Public Debt, Migration and Shortsighted Politicians*

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Abstract

We analyze a model where local public debt levels are set by politicians who are chosen in local elections. Migration causes an externality across districts, and leads to over-accumulation of local public debt. Since debt is a *strategic substitute* the median voters in each district prefer shortsighted political leaders who "borrow and spend", thereby exacerbating the problem of over-accumulation of public debt. *Keywords:* Migration, Elections, Public Debt. *JEL*: D71, D72, H74

1 Introduction

In many countries and during various time periods, state and federal governments have imposed limits on local borrowing. For instance, in the US it is common practise for states to set a ceiling on local debt. Canada and many European countries impose debt restrictions on local budgets. The Australian federal government exercises control over state borrowing by subjecting all state borrowing to the approval of the Australian Loan Council.[1]

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[1] For discussions of debt limits in various countries, see Richard J. Aronson and John L. Hilley (1986), Richard M. Bird and N. Enid Slack (1983), Christian Smekal (1986), Bird (1986), and Russell Mathews (1986).

In many cases the debt limits appear to be binding (McEachern, 1978). The justification for imposing debt limits must be that some externality across districts leads to an over-accumulation of local public debt. In this paper, following Daly (1969), Oates (1972) and Bruce (1995), we assume that a negative externality is caused by migration.[2] Our main result is that in a representative democracy with local elections, the over-accumulation of debt is *enhanced* by the electoral process, because in each district the voters will elect *shortsighted* political leaders. Countries with direct voting over local debt levels, such as Switzerland, should suffer *less* from the externality than countries where debt levels are determined by locally elected shortsighted politicians.

In our model there are $k \geq 2$ identical districts. Individuals have different discount factors, but are otherwise identical. There are two periods, with migration taking place between the periods. Local public debt can be accumulated in period one. Borrowing occurs at a fixed interest rate r on a capital market which is exogenous to this economy. Since a district cannot tax its *past* citizens, the local debt must be repaid in period two by the *period two* citizens of the district. Thus, citizens who move from district i to district j become responsible for the debt in district j, but cannot be forced to repay any part of the debt in district i. In period one the debt level is decided, in each district, by the district's *policymaker.* The policymaker is a citizen who wins a local election. After the election he sets the debt level that maximizes his own welfare (it is not possible to commit to a policy before the election). All individuals (including the policymakers) are fully rational. In particular, they can predict that migration may be triggered by the debt levels. There is a fixed resource in each district, which is shared by the local inhabitants. Immigration leads to congestion because more individuals will share the fixed resource. Free and costless migration implies that in period two all districts must be equally pleasant to live in, which in our simple model implies they all must have the same per-capita consumption (equal to the average consumption in the whole economy).

By borrowing one unit of the consumption good in period one, the policymaker increases the period one consumption in his district by one unit. In period two, $1+r$ units have to be repaid by the period two inhabitants of his

[2] Other explanations for why debt causes a negative externality have been proposed. In particular, Epple and Spatt (1986) argued that the default of many communities may lead to a situation where courts refuse to enforce public debt contracts, which reduces the credit rating of all communities.

district. This reduces the average economy wide consumption by $(1+r)/k$. Free migration implies that the consumption in the policymaker's own district must equal the average consumption in the whole economy, so the policymaker internalizes only one kth of the cost of the loan.[3] As a result of this "common pool" problem, the equilibrium debt levels are inefficiently high. The more the policymaker discounts the future, the more debt he will accumulate. Therefore, choosing a policymaker with a particular discount factor is *strategic delegation* in the sense of Vickers (1985) and Fershtman, Judd and Kalai (1987). By increasing the debt in his district, the policymaker reduces the period two consumption level in *all* districts, thereby raising the marginal utility of period two consumption for the other policymakers. The other policymakers' best response is to reallocate consumption from period one to period two, i.e. to *reduce* their debt. Therefore, debt is a *strategic substitute.* Since debt causes a negative externality across districts, the voters in each district will elect a policymaker who accumulates a lot of debt in order to make the other policymakers reduce their debt levels. Thus, in voting equilibrium, the policymaker in each district will be *shortsighted.* That is, the chosen policymaker will have a lower discount factor than the median voter in his district. He will be inclined to "borrow and spend". As a result, the inefficiency caused by the "common pool" problem of debt is *made worse* by the electoral process of a representative democracy. Indeed, a similar argument will imply that representative democracy is worse than direct democracy for the median voter whenever the decision variables are strategic substitutes. However, the situation is reversed when the decision variables are strategic complements. In this case representative democracy turns out to be better for the median voter. An example is provided by Persson and Tabellini's (1992) model of capital tax competition. Capital taxes are strategic complements so the voters elect a politician who is likely to set a high tax, thereby encouraging the other district to raise their tax too. This

[3] A period one tax cut in a district is enjoyed only by the current (period one) inhabitants, while an increase in the local debt will be repaid by the future (period two) inhabitants. The tax cut does not attract immigrants in period one because by assumption immigration only occurs between the periods. If outsiders were allowed to immigrate *instantaneously* as a response to a period one tax cut then there would be no strategic benefit of using debt instead of taxes, and our results would change. Such a frictionless scenario would be unrealistic, however. Decisions to migrate need to be planned ahead of time, so it seems reasonable that potential migrants are locked into their current district for some amount of time.

reduces the inefficiency caused by the tax competition, which benefits the median voters.

There is a large literature explaining why the political process may contribute to excessive borrowing by governments. Persson and Svensson (1989) and Tabellini and Alesina (1990) argue that governments may wish to use debt strategically in order to influence the choices of their successors. If the successor has different preferences on government spending, debt will effectively tie his hands and be strategically used for this purpose. A "common pool" problem of debt which was not caused by migration arose in Tabellini's (1986) model of a dynamic game of fiscal and monetary coordination. Chari, Jones, and Marimon (1996) present a model of election of the legislature, where the bargaining in the legislature makes it optimal for different districts to elect representatives who are "big spenders", although the different electorates have median voters with more conservative preferences on public expenditure. The election process amplifies the distortions in their model like in ours, although the reason for it is very different from our model.

We make the simplifying assumptions that there is no market for land and there are no public goods. These issues are discussed by Schultz and Sjöström (2000) in a model where there are no elections. Introducing a competitive market for land and allowing for variable public goods levels will not remove the debt externality caused by migration. In particular, the local public debt level will in general not be fully capitalized in land values, therefore the debt externality remains.

The organization of the paper is as follows. Section 2 presents the model. Equilibrium among policymakers is treated in section 3, while section 4 discusses the election of policymakers.

2 The model

There are $k \geq 2$ identical districts. Each district initially has a continuum of citizens which we normalize to size one. There are two periods. The agents can move between the districts only between periods one and two. The lifetime utility is the discounted sum of the utilities in the two periods, where β is the discount factor. Individuals have different discount factors, but are otherwise identical. Each agent's utility of consumption is $u(c)$, where $u' > 0,\ u'' < 0$. The initial distribution of β in each district has support $[0, 1]$ and median $\bar{\beta}$. Each district contains a natural resource which each period produces one unit of the consumption good. This unit is divided equally among the inhabitants.

The time line is as follows. Before period one each district elects a policymaker from its population (representative democracy). In period one, the policymaker in each district j decides on the amount of debt d_j to be incurred in his district. The period one per capita consumption in district j is $1 + d_j$. The loan is taken on a capital market which is exogenous to this economy and the interest rate is $r < 1$. We assume

$$(1+r)\bar{\beta} > 1$$

which implies that it is (socially) inefficient for the median voter to borrow.

Between periods one and two, the citizens can freely and without cost move between districts. At the time of migration, each agent knows the debt levels in all communities. The number of citizens living in district j in period two is denoted n_j, where $0 \leq n_j \leq k$. In period two, the debt (with interest) is repaid, subject to the constraint that consumption cannot be less than zero (limited liability). It is not the citizens who incurred the debt, but the citizens who are now living in the district, who are responsible for paying the debt. All taxes are lump sum taxes.

The second period citizens must repay the debt with interest, $(1+r)\,d_j$. Since each district's per period income is one unit of the consumption good, a loan which is bigger than $1/(1+r)$ cannot be repaid. We suppose no such loan can be obtained on the capital market. Thus, the constraint on policymaker j's loan is

$$0 \leq (1+r)\,d_j \leq 1 \tag{1}$$

What is left after the debt is repaid is consumed. The second period per capita consumption in district j is, therefore,

$$\frac{1-(1+r)d_j}{n_j}$$

if $(1+r)\,d_j < 1$ and 0 if $(1+r)\,d_j = 1$.

3 Equilibrium among the policymakers

In this section we assume a policymaker has been chosen in each district, and consider an equilibrium in the game played by the policymakers. Let

β_j denote the discount factor of the policymaker in district j, from now on referred to as policymaker j.

The objective of each policymaker is to choose a first period debt level so as to maximize his own *lifetime* utility, or equivalently, the life time utility of those first period citizens of his district that have the same discount factor as him. We assume rational expectations: (1) in equilibrium, each policymaker correctly predicts the other policymakers' choices; and (2) for each choice of $d = (d_1, ..., d_k)$, the policymakers as well as all other agents can predict each district j's second period population level $n_j(d)$. We require that $n_j(d)$ is consistent with utility maximizing behavior on the part of the agents in the following sense. For each j, given rational expectations about $n_j(d)$, each agent can calculate the utility of living in district j in period two:

$$u\left(\frac{1-(1+r)d_j}{n_j(d)}\right) \tag{2}$$

if $(1+r)d_j < 1$ and $u(0)$ otherwise. We require that in period two each agent lives in the district which gives him the highest utility. As intertemporal utility is separable and there are no costs of moving, after the first period all agents are in a symmetric position and the decision of where to locate in the second period is not influenced by where the agent lived in the first period. Notice that they are symmetric even though they may have had different discount factors, because once the first period is over the discounting does not matter anymore.

Lemma 1 *For all j, $(1+r)d_j < 1$ implies $n_j(d) > 0$. If there is some district j with $(1+r)d_j < 1$, then for all i, $(1+r)d_i = 1$ implies $n_i(d) = 0$.*

Proof. Suppose $(1+r)d_j < 1$ but $n_j(d) = 0$. If an agent who plans to live in the second period in a district with a positive population moved to district j instead, he would get an arbitrarily high consumption, from (2). This would make him better off for sure because u is increasing, but this contradicts our hypothesis that each agent lives in the district which gives him the highest utility.

If $(1+r)d_j < 1$ and $(1+r)d_i = 1$ then district j has strictly higher consumption than district i, which proves the second part of the statement. ■

We can now find the period two population of each district j as a function of the debt levels in the different districts. Suppose $(1+r)d_j < 1$ for at least one j. Suppose without loss of generality that $(1+r)d_j < 1$ for $1 \leq j \leq h$

and $(1+r)d_j = 1$ for $j > h$. Then by Lemma 1, $n_j(d) > 0$ for $j \in \{1, ..., h\}$. Because all agents make rational migration decisions, all these districts must be equally pleasant to live in, so

$$\frac{1-(1+r)d_i}{n_i(d)} = \frac{1-(1+r)d_j}{n_j(d)}$$

for $1 \le i, j \le h$. This implies

$$\frac{n_j(d)}{k} = \frac{1-(1+r)d_j}{\sum_{i=1}^{h}(1-(1+r)d_i)} \tag{3}$$

for $j \in \{1, ..., h\}$. For $j > h$, $1-(1+r)d_j = 0$ and $n_j(d) = 0$ by Lemma 1, so for *all* $j \in \{1, ..., k\}$ we have

$$n_j(d) = k\frac{1-(1+r)d_j}{\sum_{i=1}^{k}(1-(1+r)d_i)} \tag{4}$$

as long as $(1+r)d_j < 1$ for at least one j. If it should happen that $(1+r)d_j = 1$ for *all* j, then all districts have zero second period consumption, and $n_j(d)$ can be arbitrary numbers satisfying $\sum_{i=1}^{k} n_i(d) = k$.

Policymaker j's lifetime payoff is the payoff of an agent who lives in district j in the first period and who has discount factor β_j. If $(1+r)d_i = 1$ for all i, then all districts have zero consumption in period two and policymaker j's payoff is

$$u\left(1+\frac{1}{1+r}\right) + \beta_j u(0) \tag{5}$$

If there is some i such that $(1+r)d_i < 1$, then any such district is equally pleasant and from (4) has per capita consumption

$$\frac{1-(1+r)d_i}{n_i(d)} = \frac{\sum_{j=1}^{k}(1-(1+r)d_j)}{k} = 1-(1+r)\frac{\sum_{j=1}^{k} d_j}{k}$$

Thus, policymaker j's payoff is

$$V_j(d_j, \Omega_{-j}, \beta_j) \equiv \; u(1+d_j) + \beta_j u\left(1-(1+r)\frac{\Omega_{-j}+d_j}{k}\right) \tag{6}$$

where

$$\Omega_{-j} \equiv \sum_{i \neq j} d_i$$

Notice that (6) equals (5) if $(1+r)d_i = 1$ for all i. Hence, in all cases policymaker j's payoff is given by (6). It is easy to check that $V_j(d_j, \Omega_{-j}, \beta_j)$ is strictly concave in (d_j, Ω_{-j}). Notice that policymaker j's payoff only depends on d_i for $i \neq j$ through $\Omega_{-j} = \sum_{i \neq j} d_i$. The debt levels $d^* = (d_1^*, ..., d_k^*)$ form an *equilibrium among the policymakers* if and only if for each j, d_j^* maximizes $V_j(d_j, \sum_{i \neq j} d_i^*, \beta_j)$ subject to the constraint $0 \leq d_j \leq 1/(1+r)$.

Equation (6) shows the basic externality caused by the migration. Regardless of relative debt levels incurred in period one, in period two the *per capita* consumption in all inhabited districts must be equal, hence equal to the average consumption in the whole economy:

$$\frac{1-(1+r)d_j}{n_j} = \frac{\sum_{i=1}^{k}(1-(1+r)d_i)}{k}$$

for all j such that $1-(1+r)d_j > 0$.

If policymaker j borrows one more unit of the consumption good to spend in his district today, this reduces the economy-wide average consumption in period two by only $(1+r)/k$. Hence, the policymaker internalizes only one kth of the true cost of the loan. Indeed, the derivative of policymaker j's payoff function with respect to d_j is

$$\frac{\partial V_j(d_j, \Omega_{-j}, \beta_j)}{\partial d_j} = u'(1+d_j) - \frac{1+r}{k}\beta_j u'\left(1-(1+r)\frac{\Omega_{-j}+d_j}{k}\right)$$

for $0 < d_j < 1/(1+r)$. Let $BR_j(\Omega_{-j} \mid \beta_j)$ denote the best response for policymaker j (with discount factor β_j) when the other districts choose the aggregate debt level Ω_{-j}. At an interior solution, $BR_j(\Omega_{-j} \mid \beta_j)$ is implicitly determined by

$$\frac{\partial V_j(BR_j(\Omega_{-j} \mid \beta_j), \Omega_{-j}, \beta_j)}{\partial d_j} = 0 \tag{7}$$

Let $BR_j'(\Omega_{-j} \mid \beta_j)$ denote the slope of the best response function. Totally differentiating (7) we get

$$BR_j'(\Omega_{-j} \mid \beta_j) = -\frac{\frac{(1+r)^2}{k^2}\beta_j u''\left(c_j^2\right)}{u''\left(c_j^1\right) + \frac{(1+r)^2}{k^2}\beta_j u''\left(c_j^2\right)} \tag{8}$$

where

$$c_j^1 = 1 + BR_j(\Omega_{-j} \mid \beta_j)$$

and

$$c_j^2 = 1 - (1+r)\frac{\Omega_{-j} + BR_j(\Omega_{-j} \mid \beta_j)}{k}$$

are the consumption levels in periods one and two in district j. Thus,

$$-1 < BR_j'(\Omega_{-j} \mid \beta_j) < 0 \tag{9}$$

at an interior solution. So the debt levels are *strategic substitutes* and the slope of the best response function is less than one (in absolute value). Thus, a standard condition for the stability and uniqueness of equilibrium is satisfied.

Proposition 1 *For any $(\beta_1, ..., \beta_k)$ there exists a unique equilibrium among the policymakers.*

Proof. Fix $(\beta_1, ..., \beta_k)$. Since d_j belongs to a compact set $[0, \frac{1}{1+r}]$ and the policymakers' payoff functions are concave, there exists at least one equilibrium among the policymakers (Fudenberg and Tirole (1991), Chapter 1.3.3.). We now argue that the equilibrium is unique. Suppose to the contrary that there are two different equilibria, say $(d_1, ..., d_k)$ and $(d_1', ..., d_k')$. Without loss of generality, let j be a district such that $d_j' - d_j \equiv \Delta d_j < 0$. By (9), the change in the aggregate debt of all districts except j must satisfy

$$\sum_{h \neq j} \Delta d_h \geq -\Delta d_j > 0 \tag{10}$$

It follows from (10) that there must be a district, say i, such that $d_i' - d_i \equiv \Delta d_i > 0$. By (9), the change in the aggregate debt of all districts except i must satisfy

$$\sum_{h \neq i} \Delta d_h \leq -\Delta d_i < 0 \tag{11}$$

However, (10) implies

$$\sum_{h \neq i} \Delta d_h = \sum_{h \neq j} \Delta d_h + \Delta d_j - \Delta d_i > -\Delta d_i$$

which contradicts (11). ■

Fix d_i, and consider a game played among policymakers $j \neq i$ conditional on this d_i. By the argument of the proof of Proposition 1, this "reduced" game has a unique equilibrium. Let $\left(d_j^*(d_i)\right)_{j\neq i}$ denote the equilibrium choices in this reduced game, conditional on this fixed d_i, and let

$$\Omega_{-i}(d_i) \equiv \sum_{j\neq i} d_j^*(d_i)$$

denote the aggregate best response function for all districts except i. Thus, if policymaker i could somehow publicly commit to d_i, the aggregate debt level in the equilibrium among the other policymakers would be $\Omega_{-i}(d_i)$. Of course, no such commitment is possible, but the function $\Omega_{-i}(d_i)$ will play an important role in our analysis. The following result says that the aggregate debt of all districts other than j is a strategic substitute for district j's debt. For Cournot competition, similar results were proved by Dixit (1986) and Farrell and Shapiro (1990).

Proposition 2 *For any* $(\beta_1,...,\beta_k)$ *and any* h*,*

$$-1 < \frac{\partial \Omega_{-h}(d_h)}{\partial d_h} < 0 \tag{12}$$

for all d_h*, assuming that at least some district* $i \neq h$ *is at an interior solution.*

Proof. Without loss of generality, consider $h = 1$. For each $j = 2, ..., k$,

$$\frac{\partial d_j^*(d_1)}{\partial d_1} = \gamma_j \times \left(1 + \sum_{i\neq 1,j} \frac{\partial d_i^*(d_1)}{\partial d_1}\right) \tag{13}$$

where

$$\gamma_j \equiv BR_j'\left(d_1 + \sum_{i\neq 1,j} d_i^*(d_1) \mid \beta_j\right)$$

denotes the slope of the best response function. If we add $\gamma_j\left(\partial d_j^*(d_1)/\partial d_1\right)$ to both sides of (13) we obtain

$$\left(1+\gamma_j\right)\frac{\partial d_j^*(d_1)}{\partial d_1} = \gamma_j \times \left(1 + \sum_{i>1} \frac{\partial d_i^*(d_1)}{\partial d_1}\right) \tag{14}$$

which implies

$$\frac{\partial d_j^*(d_1)}{\partial d_1} = \frac{\gamma_j}{1+\gamma_j}\left(1 + \frac{\partial \Omega_{-1}(d_1)}{\partial d_1}\right)$$

Summing over all $j > 1$, we get

$$\frac{\partial\Omega_{-1}(d_1)}{\partial d_1} = \sum_{j>1} \frac{\partial d_j^*(d_1)}{\partial d_1} = \left(1 + \frac{\partial\Omega_{-1}(d_1)}{\partial d_1}\right) \sum_{j>1} \frac{\gamma_j}{1+\gamma_j}$$

This can be rearranged to get

$$\frac{\partial\Omega_{-1}(d_1)}{\partial d_1} = \frac{\sum_{j>1} \frac{\gamma_j}{1+\gamma_j}}{1 - \sum_{j>1} \frac{\gamma_j}{1+\gamma_j}} \tag{15}$$

But we know (see (9)) that $-1 < \gamma_j < 0$ if district j is at an interior solution, and $\gamma_j = 0$ otherwise. Thus, (12) holds if at least some district $j \neq 1$ is at an interior solution. This completes the proof. ■

There is always some debt in equilibrium:

Proposition 3 *In any equilibrium among the policymakers, there is j such that the debt level in district j is positive, i.e. $d_j^* > 0$.*

Proof. If $d_j^* = 0$ for all j then

$$\frac{\partial V_j(0,0,\beta_j)}{\partial d_j} = u'(1) - \frac{1+r}{k}\beta_j u'(1) > 0$$

because $r < 1$ by assumption, $k \geq 2$, $u'(1) > 0$ and $\beta_j \leq 1$. So this cannot be an equilibrium. ■

The intuition for this result is simple. Suppose $d_j = 0$ for all j. Then, the citizens of district j will have the same per capita consumption (one) in each period. Hence, they have the same marginal utility in each period. By borrowing one unit of the consumption good, the citizens in district j get one unit extra today, but as they will get the average consumption tomorrow, they effectively only pay back $(1+r)/k < 1$ units tomorrow, which in addition is discounted. No matter what his discount factor is, the policymaker prefers to borrow. Thus, any equilibrium will be inefficient from the point of view of the median voters, because by assumption it is inefficient for the median voters to borrow.

Proposition 4 *Suppose all policymakers have the same discount factor: for all j, $\beta_j = \beta$. Then the unique equilibrium $d^* = (d_1^*, ..., d_k^*)$ among the policymakers is symmetric. If*

$$\beta > \frac{k}{1+r} \frac{u'\left(1 + \frac{1}{1+r}\right)}{u'(0)} \tag{16}$$

then for each j, $d_j^* = \delta \in (0, 1/(1+r))$, *where* δ *satisfies*

$$u'(1+\delta) - \frac{1+r}{k}\beta u'(1-(1+r)\delta) = 0 \tag{17}$$

If

$$\beta \leq \frac{k}{1+r}\frac{u'\left(1+\frac{1}{1+r}\right)}{u'(0)} \tag{18}$$

then for each j, $d_j^* = 1/(1+r)$.

Proof. Consider the function

$$F(\delta) \equiv u'(1+\delta) - \frac{1+r}{k}\beta u'(1-(1+r)\delta)$$

It can be checked that $F(0) > 0$. If $F(1/(1+r)) < 0$, then by continuity of F there is $\delta \in (0, 1/(1+r))$ such that $F(\delta) = 0$. But $F(\delta) = 0$ implies that the first order condition (7) is satisfied for all j at $d_j^* = \delta$, so it is an equilibrium. It is unique by Proposition 1. If instead $F(1/(1+r)) \geq 0$, then $d_j^* = 1/(1+r)$ for all j is an equilibrium, which again is unique by Proposition 1. ■

Notice that (16) will always hold if we assume $u'(0) = \infty$, at least as long as $\beta > 0$. Hence, in this case all equilibria are interior and the debt level is given by (17).

Consider an equilibrium such that $0 < d_j^* < 1/(1+r)$ for each j. Reducing d_j^* has only a second order effect on the policymaker of district j. However, all other policymakers are strictly better off because the average consumption in period two is increased, without changing their first period consumption. Hence, reducing each d_j^* would lead to a Pareto improvement among the policymakers. If $\beta_j = \bar{\beta}$ for all j, i.e. if each policymaker represents the median voter, then it follows that if each d_j^* is reduced, the median voter in each district is made strictly better off. Therefore, all median voters would unanimously agree to a debt limit. In fact, given the assumption that $(1+r)\bar{\beta} > 1$ all median voters would want the debt limit to be zero. Such debt limits would have to be enforced by a central authority. If such a centralized solution is impossible, then one way of *implicitly* committing to Pareto improving debt reductions would be to elect policymakers which are *more patient* than the median voter, hence *less willing to incur debt.* We now show that actually the median voters will do the opposite: they will elect policymakers that are *less* patient than themselves.

4 Voting for policymaker

We now go back to the time before period one where the voters in each district elect a policymaker from the population in the district. The voting is done independently and simultaneously in the different districts. We assume each citizen is willing to become policymaker (there is no cost of running for office).[4] The distribution of discount factors has support $[0, 1]$ and we assume discount factors are observable. Thus, the elected policymaker can have any discount factor between zero and one. After the election, the policymaker will choose a debt level which maximizes his own payoff (it is not possible to commit to a certain policy before the election).

It was shown in Proposition 2 that debt is a *strategic substitute* in the following sense. If policymaker i were to increase his debt level by one unit, the other policymakers' aggregate best response would be to *reduce* their total debt by less than one unit assuming at least one other policymaker is at an interior point. By increasing his debt, policymaker i reduces the average consumption level in period two across the whole economy. This increases the marginal utility of consumption in period two for the other policymakers, who respond by reducing their debt. The best response functions are downward sloping with a slope less than one (in absolute value), as illustrated in Figure 1.

A first period citizen of district i whose discount factor is β will get a lifetime payoff

$$V_i(d_i, \Omega_{-i}, \beta) \equiv \ u(1 + d_i) + \beta u \left(1 - (1 + r)\frac{\Omega_{-i} + d_i}{k}\right)$$

if the debt in his district is d_i and the aggregate debt in the other districts is Ω_{-i}, just as in equation (6). Notice that $V_i(d_i, \Omega_{-i}, \beta)$ is strictly concave in (d_i, Ω_{-i}). Of course, d_i and Ω_{-i} will be determined by the policymakers, and influenced by policymaker i's discount factor. We will show later that under some regularity assumptions, the voters in district i have single-peaked preferences over their policymaker's discount factor. As is well known, in this

[4] One may ask whether anybody would actually be interested in running for office, in particular if there is a small cost ρ attached to running. However, following Besley and Coate (1997) we may consider at game where citizens first choose whether or not to run for office. Suppose that if nobody runs for office in a district, the outcome is a "status quo" alternative which is bad for everybody. Then, for sufficiently small ρ there is an equilibrium where the citizen who is most preferred by the median voter runs unopposed.

case we may focus on the median voter, with discount factor $\bar{\beta}$. Thus, we will for now assume that the policymaker in each district is chosen by the district's median voter. Also, we will focus on interior equilibria, i.e. we assume the equilibrium debt level in each district will be strictly between 0 and $1/(1+r)$.

As debt is a strategic substitute, the median voter wants a policymaker who is *more* willing than him to incur debt, thereby reducing the equilibrium debt level of *the other* districts. By totally differentiating the policymaker's first order condition (5) we find that the policymaker's choice of debt level depends negatively on his discount factor β_i:

$$\frac{\partial BR_i(\Omega_{-i} \mid \beta_i)}{\partial \beta_i} = \frac{\frac{1+r}{k} u'\left(c_i^1\right)}{u''\left(c_i^1\right) + \left(\frac{1+r}{k}\right)^2 \beta_i u''\left(c_i^2\right)} < 0 \tag{19}$$

where $c_i^1$and c_i^2 are the consumption levels in the two periods. Thus, raising the policymaker's discount factor shifts his best response function "inwards", i.e., towards lower debt levels, for each Ω_{-i}. In fact the median voter will elect a policymaker whose discount factor is *lower* than his own. This can be seen in Fig. 1. We can represent the problem facing the median voter of district i in (d_i, Ω_{-i}) space. Holding β_j constant for each policymaker $j \neq i$, the curve $\Omega_{-i} \equiv \Omega_{-i}(d_i)$ represents the equilibrium aggregate debt levels chosen by the other policymakers, for each d_i. The curve $BR_i \equiv BR_i(\Omega_{-i} \mid \beta_i)$ is policymaker i's best response function. The equilibrium (d_i^*, Ω_{-i}^*) among the policymakers is the intersection between Ω_{-i} and BR_i. We know from (9) and (12) that both curves are downward sloping, and in (d_i, Ω_{-i}) space the curve BR_i is steeper. If $\beta_i = \bar{\beta}$ then the policymaker has the same discount factor as the median voter. The indifference curve for the policymaker (and the median voter) has a zero slope at the equilibrium (d_i^*, Ω_{-i}^*). However, the median voter would prefer a point such as A on the curve $\Omega_{-i}(d_i)$. This can be achieved by electing a policymaker with a lower discount factor. Indeed, assume the other policymakers' discount factors are given, and lower policymaker i's discount factor from $\bar{\beta}$ to β'. This shifts his best response curve out and to the right. The new best response function $BR_i(\Omega_{-i} \mid \beta')$ is the dotted line in Fig. 1. With the new discount factor, the equilibrium among the policymakers is at the point A.

Of course, the median voters in the other districts will try to exploit the situation in a similar way. Consider the game played before period one among the median voters in each district, where the median voters in each district simultaneously choose a discount factor for their own policymaker.

An *electoral equilibrium among the median voters* is a set of discount factors $(\beta_1^*, ..., \beta_k^*)$ such that electing a policymaker with discount factor β_i^* maximizes the lifetime utility of the median voter in district i, given rational expectations about the elections in the other districts. The final outcome of the game is the (unique) equilibrium among the elected policymakers.

Consider the median voter in district i, who believes the policymakers in the other districts will have discount factors $(\beta_1^*, ...\beta_{i-1}^*, \beta_{i+1}^*, ..., \beta_k^*)$. These discount factors induce the curve $\Omega_{-i}(d_i)$ depicted in Fig. 2. A policymaker in district i with discount factor 0 would have a best response curve $BR_i(\Omega_{-i} \mid 0)$ given by the vertical line at $\frac{1}{1+r}$. A policymaker with discount factor 1 would have some best response curve $BR_i(\Omega_{-i} \mid 1)$ as drawn. Given the discount factors chosen in the other districts, the median voters in district i can attain any point on $\Omega_{-i}(d_i)$ between the two best response curves $BR_i(\Omega_{-i} \mid 0)$ and $BR_i(\Omega_{-i} \mid 1)$ by choosing β_i between zero and one. In an equilibrium among the median voters, the median voter in district i maximizes his life time payoff in this feasible set.

For the case $k = 2$, an equilibrium among the median voters is represented in Fig. 3. The two curves are $BR_1 \equiv BR_1(d_2 \mid \beta_1)$ and $BR_2 \equiv BR_2(d_1 \mid \beta_2)$. The equilibrium among the policymakers is (d_1^*, d_2^*). At (d_1^*, d_2^*) the indifference curve for the median voter of district 1 is tangential to the curve BR_2. This implies that the policymaker in district 1 must have a discount factor β_1 which is *lower* than the median voter's, because the policymaker's indifference curve is flat at the point (d_1^*, d_2^*). In this sense the policymaker is more "shortsighted" than the median voter. A similar statement holds for district 2. Thus, in any interior equilibrium both policymakers are strictly more impatient than the median voter, and the situation with $k > 2$ is clearly similar. Moreover, since lowering β_j below $\bar{\beta}$ shifts the best response functions "out", it is clear that the equilibrium debt levels will be higher than if the policymakers' discount factors had been $\bar{\beta}$.

The representative democracy that we have just discussed can be contrasted with direct democracy. In a direct democracy, local debt levels are determined by a referendum in each district. In the referendum, the debt level is chosen by the median voter directly. So the median voter himself plays the role of policymaker, and the debt levels in the direct democracy will be lower than those chosen by shortsighted politicians in a representative democracy. To sum up, we state:

Theorem 1 *In any interior electoral equilibrium among the median voters,* *policymaker j's discount factor is strictly lower than median voter j's, and the equilibrium debt levels are strictly larger than they would be in a direct democracy.*

We can now elaborate on the assumption that the policymaker's discount factor is controlled by the median voter. The feasible set of final debt levels for the voters in district i are the points on $\Omega_{-i}(d_i)$ between the two best response curves $BR_i(\Omega_{-i}, 0)$ and $BR_i(\Omega_{-i}, 1)$ in Fig. 2. Recall that payoffs are concave in debt levels. Unless the curve $\Omega_{-i}(d_i)$ is very much concave, each voter will have single-peaked preferences over this feasible set.This is illustrated in Fig. 4. So, by the standard argument, the Condorcet winner is the point preferred by the median voter.[5] For standard utility functions the reaction functions are actually linear. Indeed, using equation (7) we find that if $u(c) = c^{1-\theta}/(1-\theta)$ then

$$BR_j(\Omega_{-j} \mid \beta_j) = \frac{1 - \left(\frac{1+r}{k}\beta_j\right)^{1/\theta}}{\left(\frac{1+r}{k}\beta_j\right)^{1/\theta} + \frac{1+r}{k}} - \frac{\frac{1+r}{k}}{\left(\frac{1+r}{k}\beta_j\right)^{1/\theta} + \frac{1+r}{k}}\Omega_{-j}$$

If $u(c) = \ln c$ then

$$BR_j(\Omega_{-j} \mid \beta_j) = \frac{\frac{k}{1+r} - \beta_j}{1+\beta_j} - \frac{1}{1+\beta_j}\Omega_{-j}$$

If $u(c) = -e^{-\tau c}$ then

$$BR_j(\Omega_{-j} \mid \beta_j) = \frac{k}{\tau(1+r+k)}\left[\ln\frac{k}{1+r} - \ln\beta_j\right] - \frac{1+r}{1+r+k}\Omega_{-j}$$

Finally, if $u(c) = c - \lambda c^2/2$ then

$$BR_j(\Omega_{-j} \mid \beta_j) = k\frac{1-\lambda}{\lambda}\frac{k-(1+r)\beta_j}{k^2+(1+r)^2\beta_j} - \frac{(1+r)^2\beta_j}{k^2+(1+r)^2\beta_j}\Omega_{-j}$$

All of these best response functions are linear in Ω_{-j}. From (15) it follows that the aggregate reaction function $\Omega_{-i}(d_i)$ is also linear in each case. Thus,

[5] If the median voter in district i has single-peaked preferences over β_i, then they are automatically quasi-concave. Thus, by a standard argument, existence of a (pure strategy) equilibrium in the game among the median voters is guaranteed. See Fudenberg and Tirole (1991), Chapter 1.3.3.

in each case the situation is as in Fig. 4 (with linear $\Omega_{-i}(d_i)$) and voter preferences over the policymaker's discount factor are single peaked. The median voter's preferred point is the Condorcet winner.

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