A Note on the Formal Equivalence of the Time Inconsistency Model and the Common Pool Model of Budget De…cits

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February 2006 (This version: December 2006)

Abstract

Time inconsistency (the alternating governments hypothesis) and dynamic common pool problems are two of the more in‡uential political economy theories of the de…cit bias. Although conceptually di¤erent, this note shows that for modeling purposes, the two theories can be viewed as formally equivalent.

1 Introduction

The political economy literature on budget de…cits suggests that …scal policy may be biased toward de…cits, for various reasons related to the institution of democracy[1]. Two of the most in‡uential views on how democratic institutions produce a de…cit bias are the dynamic common pool problem formalized in Velasco (2000), and the time inconsistency hypothesis, alias the alternating governments hypothesis, proposed by Alesina and Tabellini (1990). The time inconsistency hypothesis states that when a government is uncertain of re-election, or knows with certainty that it will not be reelected, it will want to increase the debt above what is socially optimal so as to strategically in‡uence the options of a future government, which may not want to spend according to the preferences of the present one. The common pool problem, on the other hand, states that when there is more than one agent (parties, lobby groups, di¤erent ministries, etc.) involved in selecting the budget de…cit, and hence also more than one agent involved in shouldering the cost of repayment of the associated debt in

[1] Here, I focus narrowly on the political economy literature which proposes positive expanations of the de…cit bias, and hence disregard normative theories which explain the emergence of de…cits as optimal - including Barro's seminal tax smoothing theory, and the intra and intergenerational redistribution motives for taking up public debts. See Alesina and Perotti (1995) for a survey.

the future, the full discounted future cost of taking up debt in the present is not internalized by the agents. The public debt is a common, and each agent will hence be able to share the cost of her individual decisions with the other agents. As long as there is more than one agent, the common pool problem will lead to suboptimally high de…cit levels.

I show in this paper that the time inconsistency hypothesis can be interpreted as a common pool problem over time, and moreover, that these two causes of the de…cit bias can be treated as formally equivalent.

2 The Model

The basic model setup is the two period common pool model of budget de…cits of Krogstrup and Wyplosz (2006), extended with re-election uncertainty to capture time inconsistency e¤ects. For the sake of clarity, the model is simpli…ed to the one country case (i.e. there are no international externalities of debt) and productive expenditures are excluded. Neither simpli…cation changes the conclusions made below. The only function of …scal policy in this model is to redistribute resources among the di¤erent groups of society which are represented by parties in the coalition government[2].

There are $N > 1$ groups of the same size in society , which are all represented by a political party. Each party is indexed by i, $i = 1; 2; :::; N$. The government is elected at the beginning of each of the two periods, and is a coalition government in which each party represented has an equal weight. Let $n < N$ be the number of parties elected to participate in the coalition government in each period. While the number of parties elected for government is the same across periods, the composition of parties di¤ers across periods. The probability of being elected for government in each period is constant, p, and independent of whether the party representative was previously or will subsequently be elected for government.

Each party representative has the utility function

$$U_1^i = E_1 \left[\log \left(g_1^i + \frac{\overline{G}}{n} \right) + \beta \log \left(g_2^i + \frac{\overline{G}}{n} \right) \right], \tag{1}$$

where g_t^i is the net transfer (i.e. transfers received less taxes paid) to each of the members of party i. g_t^i can alternatively be interpreted as public spending on a club good which exclusively bene…ts party i members, less the tax contributions of these same members. β is the time preference factor. Note that in the point where $g_t^i + \frac{\overline{G}}{n}$ is zero, the marginal utility of g_t^i goes to in…nity. $\frac{\overline{G}}{n}$ can be interpreted as a lower threshold for net transfers to each group ($g_t^i = i \frac{\overline{G}}{n}$) which sums up to a maximum capacity to tax the aggregate economy of $\overline{G}$[3].

[2] Velasco (1999) …rst proposed this way of modeling …scal policy with the purpose of studying common pool e¤ects on the de…cit rather than on the level of spending given taxes.

[3] The assumption that the lower threshold for net transfers for each party is inversily proportional to the number of parties in the coalition government is necessary to ensure that the overall common pool stays constant as n changes.

The coalition government can freely borrow or lend as a means of …nancing a potential aggregate de…cit or surplus, but is bound by the intertemporal budget constraint. It is the job of the coalition government to select net transfers to the N groups in society and thus to decide on the budget balance. The decision making structure of the coalition government is ‡at, in that each party representative decides on the net amount of government transfers, g_t^i, that each member of the group obtains in period t. Assume also that if a party is not represented in government in period t, the constituency of that party will not receive any net transfers in that period[4]. Then the aggregate budget de…cit is the sum of each party representative's chosen net transfer to her constituency times the number of members of her party. Normalizing the amount of members of each party to 1, g_t^i thus becomes the net contribution to the budget de…cit of party representative i in period t. This implies the …rst period budget constraint of:

$$\sum_{i=1}^{N} g_1^i = B; \tag{2}$$

The debt has to be fully repaid in period two, so the second period budget constraint becomes:

$$\sum_{i=1}^{N} g_2^i + \frac{1}{R} B = 0;$$

which implies the intertemporal budget constraint:

$$\sum_{i=1}^{N} g_1^i + R \sum_{i=1}^{N} g_2^i = 0$$

where $R = \frac{1}{1+r}$. The economy is small and open, and the interest rate is …xed at the world level.

Assume that this interest rate level is equal to the time preference parameter, and that they are both equal to one:

$$R = \beta = 1 \tag{3}$$

This assumption allows us to abstract from cases of intertemporally tilted optimal consumption pro…les and simpli…es the interpretation of results without loss of generality[5].

Social welfare is de…ned as the sum of all citizens' utility, here crudely represented by their party representative's utility:

$$U_1^S = \sum_{i=1}^{N} \log(g_1^i + \frac{\overline{G}}{n}) + \log(g_2^i + \frac{\overline{G}}{n}):$$

[4] The alternative assumption could be made that total tax revenues are …xed while the parties in government select the value of gross transfers to their members. In this case, the outsider parties would not acquire any transfers at all, but would contribute with tax payments. Such an alternation of the model would not change the conclusions below.

[5] See appendix in Krogstrup and Wyplosz (2006) for the general common pool model with differing R and β.

Maximizing with respect to net transfers across parties and periods under the intertemporal budget constraint yields the socially optimal outcome of balanced budgets for all citizens in both periods:

$$g_t^i = 0; \; i = 1;::N \text{ and } t = 1;2:$$

Now turn to the case where each party decides on their own net transfer. In the second period, there is no room for maneuver of the parties in o¢ce, as the second period budget constraint is binding and debt is predetermined. Assuming that the parties of the coalition government shoulder an equal share of the debt repayment (or recieve an equal share of the savings from the previous period), the second period net transfer to each representative is given by:

$$g_2^i = \begin{cases} i\frac{B}{n}; & i = 1;::::::;n \\ 0; & i = n+1;::;N \end{cases} \quad (4)$$

In the …rst period, each representative in o¢ce will maximize expected utility with respect to her period one net transfer, given the period one budget constraint and the associated net transfer in period two:

$$\max_{g_1^i} E_1\left[U^i\right] = p\left[\log\left(g_1^i + \frac{\overline{G}}{n}\right) + \log\left(i\frac{B}{n} + \frac{\overline{G}}{n}\right)\right] + (1-p)\left[\log\left(g_1^i + \frac{\overline{G}}{n}\right) + \log\left(\frac{\overline{G}}{n}\right)\right]$$

subject to (2) and (4). The …rst order condition yields the reaction function for party representative i vis-a-vis the choices made by her fellow coalition partners' choices:

$$FOC: g_1^i = \frac{(n-p)}{(p+1)}\frac{\overline{G}}{n} - \frac{1}{(p+1)}\sum_{\substack{j=1 \\ j\neq i}} g_1^j$$

The resulting symmetric Nash equilibrium net transfer chosen by the coalition party representatives, and the resulting debt, are given by:

$$g_1^N = \Phi\frac{\overline{G}}{n}; \quad (5)$$

$$B = ng_1^N = \Phi\overline{G}; \quad (6)$$

$$\Phi \equiv \frac{n-p}{p+n}: \quad (7)$$

(5) to (7) imply that the strength of the de…cit bias in a democratically elected fragmented government composed of n fractions and subject to the re-election probability p can be summarized by the bias parameter Φ. Setting p = 1 and n > 1 yields the common pool model of a de…cit bias formalized by Velasco (2000), while setting p < 1 and n = 1 yields the time inconsistency, or alternating governments result presented in Alesina and Tabellini (1990).

(7) further demonstrates that the time inconsistency and the common pool causes of the de…cit bias can be considered formally equivalent, in that the

e¤ect on the de…cit bias parameter of any level of common pool externality, summarized by the size of n, can be replicated by a corresponding re-election probability, p(n), chosen such that $p(n) = \frac{1}{n}$. For example, the common pool model with two parties participating in government produces the same de…cit bias as the time inconsistency model where the re-election probability is one half. Both models would produce a de…cit bias parameter of one third[6].

The obvious objection to the above simple model is why would parties run for election in the second period if they know they will have to incur a loss when participating in paying back the debt. This feature of the model is unfortunate, but irrelevant for the equivalence result. What matters is that the current government members perceive to share the cost of taking up debt today with either other party members in the same or second period, or with a new government in the second period, irrespective of how their choices a¤ect political outsiders. Letting the per capita per period tax payments be exogenous and letting the coalition parties compete over gross transfers to their constituencies would yield exactly the same type of equivalence between the time inconsistency and the common pool versions of the model, and would not be subject to the above objection[7].

3 Conclusion

The political economy literature suggests two separate causes of the de…cit bias, namely the imperfect internalization of the cost of de…cits due to a dynamic common pool problem, and the strategic in‡uencing of future governments through passing on higher than optimal debt levels to future government[8].

This simple example above shows that while conceptually di¤erent, the two causes can be thought of as formally equivalent. They are both rooted in the imperfect internalization of the e¤ect of current de…cit decisions on future outcomes. The traditional dynamic common pool mechanism is due to the sharing of the repayment of the future debt with a number of other agents - here parties to a coalition government - and the traditional time inconsistency mechanism is due to the expected sharing of the repayment of the future debt with a di¤erent government. The only di¤erence from a methodological perspective is that the latter involves uncertainty as a cause of imperfect internalization, while the former does not. The di¤erence is not crucial, however, as the result still stands if we assume zero re-election probability with certainty, which in terms of its

[6] Obviously, since n out of N parties get to hold o¢ce each period, it would be logical to assume that $p = \frac{n}{N}$:Under this assumption, the de…cit bias parameter reduces to $\Re_{p=\frac{n}{N}} = \frac{N+1}{N+1}$:Thus, as the number of parties increase, the re-election probability increases as well, and the two e¤ects on the externality of de…cits cancel each other out so that the de…cit bias stays constant.

[7] Derivations are available upon request.

[8] The delayed stabilizations hypothesis can be viewed as a common pool problem which with time results in a high enough cost to all groups that they bene…t from coordination. It is hence not mentioned independently here. See Velasco (1999) for a formalization of the delayed stabilizations hypothesis.

e¤ect on the de…cit bias is equivalent to the case where the number of members of the coalition government is going to in…nity.

Making this logical equivalence explicit allows for the common treatment of the two mechanisms for the de…cit bias for the purposes of developing policy measures to increase …scal discipline.

4 References

Alesina, A. and R. Perotti, 1995, The political economy of budget de…cits, IMF Sta¤ Papers (March), pp. 1-37

Alesina, A. and G. Tabellini, 1990, A positive theory of …scal de…cits and government debts. Review of Economic Studies 57, pp. 403-414

Krogstrup, S. and C. Wyplosz, 2006, A common pool theory of de…cit bias correction. Mimeo, Graduate Institute of International Studies

Velasco, A., 1999, A model of endogenous …scal de…cits and delayed …scal reforms. In J. Poterba and J. von Hagen, eds., Fiscal Institutions and Fiscal Performance. Chicago, University of Chicago Press

Velasco, A., 2000, Debts and de…cits with fragmented …scal policymaking, Journal of Public Economics 76(1), pp. 105-125