한국경제학보 제 12권 제 1 호
The Korean Journal of Economics Vol. 12, No. 1 (Spring 2005)

The Political Economy of Social Polarization and Macroeconomics :

Fiscal Instability, Growth Collapse, and Inflation

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Abstracts

This paper analyzes the theoretical linkage between social polarization and macroeconomic problems of fiscal instability, poor growth and high inflation. Social polarization is one of the oldest ideas found in the political economy literature. Yet there are very few (or no) systematic theoretical studies on the role of social polarization in fiscal policy-making process and in the development of aforementioned problems. We contribute to the literature by developing a dynamic model of fiscal policy in a simple growth framework where social polarization (of preferences) plays a central role in macroeconomic dynamics. In a highly polarized society, a deficit occurs endogenously, fiscal spending path becomes more volatile, output collapses, and economic growth rate is reduced along the transition path to a new lower level of output. Thereby, we offer a fiscal instability channel that negatively links social polarization and growth, which is an alternative yet distinct explanation for the empirical finding that social polarization is harmful to growth. Lastly, we extend the model to study the inflationary consequence of fiscal deficit in relation to social polarization. It is shown that the higher the degree of polarization, the higher the steady state inflation. However, an increase in the money bond ratio in the deficit financing may be less inflationary for any given degree of polarization.

Keywords: Social Polarization, Fiscal Deficit, Fiscal Volatility, Growth Collapse, Inflation.

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I. Introduction

This paper studies the theoretical linkage between social polarization and macroeconomic problems of fiscal instability, growth collapse and high inflation. In discussing issues of macroeconomic policy, the traditional approach has been to assume that policymakers maximize the welfare of a representative agent or a social welfare function and to study optimal policy under this assumption. However, recurrent macroeconomic policy failures, which manifested themselves in unsustainable macroeconomic imbalances (domestic and external) observed in many countries in the past decades, are at odds with the traditional optimal policy prescription. For example, in a comprehensive study of public sector deficit, Easterly *et al.* (1994) conclude that large fiscal deficits are mainly explained by conscious fiscal policy choices and not by external or by domestic macroeconomic shocks. Indeed, it has been increasingly recognized that the policymakers often have their own objectives other than maximizing social welfare, and strategically interact with other current, future policymakers or with the public. They may represent the interests of particular groups or simply care about remaining in office. A rapidly growing political economy literature has produced theories and empirical work to explain how socio-political and institutional factors determine macroeconomic policy and its outcomes in many different contexts (See Drazen, 2000; Persson and Tabellini, 1999 for a literature survey).

In this paper, we contribute to the literature by developing a non-representative agent model of endogenous fiscal policy in which social polarization (more precisely, polarization of preference for types of government spending between socio-economic groups) plays a central role in generating fiscal instability, growth collapse and high inflation. Thereby, we emphasize that society's polarization and

degree of polarization are key factors underlying policy decisions that are responsible for such undesirable macroeconomic outcomes. Intuitively, a high degree of social polarization of preferences may make it hard for policymakers to agree on ideal government policies because of potential conflicts of interests, and hence may cause a coordination failure among the policymakers. In the presence of polarization of social preferences over public choices, heterogeneous policymakers may have greater incentives to insist on their preferred policies and may end up choosing individually rational but collectively inefficient policies, especially when institutional restraints on policymakers are lacking — for example, adoption of unsustainable fiscal policies that lead to large budget deficits, volatile fiscal outcomes, growth collapses and high inflation. We formalize this intuition in a non-cooperative dynamic game model of fiscal policy in a simple endogenous growth framework, and derive the key equations that positively link the degree of social polarization (of preferences) to the macroeconomic problems. The present paper draws heavily on our previous work on this subject, in Woo (2005a). While presenting a stripped-down version of the previous model, we extend the model to study the inflationary consequence of fiscal deficit in relation to social polarization.

Social polarization is one of the oldest ideas found in the political economy literature. Political scientists often distinguish between two major types of social polarization or socio-political conflict: economic cleavage and cultural cleavage (Powell, 1982). An important source of economic cleavage is unequal income distribution. The idea that inequality deepens factionalism and dissension in a society is really an old one. For example, James Madison noted in 1787 that "the most common and durable source of factions has been the various and unequal distribution of property." Social polarization that arises from struggles over the income distribution or ethnic divisions has long been mentioned as an important explanation for recurrent populist

fiscal policies and macroeconomic crises in Latin America and sub-Saharan Africa. Conversely, initial low income inequality in East Asia seems conducive to economic growth by promoting stable macroeconomic environment and encouraging human capital accumulation(See Woo, 2003b; Engerman and Sokoloff, 1997, 2002; Rodrik, 1996; Birdsall *et al.*, 1995; Kauffman and Stallings, 1991 and Sachs, 1989 among others). Empirical growth literature has also found that income inequality and ethnic divisions are detrimental to growth (See Woo, 2005c, 2004; Easterly, 2002; Easterly and Levine 1997; Alesina and Rodrik, 1994 among others).[1] Yet there are very few (or no) systematic theoretical studies on the role of social polarization (of preference) in fiscal policy-making process and in the development of aforementioned macroeconomic problems.[2] We fill this void in the literature by demonstrating how social polarization can cause the aforementioned fiscal and growth problems.

On the other hand, Woo (2003b) studies how social polarization of

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1) Some studies exploiting the panel dimension of the data report a zero, non-linear, or even positive relationship between income inequality and growth. Related studies are Forbes (2000) and Barro (2000). Easterly (2002) discusses why there are conflicting results in the empirical literature on inequality and growth, and finds high inequality to have a large and statistically significant negative effects on human capital accumulation and institutional quality and hence on economic growth through these channels.

2) Woo (2005a) is the first theoretical paper of its kind that highlights the distinct roles of social polarization and political uncertainty in generating fiscal deficits, volatile fiscal outcomes and output collapses, and in reducing growth along a transition path to a steady state in a unified approach. The introduction of both social polarization and political uncertainty yields richer implications for the fiscal dynamics and capital accumulation process. For simplicity, however, the present paper focuses only on polarization.

A partial exception is Alesina and Tabellini (1990) who briefly discuss the linkage between polarization and budget deficit in a different mechanism. Let alone the different mechanism we employ in our paper (i.e., the common pool setting), however, in this type of model it is not the polarization of preference *per se* but the re-election uncertainty that is the critical condition for an endogenous deficit to arise. (See also Chari and Cole, 1993b on this point.) If the government is not faced with the re-election uncertainty, deficit bias would not occur regardless of the opponent's preference.

preferences on different fiscal policies can arise from the interaction between initial income distribution and industrialization process that introduces modern manufacturing technology which combines complementary inputs, physical capital and human capital. The main argument is that in an economy with two sectors, manufacturing and traditional, the more unequal the initial income distribution, the larger the sectoral income gap during industrialization, and the more likely the polarization of sector preferences for different types of government spending.

Here we consider an economy in which each policymaker maximizes her own utility from her public good provision that may benefit a specific group (or sector) more than the other. When the preferences for types of government spending differ substantially among policymakers (or equivalently among the groups they represent), a fiscal deficit occurs endogenously. Each policymaker is aware that whatever government resources she does not exploit may or may not be available for the future provision of her preferred public good, depending on the other's spending decision. Thus, when they disagree on the ideal composition of government spending, each has an incentive to overexploit the common resource today and exerts (net) negative externality on the other, contributing to bigger overall spending and a larger deficit than the social optimum. The size of deficit rises with the degree of preference polarization because of the positive relationship between the preference polarization and the incentive to exploit the common resources (polarization effect).

The interaction between the shock to the government revenue and the policymakers' incentives to exploit it in the presence of the dynamic negative externality operated by the preference polarization implies that a shock to tax revenue is translated into a more than proportional change in spending. If the degree of polarization is positive, then government spending rises (falls) more than proportionally in response to a positive (negative) shock to tax

revenue. This can shed light on the pro-cyclicality of fiscal policies observed in a number of countries, which sharply contrasts with the conventional wisdom of Keynesian tradition that fiscal policy should be 'counter-cyclical.'[3] (See Woo, 2005b; Kaminsky *et al.*, 2004; Gavin and Perotti, 1997 for evidence.)

The output level and the transition dynamics of economic growth also depend crucially on polarization. A fiscal deficit arising from polarization leads to inefficient capital accumulation in the private sector, and permanently lowers the levels of capital stock and output in the economy. The welfare cost of permanently reduced consumption due to the polarization effect can be substantial. It may amount to 35 percent of GDP at the steady state, if we calculate using the OECD data. In the presence of polarization, the economic growth rate is also reduced along a transition path to a new steady state of a lower level of output. The transitional dynamics of growth as a function of polarization is characterized.

Finally, we extend the model to incorporate money and inflation and study inflationary consequences of the fiscal policy set by polarized policymakers. In many countries which have suffered from extreme inflation, the fiscal consequences of the debt crisis seem to be the initiating disturbances (Dornbusch *et al.*, 1990). Consistent with this observation, we show that if there is a high degree of polarization and hence a large debt accumulation results, this economy has high steady state inflation when the government turns to money financing.[4] However, an increase in the money-bond ratio in the deficit finance is

3) The fiscal pro-cyclicality implies the fiscal policy being expansionary in good times (boom) and contractionary in bad times (recession).

4) Patinkin (1993) provides a supportive observation based on Israel's high inflation experience in the mid 1980s. He regards high inflation as being resulted from the prisoners' dilemma in the coalition government, in which out of fear that his position relative to that of other minister may be worsened, each minister insists on his increased nominal budget and the overall budget whose planned expenditures exceed its expected revenues then generates an inflation. Also, see Aizenman (1990).

shown to be less inflationary for a given degree of polarization.[5] This is because as each policymaker tries to finance his expenditure through inflation tax, this increases the inflation rate which, in turn, reduces the private agent's real money demand (i.e. tax base). Therefore, they cannot spend as much as they would with pure debt-finance.

Our fiscal mechanism is related to a large literature on fiscal politics (See Drazen, 2000), and particularly to the common pool problem approach. The related papers are Weingast *et al.* (1981), Chari and Cole (1993a), Tornell and Lane (1998), Hallerberg and von Hagen (1999), and Velasco (1999). Under this approach, an excessive spending or deficit (i.e., an overexploitation of a common property) can arise because each interest group enjoys the full benefit of a specific public spending, while it pays only a fraction $1/n$ of the cost (i.e., the cost spread through generalized taxation). These studies typically consider n-player symmetric games (although in different contexts), addressing issues of whether an increase in the number of groups n leads to a worse economic outcome, the possibility of delayed fiscal reforms, or the effect of budgetary institutions on the size of deficits.

Here we address different issues, however. In general, the heterogeneity of preferences among the players is one factor that has not been well-understood as critical to the coordination failure (i.e., dynamic negative externality) in collective action in a common pool setting. So is the subjective discount factor of the players, for example, which reflects the political uncertainty facing policymakers. In Woo (2005a), a general model is developed that introduces two new dimensions of preference polarization and political uncertainty into a

5) Turnovsky (1978), Calvo (1985) and Liviatan (1984, 1988) study the implications of changing the money-bonds ratio in deficit financing for an *exogenously given* government spending. Turnovsky (1978) and Liviatan (1983) also find that an increase of money financing can be less inflationary.

two-player common pool game.[6] Preference polarization and discount factor are shown to be critical conditions for the dynamic negative externality to become operative in the common pool context. The paper clearly brings out the different roles of polarization and political uncertainty (reflected in the discount factor) in generating fiscal deficits, volatile fiscal outcomes and output collapses, and in reducing economic growth along a transition path to a steady state. Not only would this help us to theoretically identify critical conditions leading to overexploitation of the common resources, but also would yield richer, yet distinct, theoretical and empirical implications for fiscal dynamics and the capital accumulation process as shown in the paper. For example, our result suggests that the common pool problem would be more likely to occur and be more severe in societies with higher degrees of polarization (and/or political instability). By sharp contrast, the existing literature tends to associate the severity of the common pool problem with the number of participants in the collective decision-making process. However, the theoretical relationship between the number of groups and the common pool problem is fragile because it turns out to depend crucially on the assumptions about the shape of utility function (See Kontopoulos and Perotti, 1999).

Moreover, we go well beyond the issue of budget deficit. In contrast, the existing models of fiscal deficits do not address the volatility or pro-cyclicality of fiscal outcomes, let alone economic growth and inflation. The innovation of our paper is that the size of fiscal deficit, the magnitude of fiscal volatility, and the decline in output and economic growth rate are explicitly shown to be increasing functions of the degree of social polarization (and of political uncertainty : See Woo 2005a).

Last but not the least important, we offer an alternative explanation

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6) Thus, a typical two-player common pool model in the existing literature can be viewed as a special case in our framework.

for an important empirical finding that social polarization is harmful to economic growth: a fiscal instability channel. This can be viewed as alternative but distinct from the redistributive policy channel proposed by Alesina and Rodrik (1994) and Persson and Tabellini (1994). In their models, distributive conflicts within a society lead the government to engage in redistributive spending that may be harmful to growth. However, there is a lack of empirical support. What matters for growth in their models is the distortion caused by income tax that accompanies redistributive spending. Perotti (1996) does not find any negative relationship between tax variables and growth. By contrast, our theoretical explanation is highly plausible since fiscal deficits are found to be harmful to growth in numerous empirical growth studies (Fischer, 1993, to begin with). And recently Woo (2003a, 2003b) finds strong evidence that social polarization, as measured by income inequality, is robustly and positively associated with fiscal deficits and fiscal volatility in comprehensive empirical analyses. Also, social polarization is highly positively associated with greater aggressiveness of use of discretionary fiscal policy that aggravates macroeconomic instability, which, in turn, reduces economic growth (Woo, 2005c).

The plan of the paper is as follows. Section II presents a simple endogenous growth model with optimizing interest groups. Section III derives an endogenous government fiscal policy and establishes our main results on the linkage between social polarization and fiscal instabilities. Section IV analyzes the effect of this endogenous fiscal policy on the capital accumulation and growth in the presence of polarization. This is followed by an extension of the model into the case of inflationary financing of fiscal deficits in relation to polarization. Our conclusions are in Section VI.

Ⅱ. The Basic Framework

We consider an endogenous growth model with no population growth. The economy is populated by a government and a private sector composed of two groups, indexed by i, $i = 1, 2$. These two groups may represent either capitalists and labor workers, manufacturing (formal) and traditional (informal) sectors, urban and rural sectors, two powerful vested interest (ethnic) groups, or right-wing and left-wing parties. Each group consists of a large number of atomistic individuals. The government and the private sector have perfect foresight. The infinitely-lived representative agent in group i seeks to maximize her lifetime utility, which is additively separable:

$$J^i = \int_0^\infty [\log(c_i) + \lambda_i \log(g_1) + (1-\lambda_i)\log(g_2)]\, e^{-\rho t} dt \quad (1)$$

where c_i is private consumption; g_i and g_2 are two different public goods provided by the government; and ρ is a subjective discount rate, $\rho > 0$. Being small, each member of group i takes g_i as given and has the same preference for the two public goods within the group. But these two groups differ in their preferences for the public goods, which is reflected by λ_i. We assume that $0 \leq \lambda_i \leq 1$, for $i = 1, 2$ and $\lambda_2 \leq \frac{1}{2} \leq \lambda_1$. This implies that group 1 prefers g_1 to g_2 and group 2 prefers g_2 to g_1. Even though the agent in group i may not like the public good g_j, $j \neq i$ as much as g_i, it is included in her utility function because of non-exclusiveness of public goods. We also assume that she derives positive utility from the consumption of public good which is not her most favorite one.[7] We define

7) Provision of public goods can be interpreted as redistribution in that provision of one type of public good benefits a group more than the other group.

$\theta = \lambda_1 - \lambda_2$ and interpret it as the degree of difference in their preferences for two public goods. We can think of θ as a degree of polarization between the two groups. Note that $\theta \in [0,1]$. While $\theta = 1$ implies the complete disagreement on the composition of two public goods between two groups, $\theta = 0$ implies the total agreement in their preferences. We will see the important role played by θ in the evolution of fiscal deficit and fiscal volatility. Also, capital accumulation and growth process depend crucially on θ, as we will show later.

In the economy there are two kinds of real assets: capital, denoted by k, and government bonds, denoted by b. The bonds are assumed to be a perfect substitute for capital and therefore to pay the same rate of interest, r. The dynamic budget constraint of the representative agent in group i is then for $\forall t \geq 0$ and $a_0 > 0$ given,

$$\dot{a}_{it} = ra_{it} - c_{it} - \tau_i \tag{2}$$

where a_{it} is the asset held by an agent and hence $a_{it} = k_{it} + b_{it}$, and τ_i is a lump-sum tax collected by the government from group i.[8] The representative agent in group i maximizes the lifetime utility

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Redistribution which would be politically unacceptable if it were done openly can often be accomplished if it is disguised. See Drazen (2000, Chapter 8. Redistribution).

8) We assume $\tau_1 = \tau_2$. The assumption of lump-sum taxation is mainly for simplicity of algebra and can be relaxed without affecting the qualitative implications in the chapter. In what follows, we mean

$$\frac{dx}{dt} = \dot{x}$$

We also impose the No-Ponzi-Game (NPG) condition:

$$\lim_{t \to \infty} a_{it} e^{-rt} \geq 0$$

As long as marginal utility is positive, the agent will not want to have increasing wealth forever at the rate of r, and that condition will hold as an equality (See Barro and Sala-i-Martin, 2003).

function (1) with respect to c_{it}, subject to equation (2) and No-Ponzi-Game (NPG) condition, $\lim_{t\to\infty} a_{it} e^{-rt} \geq 0$. We obtain the first-order conditions for this maximization problem as follows:

$$\frac{\dot{c}_{it}}{c_{it}} = r - \rho \tag{3}$$

The budget constraint for the whole private sector is

$$\dot{a}_t = ra_t - c_t - \tau, \quad \forall t \geq 0 \tag{4}$$

where $a_t = a_{1t} + a_{2t}$, $k_t = k_{1t} + k_{2t}$, $b_t = b_{1t} + b_{2t}$, $c_t = c_{1t} + c_{2t}$, and $\tau = \tau_1 + \tau_2$, for all $t \geq 0$ (we normalize as if there is one agent in each group).

Now, we introduce firms that have the linear production function:

$$y = f(k) = Ak \tag{5}$$

where $A > 0$ is the constant marginal product of capital. We can think of capital as encompassing human and nonhuman capital (See Barro and Sala-i-Martin, 2003).

In a competitive equilibrium, the marginal product of capital is equal to the rental price for a unit of capital services. This is the first-order condition for maximization of profit. Therefore, in competitive equilibrium

$$A = r + \delta \tag{6}$$

where δ is a constant depreciation rate and $r + \delta$ is the rental price for a unit of capital services.

From the dynamic budget constraint equation (4), the profit maximization condition equation (6), and the government budget constraint, we get the following (We suppress the time index, t,

when there is no confusion.):

$$\dot{k} = (A - \delta)k - c - g_1 - g_2 \tag{7}$$

Thus, the equilibrium for the private sector is completely described by equations (3), (7), and NPG condition, given government debt, b, and the government budget constraint.

Suppose that the government budget is balanced at each point in time. Then $\dot{b} = 0$ and $b_t = b_0$, $\forall t \geq 0$. Under the balanced budget assumption, the equilibrium capital stock k_t is given by[9)]

$$k_t = \frac{\tau - rb_0}{r} + \frac{2c_0}{\rho} e^{(r-\rho)t} \tag{8}$$

The capital accumulation equation specified in equation (8) will be useful in computing the impact of polarization on capital stock and growth in Section Ⅳ. It is straightforward to see that the asymptotic

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9) First note that the optimal consumption path, $c_{it} = c_0 e^{(r-\rho)t}$, is obtained by solving equation (3). Using (7) and the NPG condition, we get k_t. Under the assumption of a balanced government budget, (7) is

$$\dot{k} - rk = rb_0 - \tau - 2c_0 e^{(r-\rho)t}$$

To solve this first-order differential equation, multiply both sides of the equation by the integration factor, e^{-rt} and integrate it from t to ∞. We then have

$$\int_t^\infty e^{-rt}(\dot{k} - rk)dt = \int_t^\infty e^{-rt}(rb_0 - \tau - 2c_0 e^{(r-\rho)t})dt$$

By applying the NPG condition $\lim_{t\to\infty} k_t e^{-rt} = 0$ to the integration, we can derive (8).

Since $y = Ak$, we easily find the output path by using (8): $\dot{y} = A\dot{k}$

The initial level of consumption, c_0, is determined by the following condition. From (8),

$$k_0 = \frac{\tau - rb_0}{r} + \frac{2c_0}{\rho}$$

and c_0 is thus determined by the initial level of the capital stock, the lump-sum tax, and initial bond holdings.

growth rate of capital $(\dot{k}/k)$ is $A-\delta-\rho$. In fact, the growth rates of consumption, capital stock, and output all asymptotically approach $A-\delta-\rho$.[10] In other words

$$\lim_{t\to\infty}\frac{\dot{k}}{k} = \lim_{t\to\infty} T\frac{\dot{c}}{c} = \lim_{t\to\infty}\frac{\dot{y}}{y} = r-\rho = A-\delta-\rho \qquad (9)$$

For now, we assume that the agents' subjective discount rate is equal to the interest rate, i.e., $\rho = r$, so that capital stock and output stay constant under a balanced budget $(\dot{b}=0)$. Also, note that consumption is constant if $\rho = r$. This assumption is only made to serve as a benchmark and to highlight the main points of the paper. The relaxation of this assumption does not change the qualitative implications, yet it introduces another channel of political uncertainty which produces richer dynamics of the model (See Woo, 2005a for more details on a general case of $\rho \neq r$).

Before we move to government fiscal policy, we make an additional assumption on the timing structure. Policymakers are assumed to simultaneously move before the private sector moves; therefore, when the private sector makes a decision, it has information about government fiscal policy that was determined by policymakers and takes the government policy as given.

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10) Note that in the standard *AK* growth model, there is no transitional dynamics; c_t, k_t, and y_t grow at the constant rate of $A-\delta-\rho$. However, in our paper where we introduce tax and the government bond, the growth rates of k_t and y_t are not constant at $A-\delta-\rho$, but only asymptotically approach that rate. This can be checked in equations (8) and (9). This also implies that changes in polarization affect the growth rate of the economy only along the transition path to the steady state. For more about this, see Section IV. The same is true for political uncertainty. Refer to Woo (2005a) about how changes in the degree of political uncertainty affect the transition dynamics of growth.

Ⅲ. Endogenous Fiscal Deficit and Volatility: Polarization

In the previous section, we took the government budget as given and assumed a balanced budget, $b = 0$. Now we consider the endogenous fiscal policy controlled by two policymakers (interchangeably called ministers) who jointly represent the fiscal authority of the government. We assume that the government can transform the consumption goods produced by the private sector into two non-storable public goods, g_1 and g_2. Two ministers indexed by $i, i = 1,2$, represent the corresponding group, $i = 1,2$, in the private sector. Minister i provides the public good g_i to the private sector, which is financed by government revenues. Each minister, i, derives greater utility from the provision of her favorite public good g_i than from the other g_j, $j \neq i$. Since they may have different preferences for the two public goods and seek to maximize their own utility, two ministers faced by the common government budget constraint behave strategically in determining the amount of public goods they provide.

To describe this endogenous fiscal policy determination process, we consider a differential game between two ministers. Each minister, i, has the following objective function:

$$V^i = \int_0^\infty [\lambda_i \log(g_{1t}) + (1-\lambda_i)\log(g_{2t})]e^{-rt}dt \qquad (10)$$

where $0 \leq \lambda_2 \leq \frac{1}{2} \leq \lambda_1 \leq 1$, and the minister's discount rate is assumed to be equal to the interest rate, r.[11] Minister i prefers g_i to g_j,

11) Each minister's utility is assumed not to depend on her consumption, which might bias the policies towards an oversupply of public goods. Yet the assumption that the discount factor is equal to the interest rate delivers a constant consumption path as one can see from equation (3). Without loss of

$j \neq i$ and $i,j = 1,2$ which implies that she puts more weight on her favorite public good, g_i, in her utility function. Minister i shares the same weight λ_1 with her favorite group, so that $\theta = \lambda_1 - \lambda_2$ is also the degree of preference polarization between the two ministers.

Now we turn to the budget constraint of the government which faces the ministers. The government collects the lump-sum tax of τ from the private sector (with normalization of the number of agents in each group to one). Government expenditures can also be financed by issuing bonds at a constant real rate of r. The government budget constraint at each instant is then

$$\dot{b} = rb + g_1 + g_2 - \tau \tag{11}$$

where b is the stock of national debt.[12]

Each minister i chooses her control variable, g_i, so as to maximize her utility function (10) subject to the government budget constraint equation (11) and the NPG condition for every possible choice of the other minister's control variable g_j, $j \neq i$. Here we employ the *feedback Nash equilibrium concept*, which allows players to revise their actions through time as the game evolves, and therefore is subgame perfect and time-consistent.

To facilitate the computation of equilibrium in this game, we define government net revenue, R_t, as

$$R_t = \tau - rb_t \tag{12}$$

In general, the feedback strategy is a function of time and state;

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generality, we can normalize the constant consumption to 1. Then $\log \bar{c} = 0$ justifies the specification of the utility form.

12) Note that the No-Ponzi-Game condition relevant for the government budget constraint is

$$\lim_{t \to \infty} b_t e^{-rtb} = 0$$

however, very few differential games can be solved in closed form because the first-order condition for this feedback Nash equilibrium involves a system of partial differential equations. In order to get a closed-form solution, we restrict the strategy set to linear *Markov* strategies that depend on the pay-off relevant current state as follows:[13]

$$g_{it} = \chi_i R_t \tag{13}$$

where χ_i will be endogenously determined as a part of the solution. We assume that the set of strategies is $\chi_i \in [0, \infty)$.

The feedback Nash equilibrium in this game, which is also the Markov perfect equilibrium, is (See Woo, 2005a for derivation of the solution):

$$\chi_1^* = \lambda_1,\ \chi_2^* = (1-\lambda_2);\ \text{and hence}\ \ g_{1t}^* = \lambda_1 R_t,\ g_{2t}^* = (1-\lambda_2) R_t \tag{14}$$

Substituting $g_{it}^* = \chi_i^* R_t$ and $R_t = \tau - rb_t$ into equation (11) yield

$$\dot{b} = (\lambda_1 - \lambda_2)(\tau - rb) = \theta(\tau - rb) \geq 0 \tag{15}$$

Whenever there are differences in the ministers' preferences for two public goods (i.e., $\theta > 0$), there occurs an endogenous fiscal deficit, $\dot{b} > 0$.[14] This result is due to the strategic behaviors of these ministers who have different preferences, but share the government budget. Each minister is aware that whatever government resources she does

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13) In the differential game literature, it is very common to consider linear strategies due to the aforementioned technical complications. See Fudenberg and Tirole (1992).

14) However, the growth of debt is not explosive. If we solve the differential equation (15) for b_t, assuming $b_0 = 0$, for simplicity, we obtain $b_t = \frac{\tau}{r} - \frac{\tau}{r} e^{-\theta r t}$. Thus the NPG (No-Ponzi-Game) condition is satisfied: $\lim_{t \to \infty} b_t e^{-rt} = \left(\frac{\tau}{r} - \frac{\tau}{r} e^{-\theta r t}\right) e^{-rt} = 0$.

not exploit may or may not be available for future provision of her preferred public good, depending on the spending decision of the other minister.[15] Thus, when they disagree on the ideal composition of government spending, each has an incentive to overexploit the common resource today. The polarization of preference leads each policymaker to insist on a higher spending for her favorite sector and to exert (net) negative externality on the other, contributing to bigger overall spending and a larger deficit than the social optimum.

Moreover, the incentive for each minister to overexploit the government revenues increases with the amount of disagreement between the two ministers (polarization effect). This implies that the size of the *current* budget deficit is a positive function of the degree of polarization.

Along with this result, the intertemporal budget constraint implies that polarization is positively associated with greater changes in fiscal outcomes over time, such as spending and fiscal balance for a given path of tax revenue. The greater the polarization is, the larger the fiscal spending and current fiscal deficit are. But this only raises the debt level more quickly and reduces available government resources, which forces policymakers to cut tomorrow's spending by more.[16] The intertemporal budget constraint means that larger deficits today

15) It is not the level of tax that causes a deficit in our model. This result holds true for any given level of tax revenue.

16) It should be noted that our model is not related to the Ricardian equivalence experiment. The Ricardian equivalence proposition implies that the timing of taxes does not matter as long as the present value of taxes is equal to the present value of government spending plus the value of the initial government debt. This is because the government spending path is exogenously given, whereas taxes are endogenous. In sharp contrast, government spending is endogenous, while taxes are exogenous in our model. Therefore, government debt acts like net wealth for the private sector. Recall that the level of initial consumption depends on the initial levels of capital stock and government bond holdings, and the lump-sum tax. In the Ricardian world, higher bond holdings just mean a higher present value of future taxes, which makes government bonds irrelevant for consumption. In our model, however, higher initial bond holdings reduce the present value of future government spending.

must be met by larger surpluses tomorrow, causing an even bigger swing of fiscal policy over time.

Importantly, an economy with a higher degree of polarization will exhibit greater fluctuations in fiscal spending in response to shocks to government revenues. We can illustrate this point by using the solution for g_i^* and g_2^*. Using equation (14), we can write the total government spending $(\tilde{g})$ at time t as

$$\tilde{g}_t = g_{1t}^* + g_{2t}^* = (1+\theta)(\tau - rb_t) \tag{16}$$

For any point in time t, government spending is proportional to the net tax revenue $\tau - rb$. Note that the policymaker revises her action at each instant on the basis of the state at that point in time, which should be $\tau - rb_{t-}$. Thus, if we take the total differentiation on this equation at an instant $t+$, then

$$\frac{d\tilde{g}_{t+}}{d\tau} = (1+\theta) \geq 1, \text{ with equality when } \theta = 0 \tag{17}$$

This yields a striking prediction that government spending rises more than proportionally in response to an increase in tax revenue if the degree of polarization is positive $(\theta > 0)$. Whenever there is a positive (negative) shock to the government net revenue, it is translated into a more than proportional increase (decrease) in government spending in the presence of polarization.[17] The absolute

17) This result is reminiscent of the voracity effect in Tornell and Lane (1999) that interest group's total appropriation of the economy capital stock rises more than proportionally to the windfall to the capital stock. Although the motive and the issues we address in our paper are sharply different from theirs, the underlying mechanism for both polarization effect and voracity effect is the negative externality in common pool settings. Aside from other major differences from the existing common pool problem literature, the novel feature of our paper is that we not only demonstrate that the polarization of preferences (and the political uncertainty, as is shown in Woo (2005a) cause the fiscal volatility to arise endogenously but also fully show that the size of

size of the change in $\tilde{g}$ will be even greater with the size of θ. The intuition behind this result is quite similar to that behind the polarization effect. Recall that the equilibrium Markov strategy in equation (14) calls for minister 1's spending to be equal to the multiproduct of λ_1 (or $(1-\lambda_2)$ for minister 2) and net tax revenue R. For a given shock to tax revenue $\Delta\tau$, minister 1 will claim $\lambda_1 \times \Delta\tau$, while minister 2 will want to increase her favorite spending by $(1-\lambda_2)\times\Delta\tau$. Unless $\lambda_1 = \lambda_2 = 1/2$, it will result in a more than proportional increase in total spending $(\Delta\tilde{g} = (1+\theta)\times\Delta\tau)$. In the case of complete agreement $(\lambda_1 = \lambda_2 = 1/2)$, the increase in tax revenue will be evenly split between two types of spending so that a balanced budget is maintained.

This result help us explain the pro-cyclicality of fiscal policies observed in a number of countries, which sharply contrasts with the conventional wisdom of Keynesian tradition that fiscal policy should be 'counter-cyclical' (Woo, 2005b; Kaminsky *et al.*, 2004; Gavin and Perotti, 1997). For example, during a boom (recession), the fiscal spending rises (falls) more than tax revenue does, causing a deficit (surplus) over this period. This pro-cyclicality can be explained in our framework. Suppose that the tax revenue is no longer a lump-sum tax but an income tax, $T = tY$, where t is a fixed tax rate and Y is a total output of the economy. If Y and T rise during a boom in a country with high polarization, total spending $\tilde{g}$ rises more than proportionally, yielding a pro-cyclical pattern of fiscal spending.

One can show that the non-cooperative feedback Nash equilibrium

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fiscal volatility itself is an increasing function of the degree of polarization and the discount factor, which yields a new testable prediction. Moreover, the polarization of preference and the discount factor are shown to be the critical conditions for the dynamic negative externality to become operative in a more general two-player common pool games. Therefore, the kind of voracity effect cannot occur in our framework, if (i) there is no polarization of preferences, and (ii) players are patient enough. See Woo (2005a) for more details.

outcome that arises in the presence of social polarization, and the resulting budget deficit and fiscal volatility are not socially optimal. The social planner's solution requires that the government budget balance all times, and exhibits a smooth fiscal spending path.[18] We can summarize the above results as a proposition.

Proposition 1

(i) The higher the degree of polarization, the larger the fiscal deficit.

(ii) The higher the polarization, the more volatile the fiscal spending and the fiscal balance.

(iii) In the presence of polarization ($\theta > 0$), the spending level and the size of deficit are always greater than the social optimum, and so is the magnitude of fluctuations of fiscal outcomes.

Ⅳ. Endogenous Fiscal Deficit and Growth

We turn to capital accumulation and growth in the decentralized economy with the optimizing private sector and endogenous fiscal policy jointly but non-cooperatively determined by two ministers. Here we are interested in how polarization is linked to capital accumulation and the growth process through the fiscal instability channel that was described in the previous section.

First, in the absence of polarization, the government budget would be balanced. We will then have the same equilibrium condition and capital accumulation path for the economy as we saw in Section Ⅱ. Second, when there is polarization of preference on the composition of the public goods between ministers, a fiscal deficit arises endogenously. We show below that government debt accumulation has negative effects on the capital accumulation of the private sector.

18) See Woo (2005a) for details.

This, in turn, affects output level and transitional dynamics of economic growth.

We first characterize capital accumulation and output in the presence of polarization. If we substitute the solution g_1^* and g_2^* into equation (7) and solve the first-order differential equation for k_t^{FD}, imposing the NPG condition, we obtain

$$k_t^{FD} = \frac{(\tau - rb_0)}{r} e^{-\theta rt} + \frac{2c_0}{\rho} e^{(r-\rho)t}$$
$$= \frac{(\tau - rb_0)}{r} e^{-\theta rt} + \frac{2c_0}{\rho} \tag{18}$$

where the superscript FD stands for fiscal deficit and $\rho = r$ is assumed as a benchmark. We observe that capital stock is negatively associated with the degree of polarization, and the greater the degree of polarization θ, the smaller the capital stock k. Also, higher polarization implies a lower level of output y. It is because greater amounts of disagreement lead to larger debt accumulation. This, in turn, reduces the share of output used for capital formation in the economy where there are only two assets: capital and government bonds. In other words, the fiscal authority controlled by two ministers wastes resources and overspends on each minister's favorite public good provision above its socially efficient level. This causes inefficient capital accumulation and permanently lowers the output level.

We can directly show that when the government runs a fiscal deficit due to polarization, capital stock and output are lower than under the balanced budget in the absence of polarization. A little algebra shows that

$$y_t^{BB} - y_t^{FD} = \frac{A(\tau - rb_0)}{r} (1 - e^{-\theta rt}) \geq 0 \tag{19}$$

with equality if $\theta = 0$ (i.e., ministers have the identical preference),

where the superscript BB stands for a balanced budget and y^{BB} is the level of output under a balanced budget (See equations (5) and (8)). In the presence of polarization, $y_t^{BB} > y_t^{FD}$ for all finite time. The higher the degree of polarization is, the larger the current gap between y_t^{BB} and y_t^{FD} is. As $t \to \infty$, $y_t^{BB} - y_t^{FD}$ approaches $A(\tau - rb_0)/r$. Thus, in a polarized society, both the capital stock and output will be permanently lower.

We can gauge the size of the impact of an increase in polarization on social welfare in terms of consumption, using equations (3), (8) and (18).[19] Note that an increase in polarization θ from zero to one is associated with a permanent reduction in k at the steady state by the amount of $(\tau - rb_0)/r$. On the other hand, the consumption is given by $c_t = \rho \cdot \left(k_t - \frac{\tau - rb_0}{r}\right)$ from equation (8) (also, note the optimal consumption is shown in Footnote 9). A one unit decrease in capital stock Δk amounts to a reduction in consumption by $\rho \Delta k$. Thus, the consumption level at the steady state is permanently reduced by the amount of $\rho(\tau - rb_0)/r$ when the degree of polarization rises from zero to one. This welfare cost of reduced consumption due to polarization effect can be substantial. According to the average figures of the OECD countries in the period of 1987~2003 from OECD (2004), taxes are 38 percent of GDP, while net debt interest payments are 3 percent of GDP. Assuming $\rho = r$, therefore, the size of consumption reduction at the steady state would amount to 35 percent of GDP!

Transition dynamics of growth depend crucially on the degree of polarization. When there is polarization $(\theta > 0)$, the growth rate of output is also lower than that in the absence of polarization $(\theta = 0)$ for all finite periods of time. Respectively, the growth rates when $\theta = 0$ and $\theta > 0$ are given by

19) I thank an anonymous referee for suggesting this exercise.

$$\left(\frac{\dot{y}}{y}\right)_{|\theta=0} = \frac{(r-\rho)}{\frac{\tau\rho}{r2c_0}e^{-(r-\rho)t}+1} = 0 \tag{20}$$

and

$$\begin{aligned}\left(\frac{\dot{y}}{y}\right)_{|\theta>0} &= \frac{\frac{-\theta\tau\rho}{2c_0}e^{-((\theta+1)r-\rho)t}+(r-\rho)}{\frac{\tau\rho}{r2c_0}e^{-((\theta+1)r-\rho)t}+1} \\ &= \frac{\frac{-\theta\tau\rho}{2c_0}e^{-\theta rt}}{\frac{\tau\rho}{r2c_0}e^{-(\theta rt)}+1} < 0\end{aligned} \tag{21}$$

where $b_0 = 0$ is assumed for simplicity, and the last term in each equation above is obtained under the assumption of $\rho = r$. It is clear from equations (20) and (21) that $(\dot{y}/y)_{\theta=0} > (\dot{y}/y)_{\theta>0}$, for all finite time $t \geq 0$. Over time, the growth rates of capital stock and output in the presence of polarization converges to the rate of growth under a balanced budget, $r-\rho$, whereas the levels of k and y themselves are permanently lowered. That is, the asymptotic growth rates of capital and of output are $r-\rho$: $\lim_{t\to\infty}(\dot{k}/k)^{FD} = (\dot{y}/y)^{FD} = r-\rho$.

Since the marginal productivity of capital stock is a constant A (and hence the value of $r-\rho$ is constant), it can produce perpetual growth without assuming some exogenous technological progress. However, the transitional dynamics of growth as a function of polarization θ looks similar to that of neoclassical models such as the Solow model. For example, a change in saving rate in the neoclassical model can lead to a permanent effect on the level of output, whereas it does not change the steady-state growth rate. Similarly, a change in the degree of polarization θ in our model leads to a permanent change in capital stock and output, but not to a permanent change in the steady-state growth rate. Thus, our model can explain why some

nations are rich and others are poor, while the differences in growth rates across countries can be explained by appealing to the transition dynamics. From the empirical point of view, this interpretation that differences in growth rates across countries are due to the fact that countries are on different transition paths to their own steady states of output works reasonably well in data. (For seminal empirical papers on this, one can refer to Mankiw *et al.*, 1992; Barro, 1991 and Barro and Sala-i-Martin, 1992 among others.)

Interestingly, the relationship between the growth rate and the degree of polarization for the economies with polarization ($\theta > 0$) is not monotonic. A more polarized economy would experience a more dramatic change in its economic growth rate for a given period of time. For example, an economy with a higher degree of polarization θ would see a sharper collapse of growth rate initially as it runs a larger deficit. However, this same economy would grow more rapidly later as its fiscal balance improves compared to an economy with a lower degree of polarization θ. This reflects the fiscal deficit dynamics in relation to polarization as illustrated in Section Ⅲ.[20] We summarize the above results on growth as the following proposition.

Proposition 2

(i) The capital stock and output at the steady state are lower in the presence of polarization.

(ii) An increase in polarization leads to a permanent reduction in capital stock and output, and to lower growth during the transition path to a steady state.

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20) Woo (2005a) shows that the above results still hold in a more general framework in which we also consider the case that policymakers are impatient enough to discount the future more heavily (i.e., $\rho > r$). It is shown that an increase in political uncertainty (as reflected in the discount rate) leads to a permanent reduction in output and capital stock, but not to a permanent decrease in the steady-state growth rate ($r - \rho$).

V. Inflation, Composition of Deficit Finance, and Social Polarization

Up to this point, we have considered pure bond-financing of the fiscal deficit. Now we introduce money into this economy and the inflation tax the government can levy to finance its spending. We incorporate money into the lifetime utility by considering a Sidrauski type utility function as follows:

$$J^i = \int_0^\infty [\log(c_i) + \gamma \log(m_i) + \lambda_i \log(g_{1t}) + (1-\lambda_i)\log(g_{2t})]e^{rt}dt \tag{22}$$

where c_i is private consumption; P the price level; $m = M/P$ the real money balance; and $\gamma > 0$. We assume that the private discount rate ρ is equal to the real interest rate r, and focus on the inflationary consequences of deficit finance in the presence of social polarization.[21] As previously, g_1 and g_2 are two different public goods provided by the government. Being small, each member of group takes g_i as given and has the same preference for the two public goods within the group. Yet these two groups may differ in their preferences for the public goods as reflected in $\lambda_i \in [0,1]$. We continue to assume that $\lambda_2 \leq \frac{1}{2} \leq \lambda_1$, which implies that group 1 prefers g_1 to g_2 and vice versa.

An agent can hold her wealth in the form of capital k, government

21) Since the discount rate is assumed to be equal to the interest rate, then consumption will be constant over time as one can recall from a private agent's life-time utility maximization problem in the previous section. This makes it easier to focus on the inflationary consequences of endogenous fiscal policies, which is the main purpose of this chapter. This separability assumption will render the behaviors of the financial sector completely independent of the production sector.

bonds b, and real money balance, m. The bonds are assumed to be a perfect substitute for capital and therefore to pay the same rate of interest r. The flow budget constraint of the agent of group i is now for $\forall t \geq 0$ and $a_0 > 0$

$$\dot{a}_{it} = ra_{it} - c_{it} - (r + \pi_t)m_{it} - \tau_i \tag{23}$$

where a_{it} is the asset held by an agent and hence $a_{it} = k_{it} + b_{it} + m_{it}$, and τ_i is a lump-sum tax collected by the government from group i.

The utility maximization subject to the above budget constraint and NPG condition yields the solution

$$c_t = \bar{c}, \text{ and } m_t = \gamma(r + \pi_t)^{-1} \tag{24}$$

where π_t is an inflation rate. Consumption is constant since the private discount rate is assumed to be equal to the real interest rate r.

Before we move to government fiscal policy, we make an additional assumption on the timing structure. Following Cohen and Michel (1988), we assume that the fiscal authority moves before the individual at each point of time and is able to pre-commit for an instant of time. Noting that the private consumption is independent of each minister's public good provision decisions, and taking into account the money demand of the private agent, each minister chooses her own public good provision level, g_i^*, which is the Markov perfect equilibrium. The fiscal authority moves first, announcing its g_1^* and g_2^* obtained by solving the optimization problem subject to the budget constraint and to the response of the private agent, c_t and m_t. The agent takes the government spending as given and solves for and c_t and m_t so that she can maximize her

life-time utility subject to her budget constraint.[22]

Each minister i has the same objective function as described in equation (10). We assume that money does not enter each minister's utility function because it is only used to finance her public good provision, g_i. Thus, the money supply is indirectly determined by the minister's spending levels, g_i. Each minister would maximize her objective function subject to the relevant government budget constraint and the private agent's real money demand function in equation (24).

Once the government finances its spending by seigniorage as well as debt-financing, the relevant government budget constraint becomes

$$\dot{b} + \dot{m} = g_1 + g_2 + rb - \tau - \pi m \tag{25}$$

where πm is the inflation tax. Using the money demand function (24), we can get $\pi m = \gamma - rm$. Note that as inflation rate goes up the inflation tax increases. But there is a maximum of inflation tax revenues that can be collected by printing money because money demand depends negatively on the nominal interest rate.[23]

Since we are primarily interested in inflationary consequences of deficit finance and in the relationship among inflation, composition of deficit finance, and degree of polarization, we consider the following experiment. The fiscal authority begins by using both debt-finance and

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22) Here we do not consider the distinct role of the central bank explicitly by assuming that the fiscal authority controls the central bank for simplicity of analysis. There is no distinction between the central bank and the fiscal authority.

23) To see this, we compute the first and second derivatives of πm with respect to π as follows:

$$\frac{d(\pi_t m_t)}{d\pi_t} = \frac{r}{(r+\pi_t)^2} > 0, \ \forall t > 0$$

but the second derivative is negative. That is,

$$\frac{d^2(\pi_t m_t)}{d\pi_t^2} = -\frac{2r}{(r+\pi_t)^3} < 0, \ \forall t > 0$$

money-finance at a given ratio of money and bonds (ξ) and then turns to pure money financing at time T in the future, either because there is a maximum level of debt service or because the fiscal authority has no other way than inflation tax to continue to finance its expenditures.[24] The maximum level of debt service is determined by the lump-sum tax τ in our model.[25]

Let us start with the simplest case of $\xi = 0$. That is, the government initially uses pure bond-financing before switching to pure money-financing. Also, let us assume, for simplicity, that the money supply is constant at the level γr^{-1} before the switch in order to guarantee money market equilibrium. This switch takes place at time T when the fiscal authority changes its financing method so as to freeze the debt at its then current level b_T, and hence $\dot{b} = 0$ from the point in time T. Thus for all $t < T$, government debt is increasing, money balances are constant, and so is private consumption. After T, the government debt is not increasing, and money balances are decreasing as the government begins to finance its expenditures by printing money and generating inflation. The $\dot{M}_t = 0$ for $t < T$; for $\dot{b} = 0$ for all $t \geq T$; and the government

24) There is another incentive to turn to inflationary finance. When the government has issued a large debt, the government might want to reduce the burden of debt by inflating away the debt. This incentive is studied by Missale and Blanchard (1994). They derive the maximum maturity of debt in which this incentive to inflate the debt burden is restrained by the reputational consideration.

25) Temporarily, the government might not be able to finance its spending by printing money, so the government relies on pure bond-financing. For example, the central bank often pursues an independent monetary policy by not accommodating the fiscal policy. Empirically, however, most independent monetary policy regimes are of short duration in practice. See Klein and Marion (1994). Dornbusch *et al.* (1990) and Drazen and Helpman (1990) also study the inflationary finance and the government fiscal deficits. Specifically, Drazen and Helpman (1990) discuss stabilization policies and inflation, and study how expectations of a policy switch affect economic dynamics before the switch, whose timing or mix among expenditure cuts, tax increase, or increases in money growth rates may be uncertain.

budget constraints are thus

$$\begin{aligned} \dot{b} &= g_1 + g_2 + rb - \tau, \quad \text{for} \quad t < T \\ \dot{m} &= g_1 + g_2 + rb_T - \tau - \pi m, \quad \text{for} \quad t \geq T \end{aligned} \tag{26}$$

We can solve for the endogenous g_i^* similarly as in section III by maximizing the minister's utility subject to (26) and to the response of private agent (24). The feedback Nash equilibrium g_i^* for $t \geq T$ is $g_1^* = \lambda_1(\pi m + \tau - rb_T)$ and $g_2^* = (1-\lambda_2)(\pi m + \tau - rb_T)$. Substituting this solution into the second equation of the government budget constraint (26) yields the following equation:

$$\dot{m} = \theta(\pi m + \tau - rb_T) \text{ for } t \geq T \tag{27}$$

We can see that the change in real money balance will be greater as the degree of polarization increases. Note that the dynamics of m around its steady state is unstable (i.e., the coefficient of m in equation (27) is $\theta\pi > 0$). The unique convergent perfect foresight path includes an immediate jump to the new steady state level: $\pi_{T+} = \pi^*$. Furthermore, the higher the degree of polarization θ, the higher the steady state inflation rate that is reached after the switch, which we show below.

Since $\dot{m} = 0$ in the steady state, using (27) and $m = \gamma(r+\pi)^{-1}$ from (24), we can get the steady sate inflation rate π^*:

$$\frac{\gamma\pi^*}{r+\pi^*} = rb_T - \tau \tag{28}$$

From the above steady state inflation,

$$\frac{d\pi^*}{db_T} = \frac{(r+\pi^*)^2}{\gamma} > 0 \tag{29}$$

The steady state inflation rate is higher if the level of debt at T is higher. Also, an additional bond issuing at T before the switch accelerates the steady state inflation that would prevail after the switch.

One can show that the government debt b_T at time T should be equal to (assuming $b_0 = 0$)[26]

$$b_T = \frac{\tau}{r} - \frac{\tau}{r} e^{-\theta r T} \tag{30}$$

Combining equations (28) and (30), and then differentiating π with respect to θ yields

$$\frac{d\pi^*}{d\theta} = (r^2 + \pi r T) > 0 \tag{31}$$

The steady state π^* will be higher if the degree of polarization within the government becomes larger.

Second, we consider a more general case that the fiscal authority uses both debt-finance and money-finance at a given ratio ξ of money and bonds (i.e. $\xi = m/b$) at the beginning, and turns to pure money financing at time T. Each minister would determine her public good provision level, g_i, by solving the maximization problem subject to the government budget constraint and the money demand function of the private sector. Let $d = b + m$. Using this d, we can rewrite the government budget constraint as follows:

$$\begin{aligned} \dot{d} &= g_1 + g_2 + rd + \tau - (r + \pi)m \\ &= g_1 + g_2 + rd - \tau - \gamma \end{aligned} \tag{32}$$

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26) The government debt path under the non-cooperative Nash Feedback equilibrium is identical to that in section Ⅲ since for $t < T$, the fiscal authority uses the pure bond financing.

The feedback Nash Nash equilibrium, g_1^* and g_2^*, is

$$g_1^* = \lambda_1(\gamma+\tau-rd), \text{ and } g_2^* = (1-\lambda_2)(\gamma+\tau-rd) \qquad (33)$$

To facilitate the interpretation of the relationship among polarization, fiscal sending and inflation rate, note that $d=(b+m)=(1+\xi)b$, where $\xi = m/b$. The feedback Nash equilibrium, g_1^* and g_2^*, is equivalent to $g_1^* = \lambda_1(\gamma+\tau-r(1+\xi)b)$, and $g_2^* = (1-\lambda_2)(\gamma+\tau-r(1+\xi)b)$. One can quickly notice that each minister's public good provision g_1^* lessens as the money-bond ratio (ξ) increases. This can be explained intuitively. Since the private agent's money demand is inversely related to the inflation rate, there is a limit on (real) revenues that can be collected by inflation tax for any given lump-sum tax and money-bond ratio in the deficit finance. As ξ becomes larger, the portion of revenue originated from inflation tax from which the polarized ministers can extract decreases and their spending declines as well.

The steady state inflation after the switch takes place at T can be obtained as follows. Since $\dot{b}=0$ at T and $m=\gamma(r+\pi)^{-1}$, the steady state inflation rate π^* is (recall that the government budget is $\dot{b}=\theta(\gamma+\tau-rd)$ from (32) and (33))

$$\pi^* = \frac{r(b-\tau)}{\gamma+\tau-rb} \qquad (34)$$

Note that the inflation rate will be higher if the debt at T when the switch takes place is higher.

Using $\xi = m/b$ and the derived g_i^*, the government budget constraint can be written as

$$\dot{b} = \frac{\theta}{1+\xi}(\gamma+\tau-r(1+\xi)b) \qquad (35)$$

Since $d = (1+\xi)b$, $\dot{d} = (1+\xi)\dot{b}$.

We go further by computing the b_T using equation (35) and NPG condition,

$$b_T = \frac{(\gamma+\tau)}{r(1+\xi)}(1-e^{-\theta r T}) \tag{36}$$

It is clear from equation (36) that a higher money-bond ratio in the deficit finance or a lower polarization leads to lower debt. Substituting (36) into (34) yields

$$\pi^* = \frac{(\gamma+\tau)(1-e^{-\theta r T}) - r\tau(1+\xi)}{(\gamma+\tau)(\xi+e^{-\theta r T})} \tag{37}$$

The steady state inflation rate depends on several variables such as polarization, money-bond ratio, and switch time T. First, we note that there is a monotonic positive relationship between the degree of polarization and inflation rate. To see this, we compute the differentiation of π^* with respect to θ:

$$\frac{d\pi^*}{d\theta} = \frac{(rTe^{-\theta r T})(\gamma+\tau-r\tau)(1+\xi)}{(\gamma+\tau)(\xi+e^{-\theta r T})^2} > 0, \forall \theta \in [0,1] \tag{38}$$

Note that in general $0 < r < 1$ and hence $\gamma + \tau - r\tau > 0$. As in the first case, either the higher the degree of polarization or the higher the resulting debt at time T, the higher the steady state inflation rate after switching to monetizing the debt service. If the government had a higher money-bond ratio at the beginning but turns to money finance later, however, then this economy will have a lower steady state inflation rate despite the polarization within the government. In other words, there is a monotonic relationship between ξ and inflation rate for any given $\theta > 0$,

$$\frac{d\pi^*}{d\xi} = \frac{-(\gamma+\tau-r\tau)(1-e^{-\theta rT})}{(\gamma+\tau)(\xi+e^{-\theta rT})^2} < 0, \quad \forall \xi > 0 \tag{39}$$

where $\gamma+\tau-r\tau>0$. The above result suggests that money-financing can be less inflationary. This result is consistent with earlier studies by Turnovsky (1978) and Liviatan (1983), although they derive the result for an *exogenously given* government spending. However, our explanation is very different. In our model, it is because as the money-bond ratio (ξ) increases, each minister's spending decreases. In a sense, money-financing provides discipline to these polarized ministers. When she tries to finance her expenditure by printing more money, this increases the inflation rate which, in turn, reduces the private agent's real money demand (i.e. tax base). With a money market equilibrium condition and the resulting limit on the inflation tax revenue, she cannot spend as much as she would with pure bond-financing. Therefore, it follows that the money finance is less inflationary if the government relies more on inflation tax relative to bond-finance from the beginning. In other words, the bond-finance of fiscal deficit may not cause inflation initially. Yet as debt accumulates, this also increases the potential inflation that would prevail when the government finally turns to seigniorage.[27]

More recently, Tornell and Velasco (2000) make a similar reasoning in a sharply different context in which they compare fixed exchange rate with flexible exchange rate regime for their fiscal implications. Conventional wisdom holds that fixed rates provide more fiscal discipline than do flexible rates. The claim that fixed rates induce more discipline stresses that sustained adoption of lax fiscal policies must eventually lead to an exhaustion of reserves and thus to a

27) This is reminiscent of the argument of Sargent and Wallace (1981) that bond-financing may be more inflationary for a given deficit, although the reason is very different. They show that when the government deficit is *held constant*, a temporary tightening monetary policy may eventually lead to higher inflation. This is because tight current monetary policy implies greater bond issuance and growing debt service to finance the given deficit.

politically costly collapse of the peg. Hence, under fixed rates irresponsible fiscal behavior today leads to punishment tomorrow. Under flexible rates irresponsible fiscal behavior has costs as well. The difference is in the intertemporal distribution of these costs: flexible rates allow the effects of unsound fiscal policies to manifest themselves immediately through movements in the exchange rate. Hence, under flexible rates irresponsible fiscal behavior today leads to punishment today. They show that if fiscal authorities are impatient, flexible rates by forcing the costs to be paid up-front provide more fiscal discipline and higher welfare for the representative private agent. Despite the different mechanism at work, the implication of their result is similar to ours in that monetary financing (under the flexible exchange rate regime) may provide more fiscal discipline (than does fixed rate regime under which the budget deficit cannot be financed by monetary financing as long as the government is credibly committed to the fixed rate).

Ⅵ. Concluding Remarks

This paper has presented a dynamic model of fiscal policy in a simple growth framework where social polarization of preferences among socio-economic groups plays a central role in the evolution of fiscal instability and growth collapse. One key feature of the paper is that the size of fiscal deficit, the magnitude of fiscal volatility, and the size of reduction in output and growth rate are explicitly shown to be increasing functions of the degree of social polarization.

Also, we investigated the inflationary consequence of fiscal deficit in relation to social polarization. It was shown that the higher the degree of polarization, the higher the steady state inflation. However, an increase in the money-bond ratio in the deficit financing turns out to be less inflationary for any given degree of polarization because the

money financing may provide more fiscal discipline to these polarized policymakers.

Broadly consistent with recent empirical studies on fiscal instability and growth, our results can particularly contribute to explaining why many Latin American and other developing countries in the past decades have suffered from chronic fiscal deficits, volatile fiscal outcomes, pro-cyclicality of fiscal policies, disappointingly poor growth, and high inflation. Our theory suggests that all of these problems can be ultimately attributed to the polarization within the government or among socio-economic groups in a society. Although social polarization might be among the oldest ideas in the political economy literature, we have theoretically demonstrated how social polarization can cause the aforementioned macroeconomic problems.

In short, our theory suggests that social polarization may lie in depth behind the fiscal problems. So whether institutional arrangements (including budgetary institutions) can be made to mitigate the negative fiscal effects from social polarization remains to be an important question. In this regard, Woo (2003a) reports encouraging econometric evidence that the effects on public sector deficits of the social polarization tend to be smaller in countries with better (budgetary) institutional arrangements.[28] Conversely, the social polarization has particularly strong effects on deficits in the presence of poor institutions. This finding has important policy implications. In a highly polarized country, for example, fiscal decentralization only increase tension among central and regional governments and different groups, and can threaten macroeconomic stability unless it is checked by proper institutional restraints.

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28) Related to this, recent studies have presented evidence that stringent budgetary procedures and rules can directly influence fiscal outcomes (Alesina *et al.*, 1999; Hallerberg and von Hagen, 1999; von Hagen, 1992). Yet they do not study whether and how institutional arrangements can alleviate the harmful effects on fiscal outcomes of social polarization.

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