A NOTE ON LOCAL PUBLIC INVESTMENT AND DEBT LIMITATION IN A FEDERATION*

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The paper considers the local provision of public infrastructure in symmetric jurisdictions when population is mobile. It shows that an inflexible deficit limitation may result in too little local public investment if the population is mobile. Conversely, given the existence of migration externalities, implementing Musgrave’s pay as you use finance, according to which new debt should match net investment, can lead to optimal local investment. (JEL: H74, H54)

1. Introduction

This paper considers the decentralized provision of local public infrastructure in a federation. As in the standard literature on local provision of public goods (Boadway (1982), Myers (1990), Mansoorian and Myers (1993)), the analysis assumes that regional governments maximize their initial population’s welfare, subject to a mobility constraint. The present study however differs from this literature in two important respects. First, it emphasizes the investment character of public expenditures. This leads to a two period model of public provision where public expenditures enter the production functions of local firms rather than the utility functions of residents. Second, unlike the standard literature, which usually deals with the efficiency properties of residence taxes versus source based taxes, the paper considers the choice between debt and taxes and the question of optimal debt limitation in a federation.

The question of whether there is any sense in imposing debt and deficit constraints on regions within a federation has attracted considerable attention in connection with European Economic and Monetary Union. The bulk of the literature is rather skeptical about the value of debt and deficit limitations and, in particular, fears the negative impact of limitations on the functioning of automatic stabilizers [see, e.g. Buiter, Corsetti and Roubini (1993) or Eichengreen and Wyplosz (1998)]. Strong proponents of debt limitations point to the bail-out problem. Regions in a federation may be induced to issue too much debt if the federal level cannot credibly commit to not bailing out lower level governments.¹

The issue of population mobility has received little attention in the recent discussion of debt limitations. This is somewhat surprising since

¹ Critics of this view emphasize that prudent regulation of the banking sector can easily increase credibility by limiting contagious effects between regions.

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the fear of debt driven population mobility is a traditional concern, dating back to Ricardo’s classical discussion of public debt.

One possible reason for contemporary economists’ trust in the efficiency of local debt decisions is the analysis by Wagner (1970, 1971) and Daly (1969) who argue that if all a region’s fixed factors are owned by local residents, then the regional government has sufficient incentives to employ a prudent public debt policy. Since any debt policy is capitalized in local land prices, any effort by current citizens to shift debt burden to future immigrants must fail. However, a sizeable literature on fiscal federalism emphasizes the potential problems that may arise if part of a region’s land is foreign owned or if there are publicly owned fixed resources. In addition, land ownership may be very unequai. In this case, capitalization does not automatically ensure efficient local decisions in majority decisions. Moreover, Schultz and Sjöström (2001) show that income taxation may lead to a situation in which debt decisions are not fully capitalized into land values.

Against this background, the present paper discusses the merits of Musgrave’s (1959, p. 558–563) ‘pay-as-you-use-finance’ of public investment. According to this ‘golden rule of public finance’, governments, for reasons of intergenerational equity, should finance current consumption expenditures by taxes but should finance (net) investment in infrastructure by debt. Indeed, this rule of thumb had some impact on the Maastricht Treaty on European Union which allows a three percent deficit/GDP ratio based on the fact that expenditure for public investment in Europe in the past has hovered around three percent of GDP. While this emphasizes its political relevance, Musgrave’s rule has received various criticisms from a theoretical side. Among other things, it has been argued that tax financing may also crowd out private capital investment and therefore it is not only debt finance that creates issues of intergenerational equity. Conversely, in a dynamic framework intergenerational equity may require less than full debt finance of public investment if future generations receive a plausible weight in the social welfare function to avoid that debt service and crowding out effects unduly affect future generations (Fehr and Gottfried (1993)). In connection with European Monetary Union, Wyplosz (1997) has called the European three percent rule as naïve at best since the historical three percent ratio of public investment to GDP ignored public investment in human capital but acknowledged even ill-designed public investment.

On the other hand, Dur (2000, chapter 2) argued that if a budget rule is implemented because of a myopic political process, then the budget rule should take into account public investment, as done by the golden rule. The present paper supports the golden rule of public finance by showing that Musgrave’s rule can be used as an instrument to induce efficient local investment if the population is mobile. The argument in favor of the rule differs from the previous literature since the golden rule of public finance, unlike in most other papers, is rationalized by efficiency rather than by equity considerations.

2. Public investment

If the population in a federation is perfectly mobile in the long run, then today’s local decision to invest in public infrastructure will potentially benefit the population in the whole federation, while financing may fall disproportionately on the region’s initial population. To highlight this point, I will assume that the population is imobile in the first period but perfectly mobile in the second period. This set-up is borrowed from Bruce (1995) who considers decentralized debt decisions but abstracts from public investment. As in Bruce (1995), it is assumed that local land rents and other local rents are equally shared among the present population.

While the investment decision takes place in the first period, all investment returns and all private consumption take place in the second period. Production requires labor, public investment and a publicly owned fixed factor in fixed supply. Environmental quality may be an example. A similar assumption is employed e.g. in Mansoorian and Myers.
may be tax financed or debt financed. First period debt must be retired in period 2 and carries an (exogenous) interest cost \( r \). A consumer in region \( i \), \( i = 1,2 \), has a fixed endowment of \( y_i \) in the first period. For simplicity and without limiting the generality of the results below, consumption is taking place in period 2 only. Therefore, utility of a consumer living in region \( i \) in both periods is given as

\[
(1) \quad u^i = u^i \left[ f^i \left( n_i^2, G_i \right) / n_i^2 \right.
- (1 + r)(G_i - T_i n_i^2) / n_i^2 + (1 + r)(y_i - T_i) \bigg] ,
\]

where \( n_i \) and \( n_i^2 \) denote the population of region \( i \) in period 1 and 2. \( T_i \) is a first period residence based head tax in region \( i \). While the utility of a mover is omitted, because of the equilibrium condition introduced below the utility of an individual who is moving at the beginning of the second period must be just as high as the utility of a non-mover given in (1). The argument of \( u^i \) can be explained as follows. In period 2, any inhabitant of \( i \) receives the average gross income \( f^i(n_i^2, G_i)/n_i^2 \). Gross income is reduced by any taxes needed to service debt. Note that the difference between first period investment \( G_i \) and first period tax revenues, \( T_i n_i^2 \), must be debt financed. Therefore, the interest cost and the retiring of the debt reduce second period per capita consumption by \( (1 + r)(G_i - T_i n_i^2)/n_i^2 \). Finally, the individual can consume her net of tax endowment of the first period, which grew at the interest rate \( r \) between periods 1 and 2.

In an interior equilibrium, first period inhabitants of region \( i \) must be indifferent between moving and staying in the second period. Hence, the second period net of tax per capita income must be identical across regions:

\[
(2) \quad f^i \left( n_i^2, G_i \right) / n_i^2 - (1 + r)(G_i - T_i n_i^2) / n_i^2
- f^i \left( n_i^2, G_i \right) / n_i^2 + (1 + r)(G_j - T_j n_j^2) / n_j^2 = 0
\]

Note that an individual’s grossed up savings from the first period, i.e. the third term in the utility function of equation (1), cancel since these first period savings are not affected by moving. Differentiation of (2) yields the migration reaction with respect to first period decisions.

\[
(3) \quad \frac{\partial u^i}{\partial T_i} = \frac{\partial u^i}{\partial n_i^2} \left( \frac{f^i(n_i^2, G_i)}{n_i^2} - \frac{(1 + r)(G_i - T_i n_i^2)}{n_i^2} \right)
+ \frac{\partial u^i}{\partial n_i^2} \left( \frac{f^i(n_i^2, G_i)}{n_i^2} + \frac{(1 + r)(G_j - T_j n_j^2)}{n_j^2} \right) dn_i^2
+ \left[ \frac{(1 + r)n_i^2}{n_i^2} \right] dT_i + \left[ \frac{f^i_j - (1 + r)}{n_i^2} \right] dG_i = 0
\]

(4) \quad \frac{\partial n_i^2}{\partial G_i} = -\left[ \frac{f^i_j - (1 + r)}{n_i^2} \right] / \Delta

(5) \quad \frac{\partial n_i^2}{\partial T_i} = -\left[ \frac{(1 + r)n_i^2}{n_i^2 \Delta} \right] ,

where

\[
\Delta = \left[ \frac{f^i(n_i^2, G_i)}{n_i^2} + \frac{(1 + r)(G_i - T_i n_i^2)}{n_i^2} \right]
+ \left[ \frac{f^i_j(n_i^2, G_j)}{n_i^2} + \frac{(1 + r)(G_j - T_j n_j^2)}{n_j^2} \right]
\]

In a stable equilibrium, a small migration from \( i \) to \( j \) must increase utility in \( i \) compared to \( j \). Therefore, \( \Delta \) must be negative and this is assumed below.

**Debt policies**

Ignoring any debt capacity constraints, differentiation of \( u^i \) with respect to \( T_i \) yields:

\[
(6) \quad \frac{\partial u^i}{\partial T_i} = u^i \left[ (1 + r)(n_i^2 - n_i^2) \right] - \frac{\partial u^i}{\partial n_i^2} \left[ (1 + r)n_i^2 \right] \Delta n_i^2 ,
\]

where

\[
\frac{\partial u^i}{\partial n_i^2} = u^i \left[ \frac{f^i_j - f^i_j(n_i^2, G_i)}{n_i^2} + (1 + r)(G_i - T_i n_i^2) / n_i^2 \right] .
\]

Equation (6) indicates that decentralized debt policies must be expected to lead to instability. If we refer to symmetric regions and a symmetric equilibrium, then from \( \Delta < 0 \), we have \( \partial u/\partial n_i^2 < 0 \). Together with \( n_i^1 = n_i^2 \), this implies

(1993) or Bruce (1995) who consider the provision of public consumption goods.
\( \frac{\partial u}{\partial T_i} < 0 \): for any given \( G_i \), the region would always like to expand its debt level by raising a smaller, and even negative, head tax \( T_i \). The reason is obvious. While the first period benefit of increasing region \( i \)'s debt falls exclusively on first period inhabitants of region \( i \), the burden of retiring the debt falls on all the federation's citizens as mobility is perfect in the long run and ensures an equal net income in the second period. This indicates that it may be beneficial to have a central level of government which introduces debt rules that curb public debt and lead to stable budgets.

3. Local infrastructure with alternative debt limitations

In the following, two alternative debt limitation rules are considered. The first is a strict balanced budget rule which simply sets \( G_i = T_i n_i^1 \).

The balanced budget rule

When maximizing utility under a balanced budget rule, region \( i \)'s first order condition is:

\[
\frac{\partial u}{\partial G_i} = u_i^i \cdot \left[ \frac{f_i}{n_i^2} - \frac{(1 + r)}{n_i^1} \right] + \frac{\partial u}{\partial n_i^2} \bigg|_{G_i = T_i n_i^1} \cdot \frac{\partial n_i^2}{\partial G_i} \bigg|_{G_i = T_i n_i^1} = 0
\]

\[
= u_i^i \cdot \left[ \frac{f_i}{n_i^2} - \frac{(1 + r)}{n_i^1} \right] - u_i^i \cdot \left[ (f_i^i \cdot n_i^2 - f^i) \cdot (n_i^2 \cdot \Delta) \right] = 0
\]

In a stable equilibrium, \( \Delta \) must be negative. Since \( f_i^i \cdot n_i^2 - f^i \) is also negative \( f_i^i \cdot n_i^2 - f^i > 0 \) as long as \( n_i^2 < n_i^1 \). Given stability, decentralized maximization in a symmetric equilibrium therefore leads to a level of public investment where the return on investment exceeds the market rate of interest. Short-term attachment and long run mobility of residents leads to a situation where investment costs accrue to the initial residents, while benefits accrue to the whole federation. Public investment therefore tends to be too low.

Golden rule of public finance

In our simple framework where public expenditure equals public investment, the golden rule of public finance is implemented by the simple restriction \( T_i = 0 \). The first order condition of region \( i \) then is:

\[
\frac{\partial u_i}{\partial G_i} = u_i^i \cdot \left[ \frac{f_i^i}{n_i^2} - \frac{(1 + r)}{n_i^1} \right] + \frac{\partial u_i}{\partial n_i^2} \cdot \frac{\partial n_i^2}{\partial G_i} = 0,
\]

where \( \frac{\partial n_i^2}{\partial G_i} \) is given by (4). From (4) and (8) it follows that decentralized investment decisions lead to the socially optimal result, where the net return on public investment equals the interest rate: \( f_i^i - 1 = r \).

Two aspects of this result deserve attention. First, decentralized optimization leads to efficient public provision. This comes from the fact that the present section introduces the migration externality by assuming a publicly owned fixed factor. Hence, regions are interested in raising per capita output (once the golden rule of public finance is implemented).

Second, a debt limitation which takes into account regions' investment in infrastructure is better suited promoting efficient public investment than a strict balanced budget rule. Intuitively, there are two externalities with free mobility in the second period. On the one hand, regions which invest in the first period increase next period’s per capita income throughout the federation. On the other hand, by issuing debt regions reduce net of tax income for all. Tying debt to investment leads to cancellation of the two effects.
4. Concluding remarks

The above analysis was certainly quite simplistic and theoretical. For example, it ignored the problem of enforcing and controlling budget limitations and it did not deal with the difficulties of adequately defining public investment. Nevertheless, the analysis made clear that inflexible budget rules, if binding, may have adverse effects on public investment in a federation with high mobility. In this context, it is interesting that DiPasquale and Glaeser (1999) found a positive impact of home ownership rates on public investment in US communities. To a large extent, the effects found by DiPasquale and Glaeser worked through homeowners’ lower mobility. In principle, home ownership could also affect debt decisions because voters expect that additional debt capitalizes into land values (Daly (1969) and Wagner (1970, 1971)). On the other hand, this mechanism to curb excessive deficits will be of limited use if land ownership is unequal or if there is cross-ownership of land. In this case, the political process will inadequately take into account capitalization effects and the need for budget rules as well as the effects discussed in this paper may prevail.

Potentially distorted investment incentives may be important for the European Union where the ‘Stability Pact’ more or less requires member states to have a balanced budget during normal years to cope with the three per cent deficit rule during recessions. Admittedly, mobility between member states is still rather low. However, if these debt limitations on member states are handed down to regional and city governments, as has been proposed, for example, by the scientific council of the German ministry of finance, then the above consideration may deserve attention.

Finally, justifying debt limits by migration externalities also helps to decide which invest-

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7 Wissenschaftlicher Beirat beim Bundesfinanzministerium (1994).

References


