_b(b,w)-(1+r)\right]-\Lambda f_b(b,w)=-(1+r)\Lambda. \tag{A3.3}$$

It is reassuring that this result is identical to the application of the envelope theorem to $V(b,w)$, as the envelope theorem should apply in this case. We now turn to $W(b,w)$ where the envelope theorem does not apply.

$$\begin{aligned}W_b(b,w) &= \alpha u_T(T,\tau)\frac{\partial T}{\partial b}+\alpha u_\tau(T,\tau)\frac{\partial \tau}{\partial b}+(1-\alpha)u_\tau(0,\tau)\frac{\partial \tau}{\partial b}\\ &\quad+\beta\left[(1-p)EV_b\left(f(b,w),w'\right)+pEW_b\left(f(b,w),w'\right)\right]f_b(b,w).\end{aligned}$$

We can use (A3.2) to obtain

$$\begin{aligned}W_b(b,w) &= \alpha\left[f_b(b,w)-(1+r)\right]\Lambda+(1-\alpha)u_\tau(0,\tau)\frac{\partial \tau}{\partial b}\\ &\quad+\beta\left[(1-p)EV_b\left(f(b,w),w'\right)+pEW_b\left(f(b,w),w'\right)\right]f_b(b,w).\end{aligned}$$

Now note that when $T > 0$, $\frac{\partial\tau}{\partial b} = 0$, so that the second term is equal to zero. On the other hand, when $T = 0$, $u_\tau(0,\tau) = -w^{\varepsilon+1}(1-\tau)^\varepsilon \lambda$ while (A3.2) reads:

$$f_b(b,w) = -\frac{1-\tau-\varepsilon\tau}{1-\tau} w^{\varepsilon+1}(1-\tau)^\varepsilon \frac{\partial\tau}{\partial b} + (1+r),$$

giving:

$$\begin{aligned} W_b(b,w) &= \beta\left[(1-p)EV_b(f(b,w),w') + pEW_b(f(b,w),w')\right] f_b(b,w) \\ &\quad + \begin{cases} [f_b(b,w)-(1+r)]\Lambda & for\ T=0 \\ \alpha[f_b(b,w)-(1+r)]\Lambda & for\ T>0 \end{cases}. \end{aligned}$$

Analyzing the first line of this equation gives:

$$\begin{aligned} & \beta\left[(1-p)EV_b(f(b,w),w') + pEW_b(f(b,w),w')\right] f_b(b,w) \\ = & \ \beta\frac{p}{1-p}\left[\frac{(1-p)^2}{p}EV_b(f(b,w),w') + (1-p)EW_b(f(b,w),w')\right] f_b(b,w) \\ = & -\frac{p}{1-p}\left[\Lambda + \beta(1+r)\frac{1-2p}{p}E\Lambda'\right] f_b(b,w), \end{aligned}$$

using (A3.3) and (18) in the last step. This gives

$$\begin{aligned} W_b(b,w) &= -\frac{p}{1-p}\left[\Lambda + \beta(1+r)\frac{1-2p}{p}E\Lambda'\right] f_b(b,w) \\ &\quad + \begin{cases} [f_b(b,w)-(1+r)]\Lambda & for\ T=0 \\ \alpha[f_b(b,w)-(1+r)]\Lambda & for\ T>0 \end{cases}. \end{aligned} \tag{A3.4}$$

We now use (A3.3) and this last equation in (18) to obtain:

$$\begin{aligned} \Lambda &= \beta(1+r)\left[\int_{w'|T'=0}\Lambda' dw' + (p+\alpha(1-p))\int_{w'|T'>0}\Lambda' dw'\right] \\ &\quad + \beta(1-p)\left[\begin{array}{c} (1-p)\beta(1+r)E\left[\Lambda'' f_b(b',w')\right] - \\ \left(\alpha\int_{w'|T'>0} f_b(b',w')\Lambda' dw' + \int_{w'|T'=0} f_b(b',w')\Lambda' dw'\right) \end{array}\right] \\ &\quad - \beta p\left\{p\beta(1+r)E\left[\Lambda'' f_b(b',w')\right] - E\left[\Lambda' f_b(b',w')\right]\right\}, \end{aligned}$$

which gives the GEE.

6.4 Computational Algorithm

We solve a finite horizon variant of the model using backward induction. Let $\bar{t}$ be the foresight horizon of the model–the number of periods from time $t = 0$ the end of history. We simulate the model over t_{sim} periods, where $t_{sim} < \bar{t}$. The model is solved computationally as follows.

1. Create a grid on w and b.

2. History ends at time $\bar{t}$. All outstanding debt $b_{\bar{t}-1}$ must be repaid: $b_{\bar{t}} = 0$. The government's time $\bar{t}$ maximization problem is:

$$V^{\bar{t}}\left(b_{\bar{t}-1}, w_{\bar{t}}\right) = \max_{\tau_{\bar{t}}, T_{\bar{t}}} u\left(T_{\bar{t}}, \tau_{\bar{t}}\right).$$

s.t.

$$\tau_{\bar{t}}\left(1-\tau_{\bar{t}}\right)^{\varepsilon} w_{\bar{t}}^{\varepsilon+1} = (1+r)\, b_{\bar{t}-1} + \frac{T_{\bar{t}}}{2} + \bar{g},$$

giving the solutions $\tau_{\bar{t}}^{*}\left(b_{\bar{t}-1}, w_{\bar{t}}\right)$ and $T_{\bar{t}}^{*}\left(b_{\bar{t}-1}, w_{\bar{t}}\right)$. This problem is solved for each grid point on $\{b, w\}$. The opposition party's value can then be calculated via

$$W^{\bar{t}}\left(b_{\bar{t}-1}, w_t\right) = \alpha u\left(T_{\bar{t}}^{*}, \tau_{\bar{t}}^{*}\right) + (1-\alpha)\, u\left(0, \tau\right).$$

3. Iterate back from $\bar{t}-1$ to zero. For each $t \in [0, \bar{t}-1]$ the incumbent takes the resulting value functions from the pervious step, $V^{t+1}\left(b_t, w_{t+1}\right)$ and $W^{t+1}\left(b_t, w_{t+1}\right)$, as given. The incumbent solves

$$V^{t}\left(b_{t-1}, w_t\right) = \max_{\tau_t, T_t, b_{t+1}} u\left(T_t, \tau_t\right) + \beta\left[pEV^{t+1}\left(b_t, w_{t+1}\right) + (1-p)\, EW^{t+1}\left(b_t, w_{t+1}\right)\right]$$

s.t.

$$b_{t+1} + \tau_t\left(1-\tau_t\right)^{\varepsilon} w_t^{\varepsilon+1} = (1+r)\, b_t + \frac{T_t}{2} + \bar{g},$$

giving $\tau_t^{*}\left(b_{t-1}, w_t\right)$, $T_t^{*}\left(b_{t-1}, w_t\right)$ and $b_t^{*}\left(b_{t-1}, w_t\right)$. The opposition's value function is given by:

$$W^{t}\left(b_{t-1}, w_t\right) = \alpha u\left(T_t^{*}, \tau_t^{*}\right) + (1-\alpha)\, u\left(0, \tau_t^{*}\right) + \beta\left[(1-p)\, EV\left(b_t^{*}, w_{t+1}\right) + pEW\left(b_t^{*}, w_{t+1}\right)\right].$$

4. Repeat step 3 until $t = 0$, or until $V^t = V^{t+1}$ and $W^t = W^{t+1}$, in which case the value functions have converged.

We simulate the model with 1000 grid points for b, between $[-2, b_{\max}]$, where $b_{\max}$ is the highest level that can be repaid almost surely or the ad hoc debt limit, whichever is smaller. The lower bound on debt (upper bound on assets) is never binding. Five grid points are used for z, giving five grid points for $w = e^z$. The grid points are chosen using the method of Hussey and Tauchen (1991), whose method we also use to convert the AR(1) process into a discrete Markov chain. The reported simulations have $\bar{t} = 10,000$ and $t_{sim} = 1000$. The simulations' results remain unchanged when $\bar{t} = 1,000,000$. The first 900 simulated periods are discarded, to minimize the effects of initial conditions, and moments are calculated using the remaining 100 periods.

Table I

Components of Government Expenditure

Average correlation of cyclical component with the cyclical component of GDP

	High-Income Countries	Developing Countries
Total Government Expenditure	-.12	.37
Government Consumption	.21	.23
Government Capital Formation	.29	.30
Government Interest Expenditure	.29	.30
	High-Income Countries	**Latin America**
Social Security Transfers	-.26	.11

Cyclical component estimated using Hodrick-Prescott filter with a smoothing parameter of 100 (annual data)
Source: Interest expenditure and social security transfers for Latin America from the International Monetary Fund's Government Finance Statistics. Social social security transfers for high-income countires and corresponding real GDP are from the OECD. All other data are from IMF WEO.
Correlations are between 1970 and 2003.
n=81 for developing countries and n=21 for high-income countries, except capital expenditures where the number of observations is for high-income countries drops to 20.
For interest expenditrures n=20 for high-income countries and n=66 for developing countries.
For interest expenditures, the time period of the correlation varies from country to country.
Latin American countries included in the sample are Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Panama Paraguay and Uruguay.

Table II

Correlation between Government Expenditures and GDP

Comparison along the business cycle

	Developing Countries
All Periods	.37
Excluding Crises	.33
Periods with Ouptut Above Trend	.25
Periods with Ouptut Below Trend	.29

Cyclical component estimated using Hodrick-Prescott filter with a smoothing parameter of 100 (annual data)
Source: IMF WEO. Correlations are between 1970 and 2003.
Crisis periods are defined as periods when the cyclical component of GDP is two standard deviations below trend or lower.
n=81

Table 3

Average Ethnic Fractionalization

Standard Errors in Parenthesis

	Countries with countercyclical government expenditures	Countries with procyclical government expenditures
	.26 (.052)	.49 (.029)
n	20	82

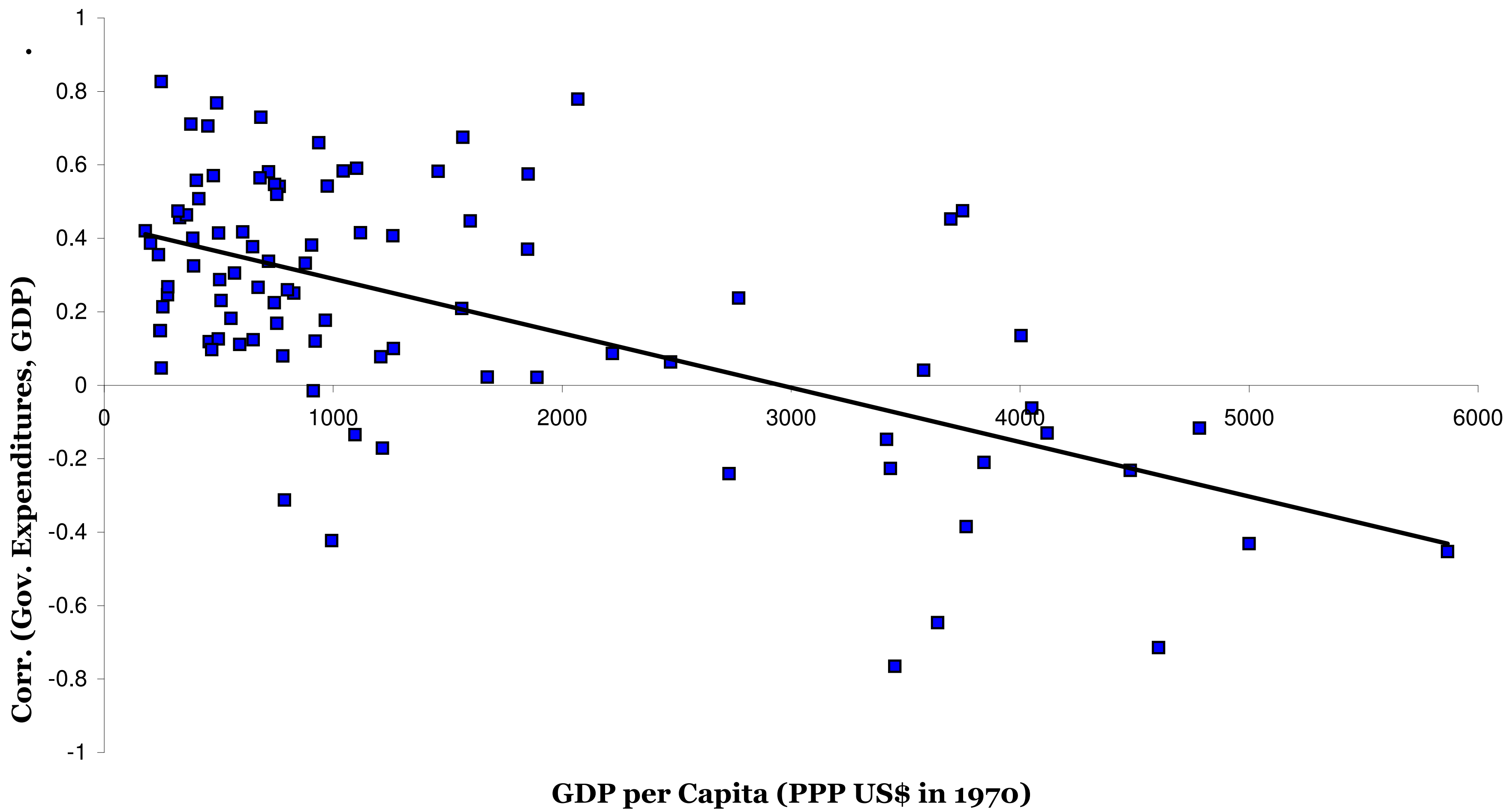
Source: Fractionalization data from Alesina et al (2003).
Fiscal data is in annual frequency from IMF WEO. Correlations are between 1970 and 2003.
Cyclical components estimated using a Hodrick-Prescott filter.

Table IV

Parameter Values

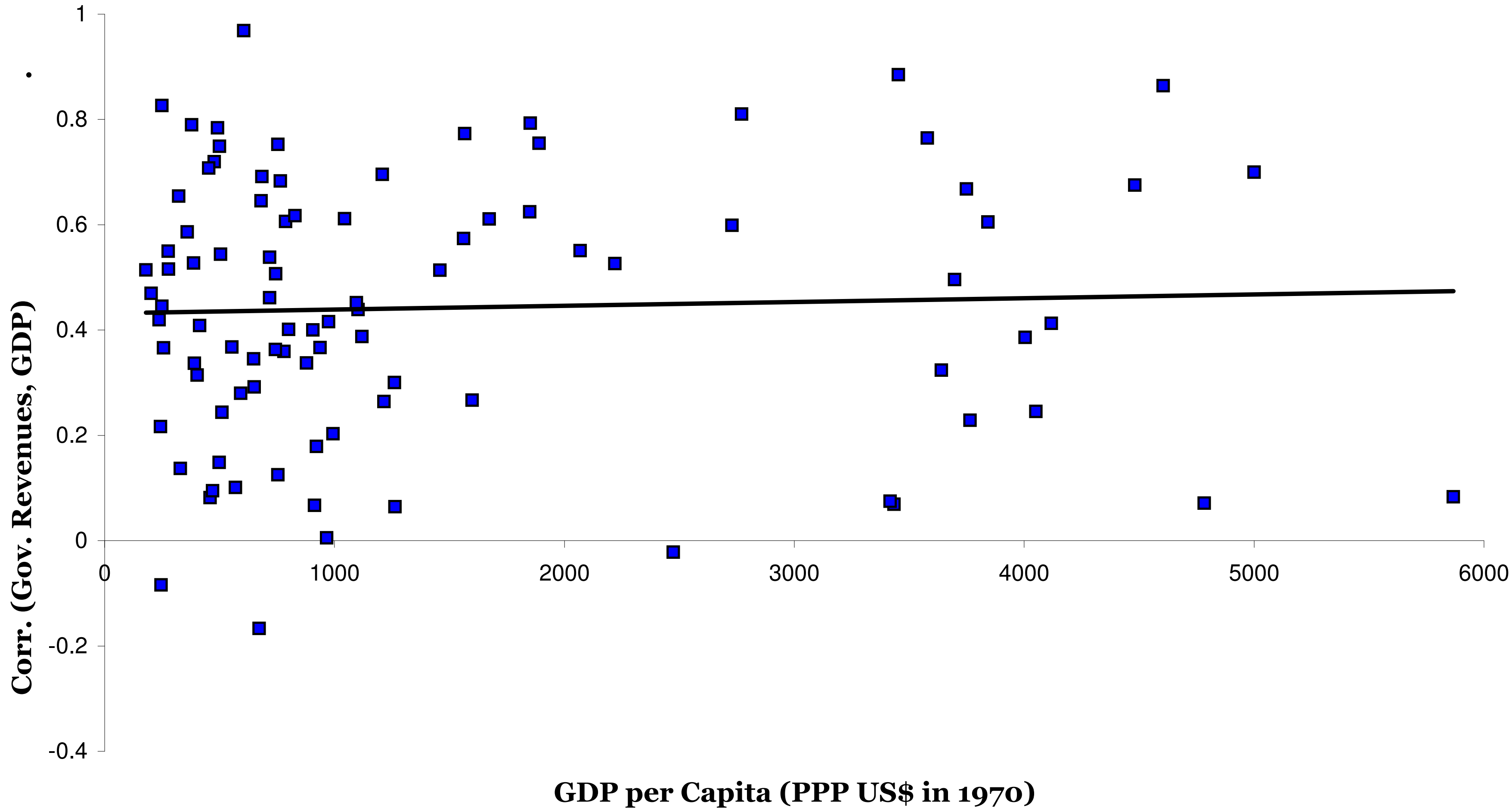
Parameter	Value (U.S./Argentina)	Source
σ	.0144 / .079	Cooley and Precott (1995), adapted to annual data / Author's estimate from IMF WEO data
ρ	0.81 / 0.56	Cooley and Precott (1995), adapted to annual data / Author's estimate from IMF WEO data
γ	2	
ε	1.7	Greenwood, Hercowitz, and Huffman (1998)
r	2.4% / 6.4%	Average annual real yield on 10-year U.S. Treasury Bonds (source: IMF) augmented by 400 basis points which was a typical bond spread for Latin American Economies in the 1990s (Table 3 in Eichengreen and Mody (1998))
β	0.976 / .934	Set to match the average debt-to-GDP ratios between 1970 and 2003 of 43% in the U.S. (source: Congressional Budget Office) / 19% in Argentina (source: World Bank Debt Tables and IFS).
g/GDP	11% / 4.5%	Average central government consumption as a percent of GDP over the period in the U.S./Argentina
p	0.9 / 0.8	Average probability that incumbent's party retains office in a given *year* in the U.S. / Argentina in the 20th century.

Figure I: Cyclicality of Government Expenditures vs. GDP per Capita



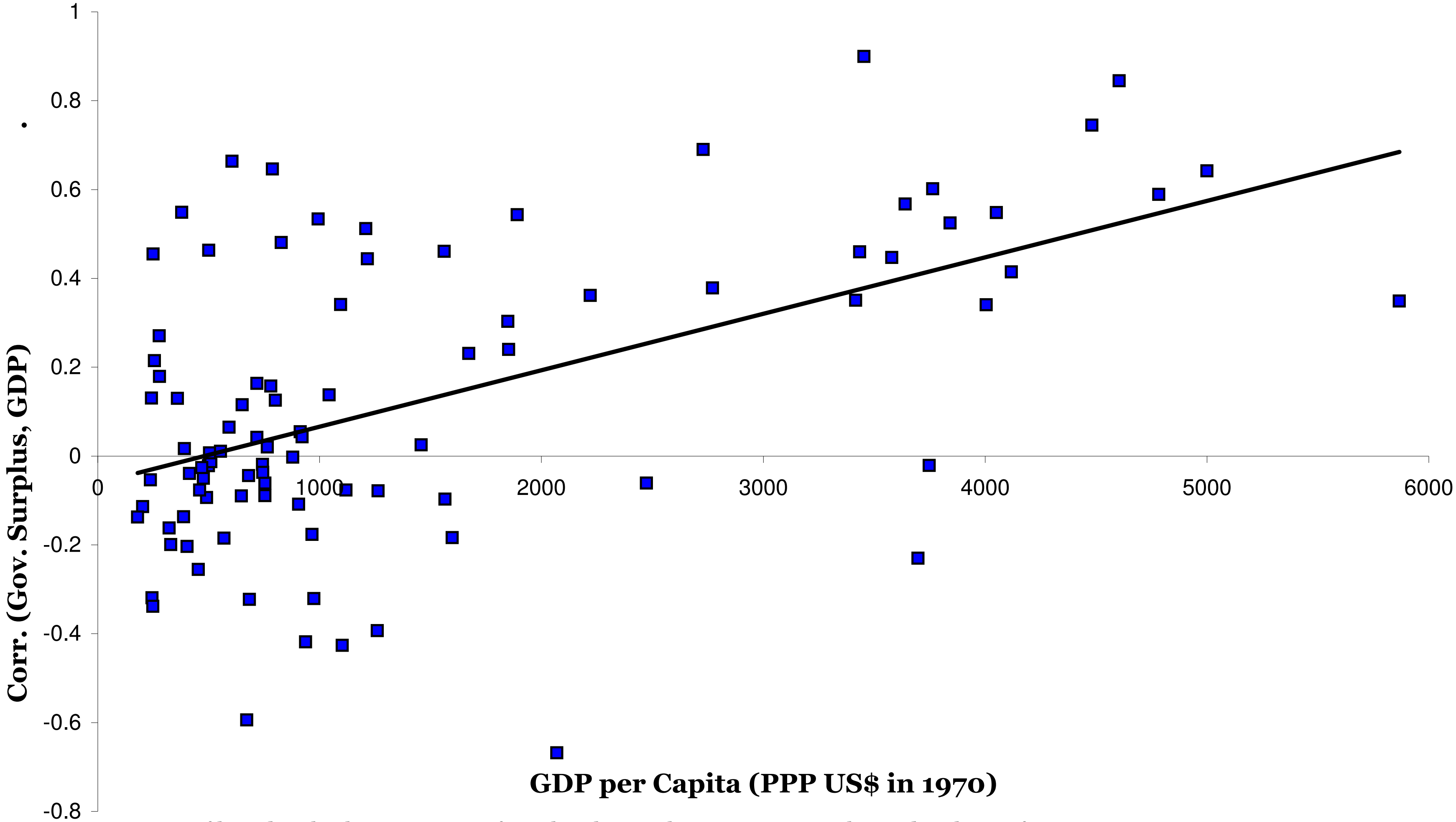
HP-filtered cyclical components of total real central government expenditures and real GDP from 1970 to 2003, using IMF WEO data. PPP GDP per capita in US$ in 1970 is from the Heston, Summers, and Aten (2002) database.

Figure II: Cyclicality of Government Revenues vs. GDP per Capita



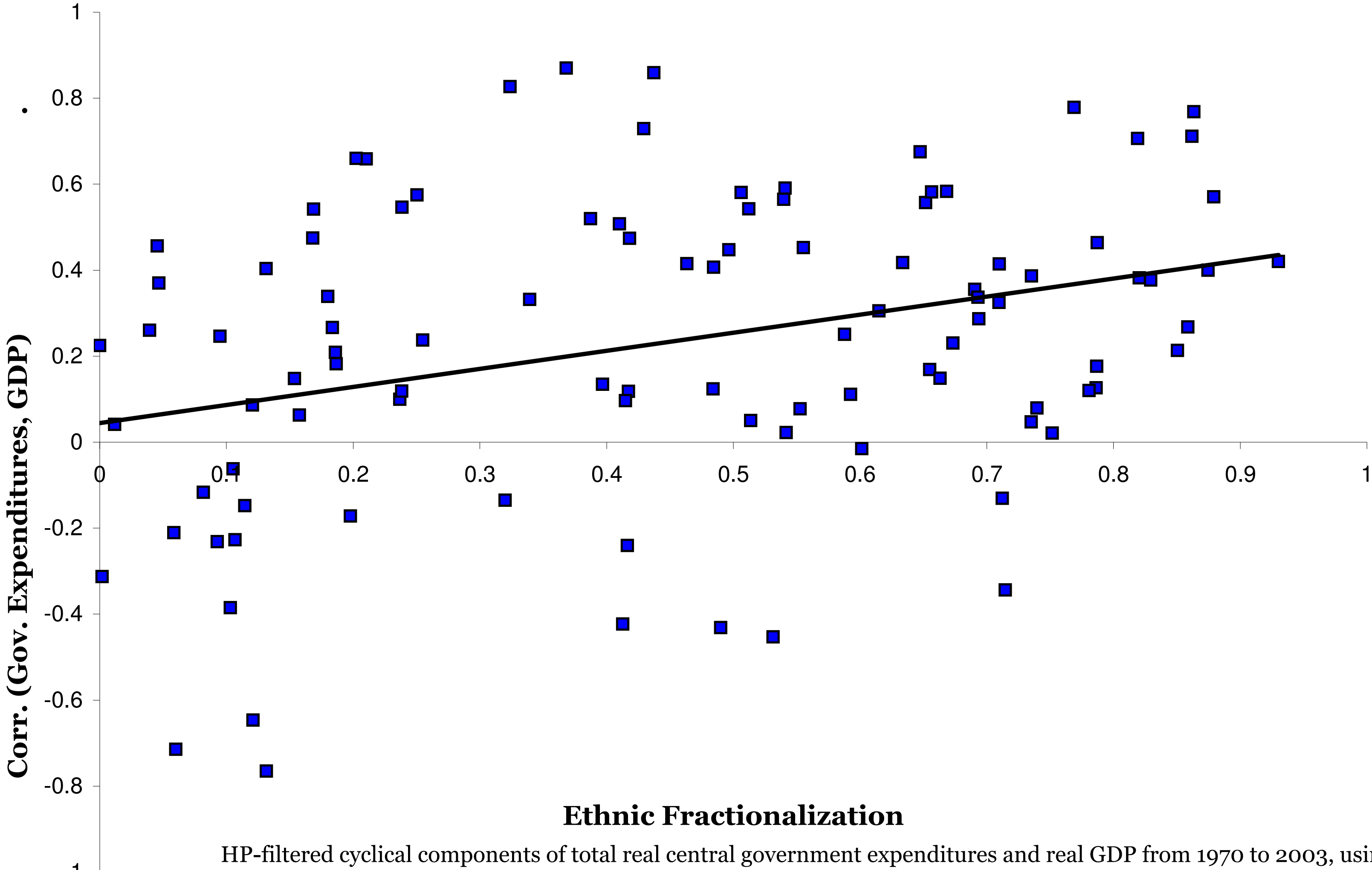
HP-filtered cyclical components of total real central government revenues and real GDP from 1970 to 2003, using IMF WEO data. PPP GDP per capita in US$ in 1970 is from the Heston, Summers, and Aten (2002) database.

Figure III: Cyclicality of Government Surplus vs. GDP per Capita



HP-filtered cyclical components of total real central government surplus and real GDP from 1970 to 2003, using IMF WEO data. PPP GDP per capita in US$ in 1970 is from the Heston, Summers, and Aten (2002) database.

Figure IV: Cyclicality of Government Expenditures vs. Ethnic Fractionalization



HP-filtered cyclical components of total real central government expenditures and real GDP from 1970 to 2003, using IMF WEO data. Ethnic fractionalization index from Alesina et al (2003)

Figure V: Government Expenditures and Political Cohesion

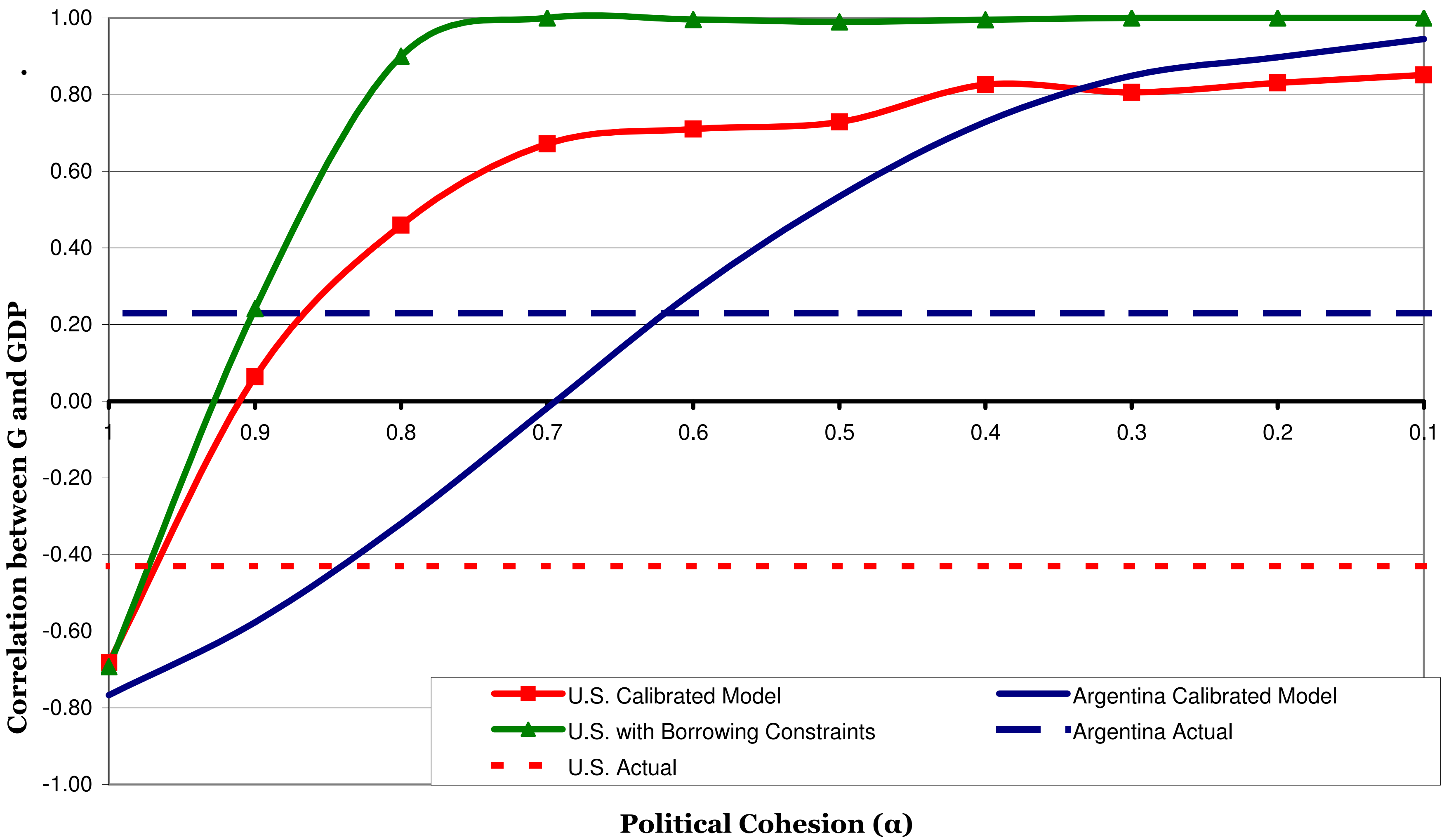


Figure VI: Government Revenues and Political Cohesion

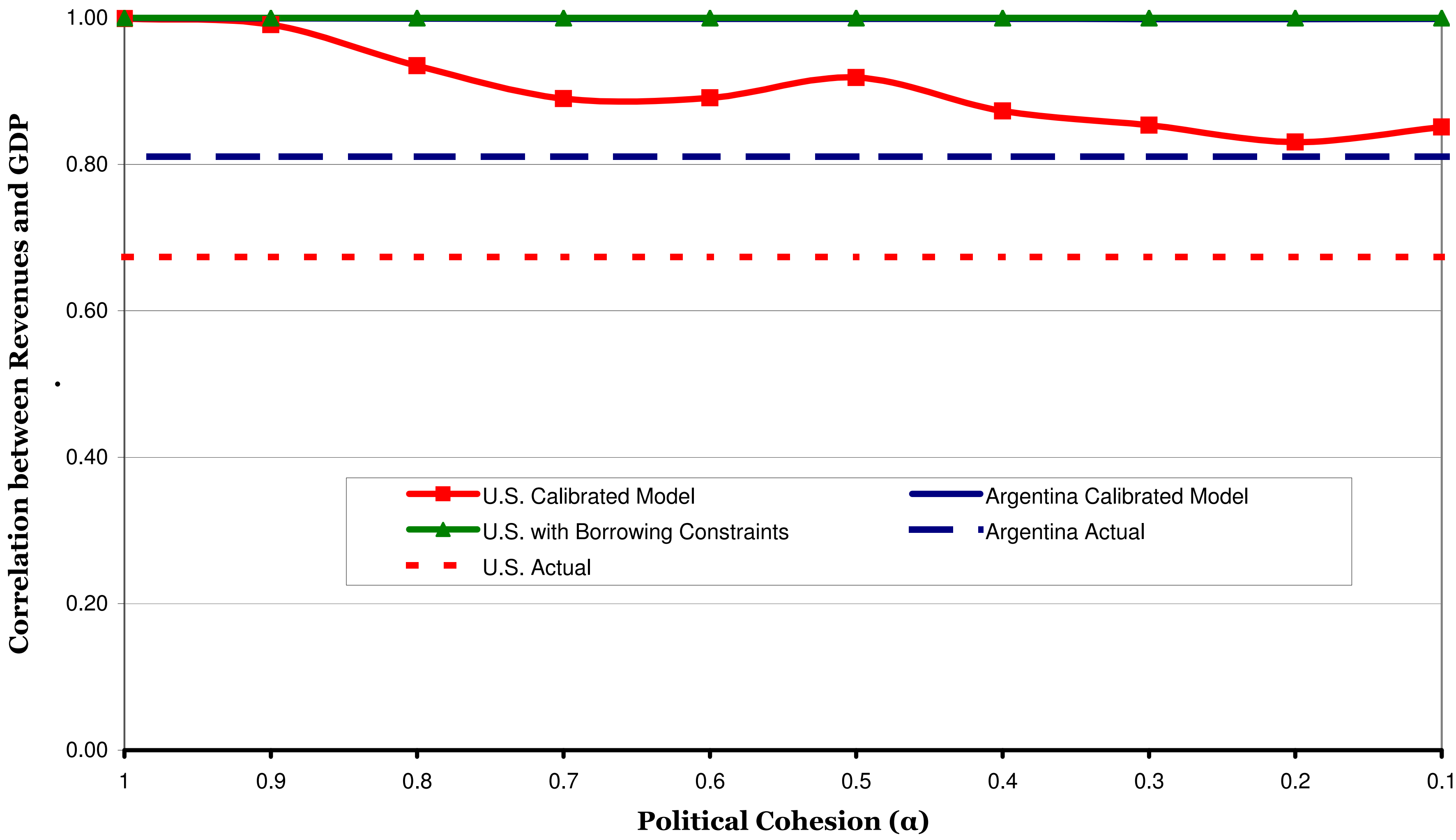


Figure VII: Government Deficit and Political Cohesion

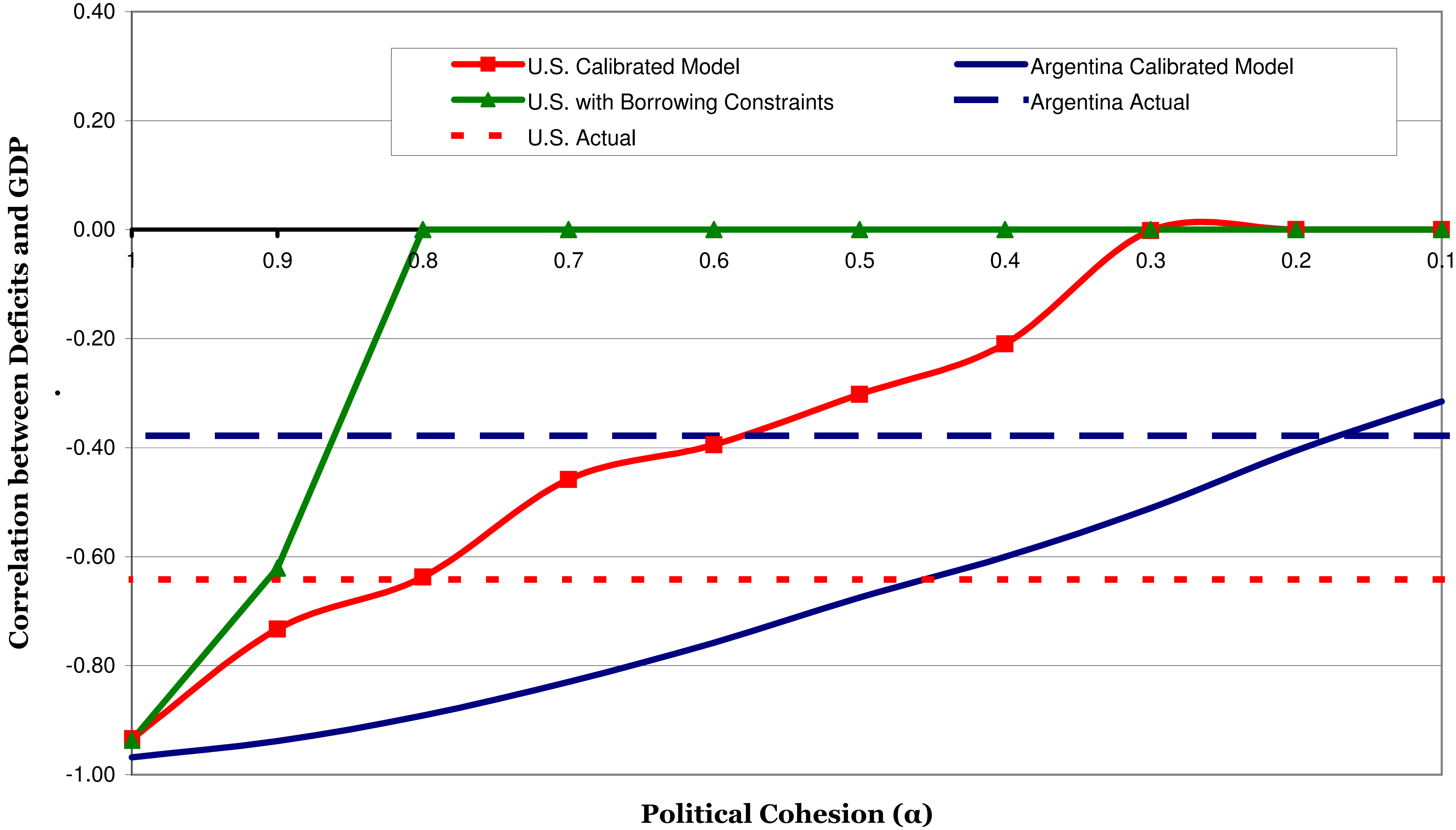


Figure VIII: Government Expenditures and Political Cohesion
Comparing Values of p