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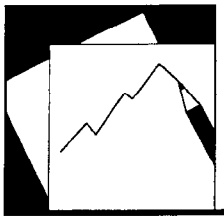

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Do Fixed Exchange Rates Induce More Fiscal Discipline?

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Do Fixed Exchange Rates Induce More Fiscal Discipline?

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Abstract

Conventional wisdom has held that a fixed exchange rate regime induces more fiscal discipline, but Tornell and Velasco (1995, 1998) argue the opposite. Using a dynamic model with fragmented fiscal policymaking, this paper evaluates the two arguments in a single framework and shows that (1) future punishment against fiscal laxity exists under both fixed and flexible regimes; (2) fiscal authorities have a greater incentive to spend more today under fixed rates than under flexible rates; (3) in the presence of both factors above, fixed rates will induce more fiscal discipline only if the future punishment is sufficiently stronger than under flexible rates; and (4) neither fixed nor flexible rates could resolve the structural distortions caused by fragmented policymaking, and fiscal centralization needs to be undertaken to strengthen fiscal discipline.

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I. INTRODUCTION

Which exchange rate regime provides more fiscal discipline, fixed or flexible?[2] The conventional wisdom is that fixed rates provide more fiscal discipline, although rigorous economic analysis on this link has yet to be provided.[3] Its basic argument is that implementing lax fiscal policies under fixed rates will eventually lead to a collapse of the peg, incurring big political and economic costs for policymakers. In other words, under a fixed exchange rate regime, lax fiscal policy today would lead to punishment tomorrow. This punishment mechanism leads policymakers to be disciplined. Tornell and Velasco (1995,1998) argue that, contrary to the conventional wisdom, fixed rates do not necessarily induce more fiscal discipline. By delaying the inflationary consequence of fiscal laxity to the future, a fixed exchange rate regime can actually induce impatient policymakers to spend more. Empirical results have been mixed so far. Gavin and Perotti (1998) find that fixed exchange rate regimes and budget deficits are significantly correlated in Latin American countries, but they do not find such correlation in industrial countries. Hamann (2001) finds no evidence that fiscal discipline is enhanced by adopting an exchange-rate-based stabilization. Fatas and Rose (2001) analyze fiscal policies in countries with extreme monetary regimes. They find that belonging to an international common currency area is not associated with fiscal discipline, while currency boards are associated with fiscal restraint.

The objective of this paper is to investigate in greater depth the relation between exchange rate regimes and fiscal discipline. A dynamic model with fragmented fiscal policymaking is used to evaluate the above two arguments in a single framework. The two arguments lead to opposite conclusions because each of them emphasizes only part of the whole story. The conventional wisdom emphasizes the punishment mechanism under a fixed exchange rate regime, while Tornell and Velasco emphasize the incentive to spend more under a fixed exchange rate regime. This paper shows that, on the one hand, the punishment mechanism against lax fiscal policy exists under both regimes; on the other hand, fixed rates do enable policymakers to spend more today without worrying about immediate inflationary consequences. In the presence of both factors, a fixed regime will impose more fiscal discipline only if the future punishment is sufficiently stronger than that under a flexible regime.

This model is an extension of the Tornell-Velasco two-period model with price flexibility, perfect foresight, and perfect capital mobility. The inflation rate is the same as the nominal devaluation rate regardless of the exchange rate regime. Given the regime policies, government transfer is endogenized in each period. The following two assumptions are adopted from the Tornell-Velasco model. The first one is that the exchange rate regime of period 1, fixed or flexible,

[2]We use "fixed rates" and "a fixed exchange rate regime", "flexible rates" and "a flexible exchange rate regime" interchangeably in this paper.

[3]Setting up a game of incomplete information with imperfect monitoring, Canavan and Tommasi (1997) argue that an exchange rate anchor provides more macroeconomic discipline because it is much easier for the public to monitor the nominal exchange rate than other variables. With the exchange rate anchor, the public could readily detect bad government behavior and threaten punishment. But Canavan and Tommasi did not directly address the impact on fiscal policy of different exchange rate regimes.

is exogenously set by the central bank (CB) and is not the outcome of any optimization problem. The CB can choose to either target the nominal devaluation rate in the case of a fixed exchange rate regime, or target the nominal money growth rate in the case of a flexible one. Given the exchange rate regime set by the CB, optimizing fiscal authorities determine fiscal policies in the usual trade-off between government transfers and inflation. The second assumption is that the CB can only precommit to its monetary policy for a limited period of time under either regime. In other words, the CB's policy suffers from a credibility problem. The initial monetary policy under either regime will collapse and the CB has to monetize budget deficits to keep the government solvent in the second period. Tornell and Velasco provide both empirical and theoretical justifications for this assumption.[4] Another justification for this assumption would be that the CB may choose to precommit only for a finite time because of the high cost associated with the commitment. De Kock and Vittorio Grilli (1993) argue that the collapse of fixed rates may be consistent with optimal policies because it allows the government to meet large government spending needs at a certain period.

This model differs from Tornell-Velasco's in two key aspects. In the Tornell-Velasco model, the distortion that leads the fiscal authority to spend more than the socially optimal level is exogenously assumed. By introducing fragmented fiscal policymaking, this paper provides a microfoundation for the fiscal distortion. In the model, the fiscal authorities represent a number of interest groups, each of which try to set the government transfers at their desired levels.[5] The interaction among the fiscal authorities over time will generate two distortions. The first one is called "competitive externality," as defined by Aizenman (1992). With a weak CB, whose monetary policies are of limited duration, and strong fiscal authorities, the benefits from spending accrue entirely to each interest group whereas the inflation cost is shared by all. This gives each fiscal authority a spending bias. The second distortion is the "tragedy of the commons." All fiscal authorities share one common property: government net assets. Each of them has a tendency to spend more today because of the fear that there will be less left tomorrow if other fiscal authorities take more today. The final result is that each fiscal authority spends more today, leaving a debt for the future. This occurs even when there is no reason for intertemporal smoothing: each fiscal authority discounts the future at the world real interest rate. In sum, fragmented fiscal policymaking generates structural biases that lead to large fiscal deficits and government debts. Neither regime, fixed or flexible, can resolve the two structural biases.

The second key difference is that this model is dynamic while the Tornell-Velasco model is essentially static. In their model, the single fiscal authority decides its transfers for both period 1 and period 2 at the beginning of period 1.[6] No discussion about government transfers in the second period exists and the fiscal authority is assumed to be able to precommit to its transfer plan. In this paper, however, all fiscal authorities independently choose their transfers. Owing to the lack of cooperation among the fiscal authorities, there is no guarantee that they would

[4]See Tornell and Velasco (1998) for detail.

[5]For more discussions on the assumption of fragmented fiscal policymaking, see Velasco (1999)

[6]This is the reason why Tornell and Velasco could derive the same results no matter whether the fiscal authority makes transfers only in period 1 (1995) or in both periods (1998).

precommit. The well-known time-inconsistency problem occurs. The optimizing fiscal authorities make transfer decisions at the beginning of each period. Moreover, when they make decisions at the beginning of period 1, they will take into account their optimal decisions at the second period.[7]

The dynamics of this model enables one to explore the role of two factors, namely, the punishment mechanism under either regime and the greater incentive to overspend under a fixed regime. Rational and optimizing fiscal authorities in a divided government structure tend to implement lax fiscal policies, which eventually lead to the collapse of the original tight monetary policy under either regime. This model's dynamic feature can accommodate the fact that punishment is at work under either regime. Since each fiscal authority takes account of its future decision when choosing its spending today, it understands that it has to pay back the inflation cost of fiscal laxity tomorrow under either regime. This will in turn affect its fiscal decision today. The higher the inflation cost it has to pay tomorrow, the less it will spend today. This serves as a punishment mechanism in the model. The punishment mechanism exists under both regimes, not just in a fixed exchange rate regime, as conventional wisdom claims.

The dynamics also reveal that the incentive to spend more today is stronger under fixed rates. The difference between fixed and flexible rates lies in the intertemporal distribution of the inflation cost of fiscal laxity. Under fixed rates, the inflation cost is pushed to the future, while it is spread across time under flexible rates. Each optimizing fiscal authority understands that, under fixed rates, any increase in government spending and fiscal deficits would not affect inflation immediately, whereas it will cause an immediate increase of inflation under flexible rates. This gives each fiscal authority a greater incentive to spend more today under fixed rates. This result does not depend on any special assumption about individual fiscal authority's discount rate.

Putting the above two factors together yields the general conclusion: fixed rates will impose more fiscal discipline only if the punishment tomorrow is sufficiently stronger under fixed rates than under flexible rates. Moreover, in contrast to Tornell-Velasco's result, fixed rates and flexible rates are not equivalent even when the fiscal authority discounts the future at the world real interest rate.

Conventional wisdom fails to notice that a fixed exchange rate regime indeed gives policymakers a greater incentive to overspend and that fiscal laxity today leads to punishment tomorrow under flexible rates as well. Emphasizing only the punishment mechanism under fixed rates, the conventional wisdom concludes that fixed rates induce more fiscal discipline. The argument of Tornell-Velasco can be viewed as an extreme case of this model's general result: fixed rates induce more indiscipline for policymakers who do not worry about future punishment. Their assumption that policymakers are impatient gives rise to the same result as my dynamic model does, that is, there is a stronger incentive for policymakers to spend more today under fixed rates. But, the punishment mechanism, which is another integral part of this dynamic model, is absent in their static model. Therefore, they conclude that fixed rates impose more fiscal indiscipline for impatient policymakers.

[7]Technically speaking, the equilibrium of this paper is subgame perfect.

In this model, the "tightness" of monetary policy under either regime will affect the degree of fiscal discipline it induces. Based on different assumptions about the "tightness" of monetary policy, two special cases are discussed to illustrate the above general analysis . One case is when monetary policy under either regime is very loose: the devaluation rate and the nominal money growth rate approach the upper limit.[8] In this extreme case, fixed rates and flexible rates are equivalent since the incentive to overspend under fixed rates disappears in the limit and future punishment under both regimes are the same.

The second case is a pegged regime with zero inflation rate and a floating regime with zero nominal money growth rate. In this case, fiscal laxity today eventually leads to the abandonment of the original tight monetary policy tomorrow. I show that the inflation rate in period 2 is always higher than that in period 1 under either regime, meaning that future punishment against fiscal laxity exists under both regimes. Moreover, the inflation rate in period 2 is always higher under a pegged regime than under a floating one. Facing stronger future punishment, policymakers have to spend less in period 2 under a pegged regime than under a floating regime. However, the stronger punishment under a pegged regime does not necessarily lead policymakers to be disciplined, because they have a greater incentive to spend more today without worrying about any immediate inflationary consequence.

The paper is organized as follows. Section 2 presents the general model. Section 3 discusses some standard results as special cases of the general model. Section 4 solves for the subgame perfect equilibrium under either regime and gives a general comparison between the two regimes. In Section 5, comparisons of two special cases are carried out. The paper concludes in Section 6.

II. THE GENERAL MODEL

The model is a standard one of a small open economy that lasts two periods with full price flexibility and perfect capital mobility. The economy is populated by a number of influential interest groups and a government that consists of one central bank and a number of fiscal authorities. Each fiscal authority represents its own interest group, which benefits from a particular kind of government transfer. In this sense, this model has a case of "fragmented" fiscal policymaking.

A. The Representative Agent

[8] In this model, the inflation (devaluation) rate is defined as:

$$\pi_t \equiv \frac{P_t - P_{t-1}}{P_t} < 1$$

The nominal money growth rate is defined as:

$$v_1 \equiv \frac{M_1 - M_0}{M_1} < 1$$

Therefore, both the inflation rate and the nominal money growth rate lie between 0 and 1.

For simplicity, there is only one private agent in each interest group. The representative agent of interest group h consumes one tradable good $c_{h,t}$ which is taken as the numeraire. The private agent can hold her wealth in the form of an internationally traded bond, whose real value is denoted by $f_{h,t}$, or in the form of domestic currency. The nominal stock of domestic currency, $M_{h,t}$, is chosen at the end of period t and carried over to period $t+1$. Assuming PPP and normalizing the foreign price level to be constant at one yield the familiar relation between the domestic price level and nominal exchange rate: $P_t = E_t$. So inflation and nominal devaluation rates are the same, which are defined as:

$$\pi_t \equiv \frac{P_t - P_{t-1}}{P_t} = \frac{E_t - E_{t-1}}{E_t} \qquad 0 \leq \pi_t \leq 1 \tag{1}$$

Let r be the exogenous world real interest rate. For simplicity, it is assumed that the private agent's subjective discount rate is the same as the real interest rate. The domestic nominal interest rate is defined as $i_t = r + \pi_t$. The private agent of each group has an initial stock of real bonds $f_{h,0}$ and an initial holding of nominal money $M_{h,0}$. In period 1, she receives a constant income y, a lump-sum transfer $g_{h,1}$ and pays income taxes τy. Then she chooses her private consumption $c_{h,1}$, adjusts her holdings of real bonds and real money to $f_{h,1}$ and $m_{h,1} \equiv \frac{M_{h,1}}{P_1}$, respectively. In the second period, she receives $g_{h,2}$ and y. She uses up all her income ($g_{h,2}$ and y) and accumulated wealth ($f_{h,1}$ and $m_{h,1}$) to pay for the income tax, inflation tax and consumption $c_{h,2}$.

The private agent's utility function of group h is given by

$$\begin{aligned} & u(c_{h,1}) + \left(\frac{\epsilon}{\epsilon - 1}\right)(m_{h,0})^{(\epsilon-1)/\epsilon} + \log(g_{h,1}) \\ & \quad + \left(\frac{1}{1+r}\right)\left[u(c_{h,2}) + \left(\frac{\epsilon}{\epsilon - 1}\right)(m_{h,1})^{(\epsilon-1)/\epsilon} + \log(g_{h,2})\right] \end{aligned} \tag{2}$$

where ϵ is assumed to lie between 0 and 1 to ensure that the economy is always on the upward-sloping side of the Laffer curve. Notice that $m_{h,t-1}$ is the real balance chosen by private agent h at the end of period t-1 and carried over to period t.

The private agent's budget constraint of group h for period 1 is given by:

$$(1+r)(f_{h,0} + m_{h,0}) + (1-\tau)y + g_{h,1} = c_{h,1} + i_1 m_{h,0} + m_{h,1} + f_{h,1} \tag{3}$$

and for period 2:

$$(1+r)(f_{h,1} + m_{h,1}) + (1-\tau)y + g_{h,2} = c_{h,2} + i_2 m_{h,1} \tag{4}$$

The consolidated budget constraint of both periods for private agent h is thus:

$$(1+r)\left(f_{h,0}+m_{h,0}\right)+(1-\tau)y(\frac{2+r}{1+r})+g_{h,1}+\frac{g_{h,2}}{1+r}$$
$$= \quad c_{h,1}+i_1 m_{h,0}+\frac{c_{h,2}+i_2 m_{h,1}}{1+r} \tag{5}$$

Summing up the consolidated budget constraints across all interest groups gives the intertemporal budget constraint of the private sector.

$$(1+r)\left(\sum_{h=1}^{n} f_{h,0}+\sum_{h=1}^{n} m_{h,0}\right)+n(1-\tau)y(\frac{2+r}{1+r})+\sum_{h=1}^{n} g_{h,1}+\frac{\sum_{h=1}^{n} g_{h,2}}{1+r}$$

$$=\sum_{h=1}^{n} c_{h,1}+\sum_{h=1}^{n} i_1 m_{h,0}+\frac{\sum_{h=1}^{n} c_{h,2}+\sum_{h=1}^{n} i_2 m_{h,1}}{1+r} \tag{6}$$

B. The Government

The government consists of a number of fiscal authorities (FA) and one central bank (CB). Each fiscal authority decides the optimal transfer for its own interest group. One way to interpret this assumption is that finance minister is weak and many spending ministers can influence his decision. Fiscal authority of interest group h is assumed to be benevolent in the sense that it chooses $g_{h,1}, g_{h,2}$ to maximize its private agent's preference, taking other fiscal authorities' decisions as given.

The initial government liabilities include a stock of net foreign debt nb_0 (b_0 is the debt per capita) and domestic nominal monetary liability $\sum_{h=1}^{n} m_{h,0}$. In period 1 the government makes the lump sum transfer $g_{h,1}$ to the representative agent of interest group h $(h = 1, 2, ..n)$, pays interest on its net debt, and changes its net debt holdings. It collects both income tax revenue and monetary revenue, including seigniorage and inflation tax. During period 2 the government makes another transfer $g_{h,2}$ and has to pay back both monetary and real debts. Its revenue comes from the inflation tax and income tax. It follows that the budget constraint of each period is:

$$(1+r)\left(nb_0+\sum_{h=1}^{n} m_{h,0}\right)+\sum_{h=1}^{n} g_{h,1} \quad = \quad \sum_{h=1}^{n} i_1 m_{h,0}+n\tau y+\left(nb_1+\sum_{h=1}^{n} m_{h,1}\right) \tag{7}$$

$$(1+r)\left(nb_1+\sum_{h=1}^{n} m_{h,1}\right)+\sum_{h=1}^{n} g_{h,2} \quad = \quad n\tau y+\sum_{h=1}^{n} i_2 m_{h,1} \tag{8}$$

Consolidating Eq. (7) and (8) yields:

$$(1+r)\left(nb_0+\sum_{h=1}^{n}m_{h,0}\right)+\sum_{h=1}^{n}g_{h,1}+\frac{\sum_{h=1}^{n}g_{h,2}}{1+r}$$
$$= n\tau y+\sum_{h=1}^{n}i_1m_{h,0}+\frac{n\tau y+\sum_{h=1}^{n}i_2m_{h,1}}{1+r} \tag{9}$$

The economy-wide resource constraint is obtained by combining Eq.(6) and (9):

$$\sum_{h=1}^{n}c_{h,1}+\frac{\sum_{h=1}^{n}c_{h,2}}{1+r}=(1+r)(\sum_{h=1}^{n}f_{h,0}-nb_0)+ny+\frac{ny}{1+r} \tag{10}$$

C. Solving the Representative Agent's Problem

The representative agent of group h chooses $c_{h,1}, c_{h,2}, m_{h,1}, m_{h,2}$ to maximize Eq.(2) subject to (5), taking $g_{h,1}$ and $g_{h,2}$ as given. The optimal conditions are:

$$u'(c^*_{h,1})=u'(c^*_{h,2}) \tag{11}$$

$$(m^*_{h,t-1})^{-1/\epsilon}=i_tu'(c^*_{h,t}),\quad t=1,2 \tag{12}$$

The optimal condition of consumption implies that consumption is constant over time: $c^*_{h,1}=c^*_{h,2}=\bar{c}_h$, where

$$\sum_{h=1}^{n}\bar{c}_h\left(\frac{2+r}{1+r}\right)=(1+r)(\sum_{h=1}^{n}f_{h,0}-nb_0)+ny+\frac{ny}{1+r} \tag{13}$$

Symmetry condition indicates that $\bar{c}_h=\bar{c}$ for all $h=1,2...n$. Therefore, $\bar{c}$ can be determined by the economy-wide budget constraint.

$$\bar{c}=\frac{(1+r)^2}{2+r}(f_0-b_0)+y \quad \text{where } f_0\equiv\frac{\sum_{h=1}^{n}f_{h,0}}{n} \tag{13'}$$

Consumption is the scale factor in the money demand function. Let us define $a\equiv\frac{1}{u'(\bar{c})}$. The real balance demand function can be rewritten as:

$$a(m^*_{h,t-1})^{-1/\epsilon}=i_t=(r+\pi_t),\quad t=1,2$$

Since only one inflation rate is prevalent in this economy, the real balance demand of each interest group is the same. The subscript h in $m_0(M_0)$ and $m_1(M_1)$ can be omitted.

$$m^*_{h,t-1}=m^*_{t-1}=\left(\frac{i_t}{a}\right)^{-\epsilon},\quad t=1,2,\quad h=1,2,...n \tag{12'}$$

D. The Central Bank's Policy Rules

In line with the Tornell-Velasco model, it is assumed that the central bank's rules are exogenous and are not the result of any optimization problem. In order to carry out a meaningful comparison between fixed and floating regimes, the CB is assumed to be able to commit to its policy rules only in period 1 and has to monetize the budget deficits in period 2 to remain solvent. The reason for this assumption will become clear later in this paper. Under a fixed exchange rate regime, the policy variable of CB is the devaluation rate in period 1: π_1^{fix}. Under a flexible rate regime, the policy variable is the nominal money growth rate of period 1:
$\nu_1 \equiv \frac{\sum_{h=1}^{n} M_{h,1} - \sum_{h=1}^{n} M_{h,0}}{\sum_{h=1}^{n} M_{h,1}} = \frac{M_1 - M_0}{M_1}$.

Right after the policy announcement of a fixed rate regime at the end of period 0, private agents can rearrange their portfolios by asset swaps:
$\sum_{h=1}^{n} m_0^h - \sum_{h=1}^{n} m_{0-}^h \equiv nm_0 - nm_{0-} = -(nb_0 - nb_{0-})$, where b_{0-} and m_{0-} are the levels of net foreign debt per capita and real balance before the announcement is made. There is no capital gain or loss. In contrast, due to the exchange rate movement at the end of period 0, there is a capital loss (gain) for the private agents under a flexible regime. To carry out a consistent comparison of two exchange rate regimes, Tornell-Velasco's assumption that the government gives a rebate to private agents equal to the loss (gain) is adopted. This ensures that the government faces the same intertemporal budget constraint under different regimes.[9] Based on the real balance demand condition of Eq.(12′), the government budget constraints (7), (8), and (9) can be rewritten as follows.

$$(1+r)(nb_{0-} + nm_{0-}) + \sum_{h=1}^{n} g_1^h = anm_0^{1-\frac{1}{\epsilon}} + n\tau y + (nb_1 + nm_1) \qquad (7')$$

$$(1+r)(nb_1 + nm_1) + \sum_{h=1}^{n} g_2^h = n\tau y + anm_1^{1-\frac{1}{\epsilon}} \qquad (8')$$

The intertemporal government budget constraint is obtained by combining (7′) and (8′):

$$(1+r)(nb_{0-} + nm_{0-}) + \sum_{h=1}^{n} g_1^h + \frac{\sum_{h=1}^{n} g_2^h}{1+r} = n\tau y + anm_0^{1-\frac{1}{\epsilon}} + \frac{n\tau y + anm_1^{1-\frac{1}{\epsilon}}}{1+r} \qquad (9')$$

The timing of the game is as follows. At the end of period 0, the CB makes its monetary policy announcement (π_1^{fix} or ν_1). Each fiscal authority chooses its transfer in period 1: $g_{h,1}$ $(h = 1, 2, ..n)$. Given the government decisions, the private agent of each interest group chooses her real balance for time 1: $m_{h,0}$. During period 1 the private agent h consumes $c_{h,1}$. At the end of period 1, each fiscal authority makes a decision on $g_{h,2}$ and then the private agent selects her

[9] For a detailed discussion on this assumption, see Tornell and Velasco (1995, 1998).

desired real balance of period 2: $m_{h,1}$. During period 2, the government pays back both real and monetary debts, and delivers the transfer $g_{h,2}$. The private agent consumes all the remaining wealth and the game ends.

III. SPECIAL RESULTS OF THE GENERAL MODEL

In this section, it is shown that the results of Velasco (1999), Aizenman (1992) and Tornell and Velasco (1998) are special cases of this general model.

A. Tragedy of the Commons

If the CB is assumed to be able to precommit to its policy rules in both periods, the present value of government budget revenue is then fixed. It is equal to income tax revenue plus monetary revenue minus the government's initial liability, regardless of the choice of exchange rate regime. In this case, a meaningful comparison between the two regimes can not be carried out. This model is then reduced to Velasco's dynamic model of *tragedy of the commons (*TC), in which the strategic interactions among interest groups determines how government transfers are allocated intertemporally. Given $\bar{c}, m_0(\pi_1)$,and $m_1(\pi_2)$, fiscal authority of interest group h simply maximizes the following objective function

$$\log(g_{h,1}) + \frac{1}{1+r}\log(g_{h,2})$$

subject to Eq.(7′) and (8′). Backward induction method to solve for the subgame perfect equilibrium yields optimal $g_{h,1}, g_{h,2}$ (see Appendix I for details). Since each interest group makes the same choice in equilibrium, the subscript h can be omitted. This will apply to all the following sections.

$$\frac{g^*_{TC,2}}{g^*_{TC,1}} = \frac{1}{n}. \tag{14}$$

This model generates a "deficit bias" in the sense that fiscal authorities tend to spend more in the first period and leave a debt, although there is no reason for intertemporal smoothing. The socially optimal transfer is achieved when $n = 1$. The transfers in both periods are the same and there is no debt. When fiscal authorities independently choose their optimal spending, it's clear that both $g^*_{TC,1}$ and $g^*_{TC,2}$ are decreasing with the number of fiscal authorities, n. However, the total transfers of period one $ng^*_{TC,1}$ and the debt b_1 can be easily shown to be increasing in n. Hence, the larger the number of interest groups, the larger the debts, and the stronger the deficit bias. This *intertemporal* distortion occurs because all fiscal authorities share one common property: government net assets. Each fiscal authority thinks that if it does not take more today, there will be less left for it tomorrow because other groups will take more today. So every interest group ends up spending more in the first period and a debt is left for period 2, although there is no reason for intertemporal smoothing.

B. Competitive Externality

In this part, it is assumed that the CB can only precommit in period 1, but n fiscal authorities could precommit in both periods. At the end of period 0, the fiscal authorities decide their transfer plans for both periods $g_{h,1}, g_{h,2}$ $(h = 1, 2, ..n)$ and stick to their plans during the game. No decision is made at the end of period 1. This way, the dynamic role of government debt is assumed away since fiscal authorities can not reoptimize based on the debt level at the end of period 1. In this sense, the two-period dynamic model actually becomes a static one-period model.

Under a fixed exchange rate regime, taking $\pi_1^{fix}(m_0)$ as given, each fiscal authority chooses $g_{h,1}, g_{h,2}$ to maximize its private agent's utility function (2) subject to Eq.(9′). Under a floating rate regime, $\pi_1(m_0)$ is endogenously determined with nominal money growth rate ν_1 being the policy tool. From the definition of v_1 and π_1, the following identity is obtained:

$$(1 - v_1)m_1 \equiv \frac{M_0}{M_1} \times \frac{M_1}{E_1} \equiv \frac{M_0}{E_0} \times (1 - \pi_1) \equiv m_0(1 - \pi_1) \tag{15}$$

In Appendix II, it is shown that the equilibrium transfer paths under two exchange rate regimes are as follows:

$$\begin{aligned} g_{CE,1}^{fix*} &= g_{CE,2}^{fix*} = na(\frac{1}{\epsilon} - 1) \geq a(\frac{1}{\epsilon} - 1) \\ g_{CE,1}^{fle*} &= g_{CE,2}^{fle*} = na(\frac{1}{\epsilon} - 1) \geq a(\frac{1}{\epsilon} - 1) \end{aligned} \tag{16}$$

This model exhibits the property of "competitive externality" (CE), which gives the economy a spending bias and an inflationary bias. The socially optimal transfer of $a(\frac{1}{\epsilon} - 1)$ is achieved when $n = 1$. With a weak CB and strong spending ministers, the benefits from spending accrue entirely to each interest group while the inflation costs are shared by all the groups. This distorts the fiscal authorities' incentives and leads to higher government transfer. Notice that the distortion exists even in the first period under a fixed exchange rate regime. As long as the CB gives in by monetizing budget deficits in the second period, the fiscal authorities tend to overspend in the first period without worrying about inflationary consequences.

The distortion caused by "competitive externality" is *intratemporal*, not intertemporal. This model shows that different exchange rate regimes yield identical spending paths because fiscal authorities discount the future at the rate of world real interest. This is the result derived in Tornell-Velasco's static model. In order to derive an equilibrium in which different regimes give different paths, an intertemporal distortion must be introduced. Tornell and Velasco (1995, 1998) assume that the fiscal authority discounts the future at a rate lower than the world real interest rate, which gives the policymaker a greater incentive to spend more under fixed rates. However, as shown later in this paper, the dynamics itself of the general model will generate the difference between fixed rates and flexible rates, and no intertemporal assumption is needed.

IV. SUBGAME PERFECT EQUILIBRIUM OF GENERAL MODEL

In this section, the subgame perfect equilibrium of the general game will be computed. Since the private sector moves last in each period, the representative agent's maximization problem should be solved first, which has been done in Section 2.3. The next step is to solve the problem of fiscal authorities using backward induction method.

A. The Equilibrium Under Fixed Rates

Under a fixed exchange rate regime, $\pi_1(m_0)$ is exogenously given. The unknowns are $g_{h,1}, g_{h,2}, \pi_2$, and m_1. The subscript h will be omitted because the decision of each fiscal authority is the same in equilibrium.

Period 2:

At the beginning of period 2, objective function of each fiscal authority changes. It no longer cares about its utility of period 1. Given the debt level of nb_1, fiscal authority of interest group h now chooses $g_{h,2}$ to maximize

$$u\left(c_{h,2}\right)+\left(\frac{\epsilon}{\epsilon-1}\right) m_1^{(\epsilon-1)/\epsilon}+\log\left(g_{h,2}\right)$$

subject to Eq.(8′), Eq.(12′) and $c_{h,2}=\bar{c}$. Simple first-order condition yields the optimal transfer as an increasing function of m_1:

$$g_2^{fix} \equiv F_2^{fix}(m_1) = n\left[a(\frac{1}{\epsilon}-1)+(1+r)\, m_1^{\frac{1}{\epsilon}}\right] \tag{17}$$

Inserting g_2^{fix} into the government budget constraint of period 2, we can express b_1 as a function of m_1 and use this expression to substitute b_1 in Eq.(7′). Then the government budget constraint in period 1 can be rewritten as:

$$\begin{aligned}&(1+r)\left(nb_{0-}+nm_{0-}\right)+\textstyle\sum_{h=1}^{n} g_{h,1} = \\ &\frac{n\left[\tau y+m_1^{1-\frac{1}{\epsilon}}-an(\frac{1}{\epsilon}-1)-n(1+r)m_1^{\frac{1}{\epsilon}}\right]}{1+r}+anm_0^{1-\frac{1}{\epsilon}}+n\tau y\end{aligned} \tag{18}$$

Period 1:

Fiscal authority h will choose $g_{h,1}$ to maximize Eq.(2), its representative agent's utility, subject to Eq.(17) and (18). Notice that π_1 and m_0 are exogenously given under a fixed exchange rate regime. The optimal $g_{h,1}$ is an increasing function of m_1.

$$g_1^{fix} \equiv F_1^{fix}(m_1) = \frac{n\left[n(1+r)\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1} + a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}\right]}{\frac{(1+r)[\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+1] + a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}}{a(\frac{1}{\epsilon}-1)+(1+r)m_1^{\frac{1}{\epsilon}}}} \tag{19}$$

Replacing g_1^{fix} and g_2^{fix} back to Eq.(9′) and dividing both side by n yield the intertemporal government budget constraint in terms of each interest group, from which equilibrium m_1^{fix*} can be solved for. Let us define $k \equiv \tau y(\frac{2+r}{1+r}) - (1+r)\,(b_{0-}+m_{0-})$,

$$\frac{n\left[n(1+r)\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1} + a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}\right]}{\frac{(1+r)[\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+1] + a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}}{a\left(\frac{1}{\epsilon}-1\right)+(1+r)m_1^{\frac{1}{\epsilon}}}} + \frac{n\left[a\left(\frac{1}{\epsilon}-1\right)+(1+r)m_1^{\frac{1}{\epsilon}}\right]}{1+r}$$

$$= a^{\epsilon}\left(r+\pi_1\right)^{1-\epsilon} + \frac{am_1^{1-\frac{1}{\epsilon}}}{1+r} + k \tag{20}$$

As long as m_1^{fix*} is solved, g_1^{fix*} and g_1^{fix*} can be easily derived. The fiscal authority's problem under fixed exchange rates is fully characterized.

In contrast to the result of Tornell and Velasco (1995, 1998) that government spending is independent of the devaluation rate under fixed rates in the case of C.E.S. utility functions, both g_1^{fix*} and g_2^{fix*} are increasing functions of π_1^{fix}, the exogenous policy variable. In other words, the tightness of the exchange rate policy under a fixed regime will affect fiscal authorities' decisions

in this paper. This occurs because fiscal authorities can not precommit in the model. At the end of period 1, each fiscal authority would reoptimize and choose its optimal transfer for period 2 based on the debt level. The choice of π_1^{fix} under fixed rates will determine how much monetary revenue the government can collect in period 1 and thereby affect how much debts the government needs to run in period 1. Therefore, π_1^{fix} will affect the choice of fiscal authorities in period 2 and in turn the choice in period 1. In the Tornell-Velasco model, the fiscal authority is assumed to be able to commit to a certain path of spending and it does not reoptimize at the end of period 1. In the case of C.E.S utility functions, difference between the marginal cost and the marginal benefit of increasing government spending is independent of m_1.

B. The Equilibrium Under Flexible Rates

Since the maximization problem of each fiscal authority in period 2 is the same under different regimes, the optimal transfer at the second period is also given by:

$$g_2^{fle} \equiv F_2^{fle}(m_1) = n\left[a(\frac{1}{\epsilon}-1)+(1+r)\,m_1^{\frac{1}{\epsilon}}\right] \tag{21}$$

Period 1:

Fiscal authority h chooses $g_{h,1}$ to maximize Eq.(2) subject to (15),(18), and (21).

The optimal $g_{h,1}$ is given as a function of m_1 and m_0. According to Eq.(15), m_0 can be expressed as an increasing function of m_1. Therefore, g_1^{fle} can be viewed as a function of m_1 alone.

$$\begin{aligned} g_1^{fle} &\equiv F_1^{fle}(m_1) \\ &= \frac{n\left\{n(1+r)\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+a(\frac{1}{\epsilon}-1)m_1^{-\frac{1}{\epsilon}}+\dfrac{a\,(1+r)\,(\frac{1}{\epsilon}-1)(1-v_1)}{a(\frac{1}{\epsilon}-1)+(1+r)\,m_0^{\frac{1}{\epsilon}}}\right\}}{\dfrac{(1+r)[\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+1]+a(\frac{1}{\epsilon}-1)m_1^{-\frac{1}{\epsilon}}}{a(\frac{1}{\epsilon}-1)+(1+r)m_1^{\frac{1}{\epsilon}}}+\dfrac{(1+r)\,(1-v_1)}{a(\frac{1}{\epsilon}-1)+(1+r)\,m_0^{\frac{1}{\epsilon}}}} \end{aligned} \tag{22}$$

Substituting g_1^{fle} and g_2^{fle} into Eq.(9′) and dividing both sides by n yields the intertemporal government budget constraint in terms of each interest group.

$$n\left\{n(1+r)\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+a(\frac{1}{\epsilon}-1)m_1^{-\frac{1}{\epsilon}}+\frac{a\,(1+r)\,(\frac{1}{\epsilon}-1)(1-v_1)}{a(\frac{1}{\epsilon}-1)+(1+r)\,m_0^{\frac{1}{\epsilon}}}\right\}$$

$$\frac{(1+r)[\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+1]+a(\frac{1}{\epsilon}-1)m_1^{-\frac{1}{\epsilon}}}{a(\frac{1}{\epsilon}-1)+(1+r)m_1^{\frac{1}{\epsilon}}}+\frac{(1+r)\,(1-v_1)}{a(\frac{1}{\epsilon}-1)+(1+r)\,m_0^{\frac{1}{\epsilon}}}$$

$$+\frac{n\left[a(\frac{1}{\epsilon}-1)+(1+r)m_1^{\frac{1}{\epsilon}}\right]}{1+r}=am_0^{1-\frac{1}{\epsilon}}+\frac{am_1^{1-\frac{1}{\epsilon}}}{1+r}+k \qquad (23)$$

Unlike the case of a fixed exchange rate regime, m_0 is unknown under a floating exchange rate regime. In order to fully characterize the equilibrium, we need one more equation, which is given by Eq.(15). Equilibrium m_0^{fle*} and m_1^{fle*} can be solved from Eq.(23) and Eq.(15). As long as m_0^{fle*} and m_1^{fle*} are solved, g_1^{fle*} and g_2^{fle*} can be obtained according to Eq.(21) and (22). The subgame perfect equilibrium under flexible exchange rates is then fully characterized.

The above discussions show that optimal transfers under both regimes can all be expressed as functions of m_1. There are some interesting properties of these four functions, $F_1^{fix}(m_1), F_2^{fix}(m_1), F_1^{fle}(m_1)$, and $F_2^{fle}(m_1)$. Since fiscal authorities face the same maximization problem in period 2, $F_2^{fix}(m_1)$ and $F_2^{fle}(m_1)$ are actually the same function. Appendix III shows that all four functions are increasing with m_1, that is, government transfers decrease with the future inflation rate. This generates the punishment mechanism in this model. Future inflation or currency depreciation serves as punishment against fiscal laxity in this model. The higher the future inflation (depreciation), the less the government transfer. In addition, as long as $v_1 \neq 1$, given the same value of m_1, the following relation is obtained:

$$F_1^{fix}(m_1) > F_1^{fle}(m_1) \text{ and } F_2^{fix}(m_1) = F_2^{fle}(m_1) \qquad (24)$$

Eq.(24) reveals an important difference between fixed and flexible exchange rate regimes: the greater incentive to spend more in period 1 under fixed rates. This occurs because the fiscal authorities will take into account their optimal behavior in period 2 making decisions in period 1. They understand that, under fixed rates, unsound fiscal policy will not cause any inflation in period 1 and inflation only happens in period 2. In contrast, under flexible rates, fiscal laxity will have an immediate inflationary impact in period 1. Therefore, fiscal authorities have a greater

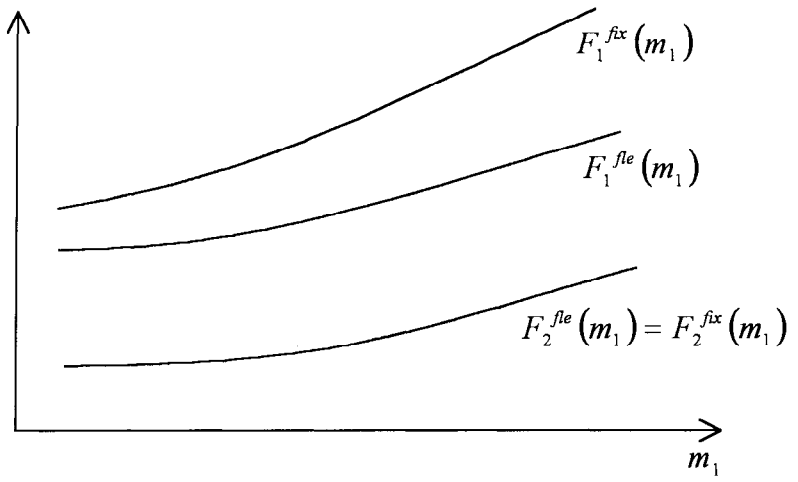

Figure 1: Optimal government transfers in terms of m_1

incentive spend more in the first period under fixed rates than under flexible rates, although they discount the future at the world real interest rate. This is the basis on which Tornell and Velasco (1995) build their critique about conventional wisdom. In their model, due to the absence of explicit dynamic analysis, they need the assumption that the fiscal authority discounts the future at the rate lower than the world real interest rate. Actually, the dynamics itself of the general model is sufficient to generate the greater incentive to spend more today under fixed rates and no special assumption on the discount rate is needed.

Figure 1 illustrates the above points clearly. The curve of F_1^{fix} is always above the curve of F_1^{fle}. Whether the curve of F_2^{fix} and F_2^{fle} is above, below, or in-between the curves of F_1^{fix} and F_1^{fle} depends on n, number of interest groups. In all graphs of this paper, F_2^{fix} (F_2^{fle}) is drawn to be below F_1^{fix} and F_1^{fle}.

However, the greater incentive to spend more in period 1 does not necessarily mean that fiscal authorities would always spend more under fixed rates. The equilibrium level of m_1 could be different under different regime. In addition, the higher the future inflation (depreciation) rate, the less the government transfer. Therefore, the future punishment may deter the fiscal authorities from transferring more today. This serves as the punishment mechanism in this paper. If m_1^{fix*} is smaller than m_1^{fle*}, that is, if the depreciation in period 2 is higher under fixed rates than under flexible rates, government transfer of period 2 under fixed rates could be lower than that under flexible rates, meaning that the fiscal authorities will face stronger punishment tomorrow under a fixed regime. If the future punishment is sufficiently stronger under fixed rates, that is, m_1^{fix*} is much smaller than m_1^{fle*}, transfer in period 1 might also be smaller under fixed rates. In such a case, the total government transfers will be lower and more fiscal discipline is imposed by fixed rates. In sum, the general result is that fixed rates could induce more fiscal discipline only if the

future punishment against fiscal laxity is sufficiently stronger than under flexible rates.

C. Three Distortions of the General Model

Before moving on to make comparisons between fixed and flexible regimes, we will analyze distortions which lead fiscal authorities to spend more.

Let us begin with a social planner's solution. A social planner adopts her preference as an equally-weighted average of the preferences of each interest groups and could precommit. Appendix III shows that, regardless of the choice of exchange rate regime, the socially optimal government transfer of each period is given by:

$$g_1^s = g_2^s = a(\frac{1}{\epsilon} - 1) \tag{25}$$

Clearly, a social planner's transfer is the same under different regimes and there is no incentive for intertemporal smoothing.

It is easy to see that $g_1^{fix}, g_2^{fix}, g_1^{fle}$, and g_2^{fle} of the subgame perfect equilibrium are always greater than $a(\frac{1}{\epsilon} - 1)$, the social optimal level, regardless of the equilibrium level of m_1 under either regime. Why do fiscal authorities tend to spend more than the social planner? This model incorporates the two distortions discussed in Section 3: tragedy of commons and competitive externalities, both of which are caused by "fragmented" fiscal policymaking. To see this point, let us take a closer look at the expressions of $g_1^{fix}, g_2^{fix}, g_1^{fle}$ and g_2^{fle}. Number of interest groups n appears in both g_1^{fix} and g_2^{fix}, and in both g_1^{fle} and g_2^{fle}. This occurs because the *intratemporal* distortion of "competitive externalities" leads policymakers to spend more in both periods. But another n appears only in the expressions of g_1^{fix} and g_1^{fle}, the transfers in period 1, owing to the dynamic distortion of "tragedy of commons". This *intertemporal* distortion induces policymakers to spend more in the first period than in the second period.

To see the third distortion, let us assume $n = 1$ to leave out the two distortions caused by "fragmented" fiscal policymaking. It is easy to see that even when $n = 1$, $g_1^{fix}, g_2^{fix}, g_1^{fle}$, and g_2^{fle} are still higher than $a(\frac{1}{\epsilon} - 1)$, the social optimal level. Therefore, the third distortion has nothing to do with fragmented policymaking. It is actually owed to the inability of the single fiscal authority to precommit, a well-known time-inconsistency problem. When the second period comes, the objective of the fiscal authority is changed and it no longer cares about its utility in period 1. Since the fiscal authority could reoptimize at the end of period 1 based on the debt level and the CB will monetize any budget deficit in period 2, the intertemporal incentive of fiscal authority is distorted toward more transfer in period 2. Therefore, the third distortion is also *intertemporal*. The following proposition summarizes the above result.

Proposition 1 *When n=1, the single fiscal authority always transfers more in the second period than in the first period, regardless of the choice of exchange rate regime.*

Proof. See Appendix V. ■

In this model, there are two intertemporal distortions working in opposite directions. The distortion from "tragedy of commons" leads fiscal authorities to spend more today while the "time-inconsistency" distortion induces them to spend more tomorrow. Which force will dominate depends on n, number of interest groups. As number of interest groups increases, the distortion of "tragedy of commons" is going to dominate, that is, fiscal authorities tend to spend more in period 1 than in period 2.

V. COMPARISON BETWEEN TWO EXCHANGE RATE REGIMES

Fiscal policies under two different exchange rate regimes are compared in this section. Discussions in Section 4 show that equilibrium government transfers will be affected by π_1^{fix} and v_1, the policy variables under the two regimes. Therefore, in order to carry out a meaningful comparison, we need to specify the values of π_1^{fix} and v_1. Two special cases are considered: one is $\pi_1^{fix} \to 1$ and $v_1 \to 1$, which is the case of extremely loose monetary policies under either regimes; and the other one is $\pi_1^{fix} = 0$ and $v_1 = 0$, which fits the definition of a pegged exchange rate regime.

A. Case One: Loose Monetary Rules ($\pi_1^{fix} \to 1$ and $v_1 \to 1$)

As the nominal money growth rate goes to infinity ($v_1 \to 1$) under flexible rates, we can get $m_0(1-\pi_1) \to 0$ from Eq.(15). Therefore, π_1^{fle*} approaches 1 since m_0^{fle*} can not be zero. Clearly, $F_1^{fix}(m_1)$ and $F_1^{fle}(m_1)$ become the same function of m_1 as $v_1 \to 1$. In this case, Eq.(21) and (24) are reduced to the same following equation, from which the equilibrium results of both regimes can be solved.

$$\frac{n\left[n(1+r)\frac{1}{\epsilon}m_1^{\frac{1}{-\epsilon}-1}+a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}\right]}{\frac{(1+r)[\frac{1}{\epsilon}m_1^{\frac{1}{-\epsilon}-1}+1]+a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}}{a\left(\frac{1}{\epsilon}-1\right)+(1+r)m_1^{\frac{1}{-\epsilon}}}}+\frac{n\left[a\left(\frac{1}{\epsilon}-1\right)+(1+r)m_1^{\frac{1}{-\epsilon}}\right]}{1+r}$$

$$= a^{\epsilon}(1+r)^{1-\epsilon}+\frac{am_1^{1-\frac{1}{\epsilon}}}{1+r}+\tau y(\frac{2+r}{1+r})-(1+r)\left(b_{0-}+m_{0-}\right) \tag{26}$$

As $v_1 \to 1$, the incentive to spend more in period 1 under fixed rates disappears. Future punishment under both regimes becomes the same. Therefore, fixed rates and flexible rates yield

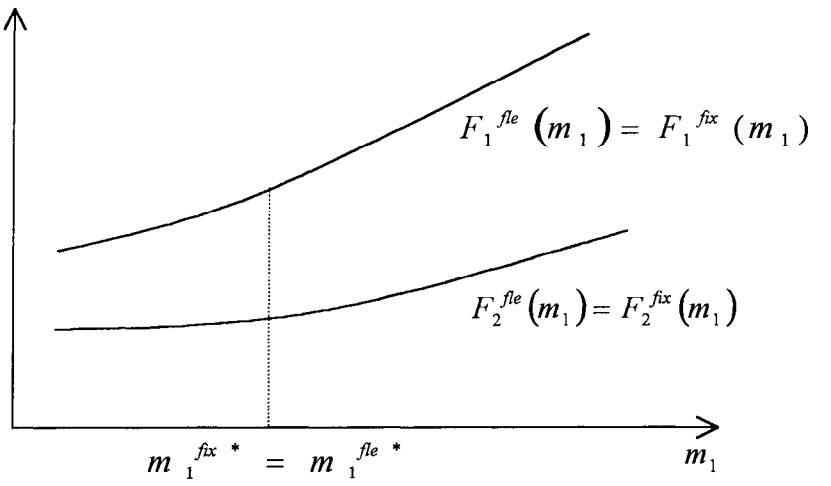

Figure 2: Loose monetary rules ($\pi_1^{fix} \rightarrow 1$ and $v_1 \rightarrow 1$)

the same fiscal outcome when the monetary policies under two regimes are extremely loose (Figure 2).

In the paper of Tornell and Velasco (1995, 1998), when the monetary policy under a flexible regime is extremely loose, that is, $v_1 \rightarrow 1$, the paths of government transfer are the same under two different regimes. The tightness of the monetary policy under fixed rates, π_1^{fix}, does not matter. This yields the unpleasant result that very loose monetary policy under flexible rates ($v_1 \rightarrow 1$) and very tight monetary policy under fixed rates ($\pi_1^{fix} = 0$) have the same influence on fiscal outcome. Once the dynamics of this general model is taken into account, the Tornell-Velasco result no longer holds. The tightness of monetary policy under fixed rates will matter in the presence of dynamics. Fixed rates and flexible rates are equivalent when the monetary policies under both regimes are extremely loose.

B. Case Two: A Pegged Exchange Rate Regime ($\pi_1^{fix} = 0$) and A Flexible One ($v_1 = 0$)

In this section, we will discuss a special case of fixed rates: a pegged exchange rate regime. By pegging its own currency with a stable currency, a country can exogenously set its inflation to be the same as the inflation of the stable currency, which is assumed to be zero in this paper. For comparison purpose, the nominal monetary growth rate under a flexible regime has to be zero.

Punishment in Period 2

Under a pegged exchange rate regime, the inflation rate of period 1 is exogenously set to zero. As a result of imprudent fiscal policies today, future inflation will rise. Under a flexible exchange rate regime, there will be inflation in both periods. According to Eq.(15), the following relation is

obtained:

$$(1-v_1)m_1^{fle*} = m_1^{fle*} = m_0^{fle*}(1-\pi_1^{fle*}) < m_0^{fle*} \tag{27}$$

It is easy to see that an unsound fiscal policy also has costs under flexible rates. Therefore, under both regimes, an unsound fiscal policy will eventually lead to higher inflation in period 2 than in period 1, and higher inflation in period 2 serves as the punishment against fiscal laxity. In other words, there is future punishment against fiscal laxity under both regimes. Since the government can collect inflation tax only at the second period under a pegged regime while it can do so at both periods under a floating regime, the inflation rate of period 2 under a pegged regime must be higher than that under a flexible one. The following result is obtained.

Lemma 1 *The holding of real balance in period 2 under a pegged regime is lower than that under a floating one, that is,* $m_1^{fix*} < m_1^{fle*}$.

Proof. See Appendix VI. ■

In this paper, all fiscal authorities can not precommit to a certain path of government transfers, owing to the lack of cooperation among them. When the second period comes, they will reoptimize on the basis of debt level. Since the inflation rate is set exogenously at zero in period 1 under a pegged regime, unsound government spending has to be financed through borrowing in period 1. Therefore, a higher level of public debts is left for period 2 under a pegged regime. The fiscal authorities have the same optimization problem in period 2 under both regimes, except that they face more debts under a pegged regime than under a floating regime. Since no default is allowed, fiscal authorities have to spend less in period 2 under a pegged regime in order to remain solvent. In Tornell-Velasco's static model, the fiscal authority does not take into account the fact that it will be facing more debts under a pegged regime at the second period. Therefore, its spending in period 2 under different regimes is the same in their model.

Proposition 2 *Government transfer in period 2 under a pegged regime will be lower than under a floating one.*

Proof. Since $m_1^{fix*} < m_1^{fle*}$ according to Lemma 1,

$$g_2^{fix*} - g_2^{fle*} = n(1+r)[(m_1^{fix*})^{\frac{1}{\epsilon}} - (m_1^{fle*})^{\frac{1}{\epsilon}}] < 0$$

■

Under both regimes, fiscal laxity today eventually leads to the abandonment of the original tight monetary policy in period 2. There is punishment under both regimes, not just in a pegged regime as conventional wisdom claims. The government will suffer stronger punishment, in the form of higher inflation (currency depreciation) and lower spending in period 2, under a pegged regime than under a floating one. However, the stronger punishment under a pegged regime, does not necessarily lead policymakers to be disciplined, as we will see below.

Fiscal Discipline

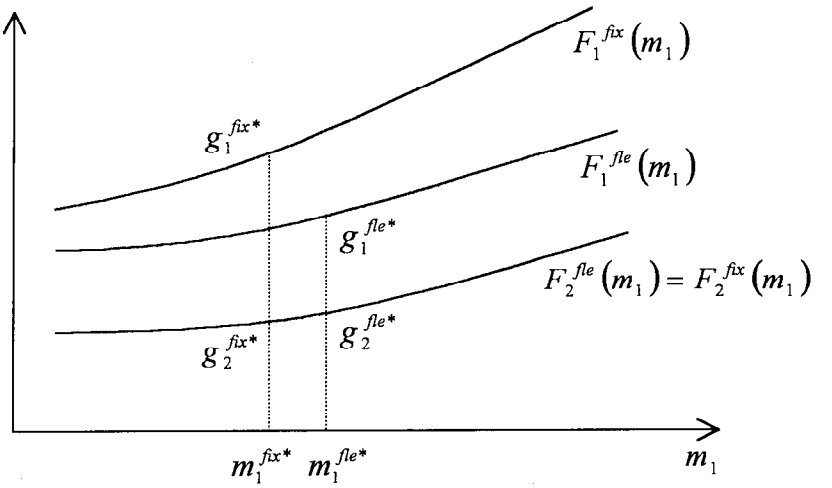

Figure 3: Flexible rates induce more discipline: $g_1^{fix*} + \frac{g_2^{fix*}}{1+r} > g_1^{fle*} + \frac{g_2^{fle*}}{1+r}$

Definition 1 *An exchange rate regime A is said to impose more fiscal discipline than an exchange rate regime B if the net present value of government transfers of both periods is lower under regime A.*[10]

Stronger punishment under a pegged regime does not necessarily mean that a pegged regime will lead the fiscal authorities to be disciplined. Conventional wisdom overlooks the fact that fiscal authorities have a greater incentive to spend more in period 1 under a pegged regime than under a floating one. If future punishment under a pegged regime is not sufficiently stronger, the fiscal authorities would spend so much more in period 1 that the present value of total government transfers is still higher under a pegged regime, despite lower transfer in period 2. Figure 3 illustrates this point.

If, however, future punishment is sufficiently stronger under a pegged regime, concerns of suffering this punishment could lead the fiscal authorities to spend less in both periods. In Figure 4, government transfer in period 1 is also lower under a pegged regime, that is, $g_1^{fix*} < g_1^{fle*}$. Therefore, when the future punishment is sufficiently stronger, a pegged regime could provide more fiscal discipline than a floating regime. In other words, a pegged regime could provide more fiscal discipline ex-ante, although it will collapse in the future.

In sum, whether a pegged exchange rate regime induces more fiscal discipline depends on which factor will dominate: the stronger future punishment or the greater incentive to spend more under a pegged regime. Conventional wisdom fails to see that a pegged regime does give

[10]It does not make any difference whether the CB chooses fixed or flexible rates in the second period. The CB has to monetize the budget deficits in period 2 under either regime.

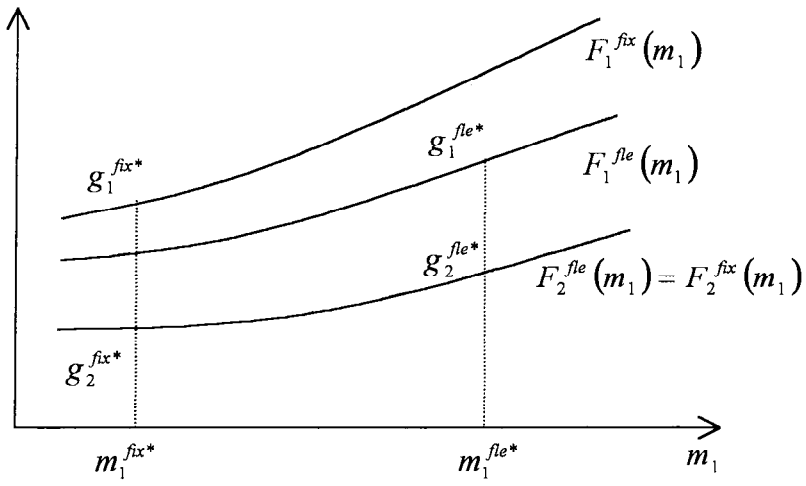

Figure 4: Fixed rates induce more discipline: $g_1^{fix*} < g_1^{fle*}$ and $g_2^{fix*} < g_2^{fle*}$

policymakers an extra incentive to overspend without worrying about any immediate inflationary consequence. Tornell-Velasco's result can be viewed as an extreme case of this general model. There is no punishment mechanism under either regime in their model. For an impatient policymaker who does not worry about future punishment against its fiscal laxity today, a floating regime actually induces more fiscal discipline.

VI. CONCLUSIONS

Which exchange rate regime imposes more fiscal discipline, fixed or flexible? In this dynamic model with fragmented fiscal policymaking, it is shown that fixed rates will induce more fiscal discipline only if the future punishment against fiscal laxity is sufficiently stronger under fixed rates than under flexible rates. The conventional wisdom emphasizes only the punishment mechanism under fixed rates. It fails to see that a fixed exchange rate regime does give the policymaker an extra incentive to run fiscal deficits because fixed rates enable the policymaker to spend more without worrying about any immediate inflationary consequence. On the contrary, Tornell and Velasco emphasize the stronger incentive for policymakers to overspend under fixed rates. Their result can be viewed as a special case of this paper's general result. For a policymaker who does not worry about the future punishment against fiscal laxity, flexible rates will induce more fiscal discipline.

This paper has several policy implications. First, neither a fixed nor a flexible exchange rate regime can resolve the structural problem in budgetary process: fragmented fiscal policymaking. Structural reforms of fiscal centralization need to be undertaken to reduce the size of fiscal deficits. Second, there is no inherent correlation between any exchange rate regime and fiscal discipline. Neither a fixed nor a flexible regime necessarily leads to more fiscal discipline. Last,

although a fixed exchange rate regime may collapse in the future, nevertheless, it could induce more fiscal discipline ex ante under certain circumstances. This provides a mechanism whereby it makes sense to choose a fixed exchange rate regime, even though a fixed regime may last only a limited period of time. However, the experience of Latin American countries overall casts doubt on the generality that policymakers will encounter sufficiently stronger punishment against their fiscal laxity under fixed rates than under flexible rates.

APPENDICES

Appendix I: Dynamic tragedy of the commons

Proof. In period 2: Given b_1, m_1 and π_2, the amount of fiscal revenue is fixed. So each fiscal authority transfers $1/n$ of the total revenue.

$$g^*_{h,2} = \tau y - (1-\pi_2)m_1 - (1+r)b_1 \tag{A-1}$$

In period 1: Taking m_0 and π_1 as given, fiscal authority h chooses $g_{h,1}$ to maximize:

$$\begin{aligned} & \log g_{h,1} + \frac{1}{1+r}\log g^*_{h,2} \\ = \; & \log g_{h,1} + \frac{1}{1+r}\log\left[\tau y - (1-\pi_2)m_1 - (1+r)b_1\right] \end{aligned}$$

subject to Eq.(7). Simple algebra yields the optimal result. Given $g_{h,1} = ng_{h,2}$ in the government's intertemporal budget constraint, the optimal transfers of both periods can be obtained:

$$\begin{aligned} g^*_{TC,1} &= \frac{cons\tan t}{n + \dfrac{1}{1+r}} \\ g^*_{TC,2} &= \frac{cons\tan t}{n\left(n + \dfrac{1}{1+r}\right)} \end{aligned}$$

It is easy to show that $ng^*_{TC,1}$ is increasing with n. Since $ng^*_{TC,2}$ is decreasing with n, from Eq.(A-1) we can easily tell that $b^*_{TC,1}$ must be increasing with n. ■

Appendix II: Competitive externality

Proof. FA of interest group h chooses $g_{h,1}, g_{h,2}$ to maximize Eq.(2).

$$\frac{1}{g^*_{h,1}} = \frac{1}{g^*_{h,2}} = -\left[(m_0)^{-\frac{1}{\epsilon}}\left(\frac{\partial m_0}{\partial g_{h,1}}\right) + \frac{1}{1+r}(m_1)^{-\frac{1}{\epsilon}}\left(\frac{\partial m_1}{\partial g_{h,1}}\right)\right] \tag{A-2}$$

Under a fixed exchange rate regime, there are four unknowns $(g_{h,1}, g_{h,2}, m_1, \pi_2)$ for each FA's maximization problem. Since m_0 is fixed, we have $\dfrac{\partial m_0}{\partial g_{h,1}} = 0$. According to Eq.(9′),

$$\frac{\partial m_1}{\partial g_{h,1}} = -(m_1)^{\frac{1}{\epsilon}}\left(\frac{1}{an}\right)\left(\frac{\epsilon}{1-\epsilon}\right)$$

Substitute $\frac{\partial m_0}{\partial g_{h,1}}, \frac{\partial m_1}{\partial g_{h,1}}$ in Eq.(A-2) yields

$$g_{CE,1}^{fix*} = g_{CE,2}^{fix*} = an(\frac{1}{\epsilon} - 1) \qquad \text{h=1,2,....n}$$

Under a flexible exchange rate regime, there are six unknowns $g_{h,1}, g_{h,2}, m_0, \pi_1, m_1, \pi_2$. The two constraints are Eq.(9′) and (15). According to Eq.(15),

$$\frac{\partial m_0}{\partial m_1} = \frac{1 - v_1}{(1+r) + a(\frac{1}{\epsilon} - 1)(m_0)^{-\frac{1}{\epsilon}}}$$

According to Eq.(9′),

$$\frac{\partial m_1}{\partial g_{h,1}} = -\left(\frac{1}{an}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\left[(m_0)^{-\frac{1}{\epsilon}}\left(\frac{\partial m_0}{\partial m_1}\right) + \frac{(m_1)^{-\frac{1}{\epsilon}}}{1+r}\right]^{-1}$$

Therefore,

$$\begin{aligned}
\frac{1}{g_{CE,1}^{fle*}} &= \frac{1}{g_{CE,2}^{fle*}} = -\left[(m_0)^{-\frac{1}{\epsilon}}\left(\frac{\partial m_0}{\partial m_1}\right)\left(\frac{\partial m_1}{\partial g_{h,1}}\right) + \frac{1}{1+r}(m_1)^{-\frac{1}{\epsilon}}\left(\frac{\partial m_1}{\partial g_{h,1}}\right)\right] \\
&= \left(\frac{1}{an}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\left[(m_0)^{-\frac{1}{\epsilon}}\frac{\partial m_0}{\partial m_1} + \frac{(m_1)^{-\frac{1}{\epsilon}}}{1+r}\right]^{-1}\left[(m_0)^{-\frac{1}{\epsilon}}\frac{\partial m_0}{\partial m_1} + \frac{(m_1)^{-\frac{1}{\epsilon}}}{1+r}\right] \\
&= \left(\frac{1}{an}\right)\left(\frac{\epsilon}{1-\epsilon}\right)
\end{aligned}$$

This yields the result in the text. ■

Appendix III: The social planner's solution

Proof. The social planner chooses $g_{h,1}$ and $g_{h,2}$ to maximize:

$$\frac{1}{n}\left\{\sum_{h=1}^{n}\left[\left(\frac{\epsilon}{\epsilon-1}\right)(m_{h,0})^{(\epsilon-1)/\epsilon} + \log(g_{h,1})\right] + \frac{1}{1+r}\sum_{h=1}^{n}\left[\left(\frac{\epsilon}{\epsilon-1}\right)(m_{h,1})^{(\epsilon-1)/\epsilon} + \log(g_{h,2})\right]\right\}$$

subject to

$$(1+r)(nb_{0-} + nm_{0-}) + \sum_{h=1}^{n} g_{h,1} + \frac{\sum_{h=1}^{n} g_{h,2}}{1+r} = n\tau y + anm_0^{1-\frac{1}{\epsilon}} + \frac{n\tau y + anm_1^{1-\frac{1}{\epsilon}}}{1+r}$$

Combining the above two expressions, we can simplify the social planner's objective function as:

$$\frac{1}{n}\left\{\sum_{h=1}^{n}\left[\left(\frac{\epsilon}{a(\epsilon-1)}\right)g_{h,1} + \log(g_{h,1})\right] + \frac{1}{1+r}\sum_{h=1}^{n}\left[\left(\frac{\epsilon}{a(\epsilon-1)}\right)g_{h,2} + \log(g_{h,2})\right]\right\}$$

The first order condition yields the result in the text. ■

Appendix IV: The properties of $F_1^{fix}(m_1), F_2^{fix}(m_1), F_1^{fle}(m_1)$ and $F_2^{fle}(m_1)$

Proof. Let us define:

$$F_1^{fle}(m_1) \equiv \frac{n\left[A(m_1)+C(m_0)\right]}{B(m_1)+D(m_0)} = \frac{n\left[A(m_1)+a\left(\frac{1}{\epsilon}-1\right)D(m_0)\right]}{B(m_1)+D(m_0)}$$

$$F_1^{fix}(m_1) = \frac{nA(m_1)}{B(m_1)}$$

where

$$A(m_1) = \left[n(1+r)\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1} + a\left(\frac{1}{\epsilon}-1\right)m_1^{-\frac{1}{\epsilon}}\right] > 0$$

$$B(m_1) = \frac{(1+r)[\frac{1}{\epsilon}m_1^{\frac{1}{\epsilon}-1}+1]+a(\frac{1}{\epsilon}-1)m_1^{-\frac{1}{\epsilon}}}{\left[a(\frac{1}{\epsilon}-1)+(1+r)m_1^{\frac{1}{\epsilon}}\right]} > 0$$

$$C(m_0) = a(\frac{1}{\epsilon}-1)D(m_0) = \frac{a(\frac{1}{\epsilon}-1)(1+r)(1-v_1)}{a(\frac{1}{\epsilon}-1)+(1+r)m_0^{\frac{1}{\epsilon}}} \geq 0$$

Then,

$$F_1^{fix}(m_1) - F_1^{fle}(m_1) = \frac{n(AD-BC)}{B(B+D)} = \frac{nD\left[A-a\left(\frac{1}{\epsilon}-1\right)B\right]}{B(B+D)}$$

For any $m_1 > 0$,

$$A - a\left(\frac{1}{\epsilon}-1\right)B$$

$$= \frac{(n-1)a(1+r)(\frac{1}{\epsilon}-1)(\frac{1}{\epsilon})m_1^{\frac{1}{\epsilon}-1} + n(\frac{1}{\epsilon})(1+r)m_1^{\frac{2}{\epsilon}-1}}{\left[a(\frac{1}{\epsilon}-1)+(1+r)m_1^{\frac{1}{\epsilon}}\right]} > 0$$

Therefore, as long as $v_1 \neq 1$, $F_1^{fix}(m_1)$ is greater than $F_1^{fle}(m_1)$ for any $m_1 > 0$.
Now we will prove $F_1^{fix}(m_1)$ is increasing with m_1.

$$\frac{\partial F_1^{fix}}{\partial m_1} = \frac{n\left(A'B - B'A\right)}{B^2}$$

It can be shown that

$$\begin{aligned} & A'B - B'A \\ = \; & n(1+r)\left(\frac{1}{\epsilon}\right)\left(\frac{2}{\epsilon}-1\right)m_1^{\frac{2}{\epsilon}-2} + a\left(n-1\right)(1+r)^2\left(\frac{1}{\epsilon}\right)\left(\frac{1}{\epsilon}-1\right)^2 m_1^{\frac{1}{\epsilon}-2} + \\ & a^2\left(n-1\right)(1+r)\left(\frac{1}{\epsilon}\right)\left(\frac{1}{\epsilon}-1\right)^3 m_1^{-2} + a^2\left(n-1\right)(1+r)\left(\frac{1}{\epsilon}\right)^2\left(\frac{1}{\epsilon}-1\right)^2 m_1^{-2} \\ & +n(1+r)^3\left(\frac{1}{\epsilon}\right)^3 m_1^{\frac{3}{\epsilon}-3} + an(1+r)^2\left(\frac{1}{\epsilon}\right)\left(\frac{1}{\epsilon}-1\right)\left(\frac{3}{\epsilon}-1\right)m_1^{\frac{1}{\epsilon}-2} \end{aligned}$$

Since $0 < \epsilon < 1$, $(A'B - B'A) > 0$. Therefore, $\frac{\partial F_1^{fix}}{\partial m_1} > 0$.

To show $F_1^{fle}(m_1)$ is increasing with m_1, we have

$$\frac{\partial F_1^{fle}}{\partial m_1} = \frac{n\left(A'B - B'A\right) - nD'\left[A - a\left(\frac{1}{\epsilon}-1\right)B\right] + nD\left[A' - a\left(\frac{1}{\epsilon}-1\right)B'\right]}{\left(B+D\right)^2}$$

From the above proof, we know $(A'B - B'A) > 0$ and $D'\left[A - a\left(\frac{1}{\epsilon}-1\right)B\right] < 0$. Therefore, if $\left[A' - a\left(\frac{1}{\epsilon}-1\right)B'\right] > 0$, we have $\frac{\partial F_1^{fle}}{\partial m_1} > 0$.

It can be easily shown that

$$A' - a\left(\frac{1}{\epsilon}-1\right)B' > 0$$

■

Appendix V: Proof of proposition 1

Proof. Under a fixed exchange rate regime, when $n = 1$, according to Eq.(19),

$$g_1^{fix*} = \frac{(1+r)\frac{1}{\epsilon}(m_1^{fix*})^{\frac{1}{\epsilon}-1} + a\left(\frac{1}{\epsilon}-1\right)(m_1^{fix*})^{-\frac{1}{\epsilon}}}{(1+r)[\frac{1}{\epsilon}(m_1^{fix*})^{\frac{1}{\epsilon}-1}+1] + a\left(\frac{1}{\epsilon}-1\right)(m_1^{fix*})^{-\frac{1}{\epsilon}}} \times g_2^{fix*}$$

Since $\dfrac{(1+r)\frac{1}{\epsilon}(m_1^{fix*})^{\frac{1}{\epsilon}-1}+a\left(\frac{1}{\epsilon}-1\right)(m_1^{fix*})^{-\frac{1}{\epsilon}}}{(1+r)[\frac{1}{\epsilon}(m_1^{fix*})^{\frac{1}{\epsilon}-1}+1]+a\left(\frac{1}{\epsilon}-1\right)(m_1^{fix*})^{-\frac{1}{\epsilon}}}<1$, it must be that $g_1^{fix*}<g_2^{fix*}$.

Under a flexible exchange rate regime, when $n=1$, according to Eq.(21) and (22),

$$
\begin{aligned}
& g_1^{fle*}-g_2^{fle*} \\
&= \frac{-(1+r)-\dfrac{(1+r)(1-v_1)(1+r)(m_1^{fle*})^{\frac{1}{\epsilon}}}{\frac{1}{\epsilon}-1+(1+r)(m_0^{fle*})^{\frac{1}{\epsilon}}}}{\dfrac{(1+r)[\frac{1}{\epsilon}(m_1^{fle*})^{\frac{1}{\epsilon}-1}+1]+(\frac{1}{\epsilon}-1)(m_1^{fle*})^{-\frac{1}{\epsilon}}}{\left[\frac{1}{\epsilon}+(1+r)(m_1^{fle*})^{\frac{1}{\epsilon}}-1\right]}+\dfrac{(1+r)(1-v_1)}{\frac{1}{\epsilon}-1+(1+r)}(m_0^{fle*})^{\frac{1}{\epsilon}}}
\end{aligned}
$$

Therefore, when $n=1$, $g_1^{fle*}-g_2^{fle*}<0$. ■

Appendix VI: Proof of lemma 1

Proof. Suppose instead we have $m_1^{fle*}\le m_1^{fix*}$
On the one hand, the RHS of Eq.(19) is always greater than the RHS of Eq.(22)

$$
\begin{aligned}
& \text{RHS of Eq.(19)-RHS of Eq.(22)} \\
=\ & a^{\epsilon}[r^{1-\epsilon}-(r+\pi_1^{fle*})^{1-\epsilon}]+\frac{a}{1+r}[(m_1^{fix*})^{1-\frac{1}{\epsilon}}-(m_1^{fle*})^{1-\frac{1}{\epsilon}}]<0
\end{aligned}
$$

On the other hand, according to Eq.(24),

$$g_2^{fle*}\le g_2^{fix*}$$

$$g_1^{fle*}=F_1^{fle}(m_1^{fle*})<F_1^{fix}(m_1^{fle*})\le F_1^{fix}(m_1^{flx*})=g_1^{fix*}$$

Therefore, the LHS of Eq.(19) is always greater than the LHS of Eq.(22). A contradiction is reached. Therefore, it must be $m_1^{fix*}<m_1^{fle*}$. ■

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