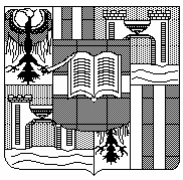

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Optimal Budget Deficits and Immigration

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Optimal Budget Deficits and Immigration

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Abstract

The paper shows that immigration can create an incentive for deficit-spending among natives. If immigrants use up some given share of public funds net of debt service, a policy of running budget deficits becomes optimal. The optimal budget deficits are higher, the higher the share of net public funds spent exogenously on immigrants. We take the share of immigrants in the total population as a proxy for exogenous spending on immigrants and estimate its effect on budget deficits for 20 OECD countries during 1980 – 1995. We find the effect to be significant and positive, suggesting that exogenous spending was increasing during that time.

JEL: H 62, H 63, F 22.

Keywords: optimal budget deficits, immigration, tax-smoothing.

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1. Introduction

The developments of budget deficits and public debt have raised much concern among OECD policymakers in the past. From the beginning of the 1970s, public debt has increased sharply in many OECD countries, reaching levels of 100 per cent of GDP and more in several cases. Apart from this similar time trend, debt accumulation experiences among countries remained curiously diverse. As a consequence, a large literature has studied the accumulation of public debt since, starting with the classic tax-smoothing theory of optimal budget deficits[1] and continuing with a number of positive political economy theories of budget deficits[2].

This paper looks at the effect of immigration on budget deficits and debt. In the first part, we develop a theory of optimal budget deficits in the presence of so-called exogenous spending on immigrants. We distinguish between spending on immigrants according to whether it is at the disposal of natives during a given budget year or not. Endogenous spending is decided upon by natives each year and constitutes a given proportion of spending on natives (e.g. transfer spending). Exogenous spending is decided upon less frequently and, therefore, given for the duration of at least one budget year – for example, because it is subject to a qualified majority or international agreements (e.g. integration and treatment according to human rights conventions, asylum application processing or border control).

The government chooses the share of public funds net of debt service to be spent on natives, maximising the utility of a representative native. Spending on immigrants is non-utility-enhancing for natives. In this setting, we find that it becomes optimal for the government to run a budget deficit, if the share of exogenous spending on immigrants in net public revenue is positive. The optimal budget is balanced in the absence of such spending. Importantly, we express all spending as a share of public revenue net of debt service. This way, we assume that the interest cost of deficit-spending is spread proportionately over both natives as well as immigrants. Thus, while the benefit of public spending is group-specific, the cost of debt service is not. This gives rise to a common pool problem and, as a result, a policy of budget deficits and debt becomes optimal.

[1] Barro (1979), Lucas and Stokey (1983, 1987).
[2] See for example Alesina and Perrotti (1995) for a detailed survey.

The existing theoretical literature on the public finance effects of immigration only deals with public revenue and spending and assumes that the public budget is balanced.[3] Empirical evidence, accordingly, corresponds to theory only imperfectly. It usually shows that public revenue decreases, while public spending increases with immigration and ethnic heterogeneity. For example, in Alesina, Baqir and Easterly (1999), total public spending increases with ethnic fractionalisation.[4] Razin, Sadka and Swagel (2002) derive a strong negative effect of the immigrant share on the labour tax rate and a strong positive effect on per capita social transfers.[5] Similarly, Facchini, Razin and Willmann (2004) find a negative effect of the immigrant share on the labour tax rate and a strong positive effect on per capita social transfers, controlling for a possible reverse effect of high transfers acting as a 'welfare magnet' on immigration.[6]

The paper is also related to political economy papers on budget deficits and political fragmentation. There, socio-economic groups with self-interest adopt policies of over-spending, which are individually rational but collectively inefficient. Because spending is group-specific, while the cost is spread over all groups, incentives are distorted and spending becomes 'too high'. The budget exhibits the characteristics of a common pool, where decision-making groups fully internalise the benefits of the spending they propose, but not the aggregate cost. The classic contribution in a static setting is Weingast, Shepsle and Johnsen (1981). Velasco (2000) derives a corresponding 'deficit-spending bias' in a dynamic setting.

Similarly, Alesina and Drazen (1991) find that fiscal stabilisations are delayed in the presence of political fragmentation. Roubini and Sachs (1989ab) give empirical evidence for the link between over-spending and political fragmentation. The key assumptions common to these models are that i) there is more than one interest group, benefiting from group-specific public spending, ii) all groups have a say in the determination of the budget or the distribution of the fiscal burden and iii) all groups share the same budget constraint, enjoying 'common access' to public funds.

[3] Much of the existing theory suggests that immigration decreases public revenue and spending, both in models of tax competition (e.g. Cremer and Pestieau (2004)) as well as political economy models (e.g. Razin, Sadka and Swagel (2002)).
[4] They use cross-section data of 1020 cities, 304 metropolitan areas and 1386 counties in the US in 1990.
[5] They use panel data of 11 European countries over the period 1974-1992.
[6] They use essentially the same dataset as Razin et al. (2002).

A third, related strand of the literature argues that budget deficits arise because finitely lived governments strategically incur debt in order to constrain the spending potential of future, ideologically different governments (Persson and Svensson (1989), Alesina and Tabellini (1990)). In this literature, there are two interest groups, one represented by the current government, and one by the future government. While the two governments also benefit from group-specific public spending (i) and share the same, inter-temporal budget constraint (iii), only the current government has a say in the determination of the budget. By over-spending today and committing future tax revenues to debt service, the current government can reduce spending of future governments.

In our model, natives and immigrants represent the two interest groups benefiting from group-specific spending. Both groups share the same budget constraint, but only one group (natives) chooses spending. The second group (immigrants) withdraws some share of net public funds that is partly endogenous, depending on the native spending share, and partly exogenous, at least in the short run, as described above. Deficit-spending becomes an optimal policy for natives, because by running a deficit, natives can curtail the funds available for exogenous spending on immigrants.[7] Here, therefore, debt is also used as a strategic device. The setting, however, does not require a change in government. An incentive for deficit-spending arises, even if tax-smoothing calls for a balanced budget (see below), and even if there is no (intra-generational) competition among groups or (inter-generational) strategic interaction among governments for the common public funds.

In the second, empirical part of the paper, we estimate the effect of immigration on budget deficits for 20 OECD countries during 1980 – 1995. We take the share of immigrants in the total population as a proxy for exogenous spending on immigrants and find a significant positive effect on the budget deficit, suggesting that exogenous spending was increasing during that time. We control for variables suggested by tax-smoothing (see below) as well as for variables suggested by a number of political economy models that do not take immigration into account.

[7] The model can be interpreted more generally, in that deficit-spending pressures of this kind can be caused not only by immigration, but also by commitments related to foreign aid, anti-terror provisions or the membership in international organisations. These can all represent external spending obligations that are not at the disposal of governments at least in the short run.

We also test for the potential role of immigration within the tax-smoothing theory of optimal budget deficits. There, budgets are also chosen by a 'benevolent social planner' government maximising the utility of a representative agent. Public spending is financed by taxation that is distortionary, since it affects labour supply. In this context, it is optimal for the government to keep the tax rate constant and run budget deficits when spending is unexpected and temporarily high, and surpluses, when it is low. Immigration might therefore cause budget deficits in this framework, if it raises spending unexpectedly and temporarily, for example due to increased welfare spending during a limited period of integration. We test this hypothesis empirically, using the change in the stock of immigrants in per cent of the total population as an indicator for a 'spending shock' related to immigration. However, we do not find a significant effect. We conclude that, in our data set, immigration gives rise to budget deficits that are optimal not for reasons of tax-smoothing, but for reasons of exogenous spending on immigrants (external spending).

In the following Section 2, we introduce our model of optimal budget deficits with external spending. Sections 3 and 4 present simulations and empirical estimations that illustrate the role of immigration in the generation of optimal budget deficits. Section 5 concludes.

2. Model of an optimal budget deficit with external spending

Consider a population which consists of both natives and immigrants. The two groups are indexed by i, $i = n, m$. Group i obtains some benefit g_{it} from the government per period t. Public spending is thus strictly separable by recipient group, and can be thought of as either transfers to group i's members or spending on a public good that only benefits group i's members. The native members of the jurisdiction directly determine the amount of public spending that accrues to themselves, g_{nt}. By this, they also partly determine spending on the foreign group, g_{mt}, of which one part depends on spending on natives and one does not:

$$g_{mt} = \alpha g_{nt} + \beta_t . \tag{1.1}$$

The first part of public spending on foreigners, αg_{nt}, is proportional to spending on natives (e.g. transfer spending).[8] The second part of spending, β_t, is independent of spending on natives. We could, for example, think of integration or administrative costs[9], or the cost of border control. Such spending cannot directly be determined by natives in the short run. However, it is restricted by the budget constraint and can, therefore, be influenced indirectly by the natives' choice of the budget deficit, as we will see below in an instant.

The public sector gains public revenue τ per period, which is given and assumed to be constant for simplicity. Public spending per period can be financed either by current revenue or by borrowing at a constant (net) real rate r.

The government budget constraint in each period is the following:

$$\dot{b}_t = rb_t + g_{nt} + g_{mt} - \tau\,, \tag{1.2}$$

where b_t is the stock of debt at the beginning of period t.

Public spending on natives and foreigners is expressed as a share of public revenue net of debt service in each period, respectively:

$$g_{nt} = \phi_{nt}(\tau - (1+r)b_t)\,. \tag{1.3a}$$

$$g_{mt} = (\alpha\phi_{nt} + \phi_{mt})(\tau - (1+r)b_t)\,. \tag{1.3b}$$

ϕ_{nt} is the share of spending on natives in period t, while ϕ_{mt} is the share of exogenous spending on foreigners, β_t:

$$\phi_{nt} = \frac{g_{nt}}{(\tau - (1+r)b_t)}\,. \tag{1.4a}$$

$$\phi_{mt} = \frac{\beta_t}{(\tau - (1+r)b_t)}\,. \tag{1.4b}$$

[8] The size of α is not crucial for our results. For example, α = M/N (where M is the number of migrants and N the number of natives), if legislation on social policy is non-discriminatory and foreigners do not differ from natives in the socio-economic characteristics that determine benefit recipiency. If discriminatory legislation excludes foreigners from certain public benefits, per capita spending on foreigners could be lower (α < M/N). We could also think of it as being higher, for example due to a relatively higher welfare-dependency of foreigners or relatively stronger foreign lobbying (α > M/N).

[9] E.g. the costs for language courses or asylum application processing.

We express spending as a share of public revenue net of debt service, $\tau - (1+r)b_t$, which implies that the cost of debt service is spread equally over all spending types. ϕ_{mt} as well as τ follow an exogenously given time path. β_t is determined by ϕ_{mt} and b_t, according to (1.4b). ϕ_{nt} is the control variable, to be chosen by the government.

Assuming that debt cannot grow indefinitely, we impose the usual solvency condition

$$\lim_{t\to\infty} b_t \, \mathrm{e}^{-rt} \leq 0 \,. \tag{1.5}$$

The government chooses which share of public net revenue per period, ϕ_{nt}, to spend on natives, in order to maximise the utility of natives. Utility is given by the present value of the log of spending on natives:

$$U^n = \int_{t=0}^{\infty} \log\left[\phi_{nt}(\tau - (1+r)b_t)\right] \mathrm{e}^{-rt} \, \mathrm{d}t \,. \tag{1.6}$$

It is maximised subject to (1.2) – (1.5) and to given b_0. We assume that $b_0 = 0$ for simplicity. In (1.6), it is assumed that the native time preference rate is equal to the interest rate r. This way, since income τ is flat over time, there are no transfer-smoothing reasons for debt accumulation.

Solving this optimal control problem[10] yields the optimal native spending share:

$$\phi_{nt} = \frac{\tau - rb_t}{(1+\alpha)(\tau - (1+r)b_t)} \,. \tag{1.7}$$

The share of public spending on natives is independent of the external spending cost ϕ_{mt}. It is, however, decreasing in the proportion of spending on foreigners α.

Next, we determine the public debt that results from this spending rule. Substituting (1.7) into (1.2) using (1.3a) and (1.3b) and solving the differential equation yields the endogenous public debt of period t:

$$b_t = \frac{\tau}{1+r}\left[1 - \mathrm{e}^{-\phi_{mt}(1+r)t}\right] . \tag{1.8}$$

[10] See the Appendix A for details.

Substituting (1.8) in (1.2), using (1.3a), (1.3b) and (1.7)[11], yields the change in public debt over time, i.e. the budget deficit:

$$\dot{b}_t = \tau \phi_{mt} \, \mathrm{e}^{-\phi_{\mathrm{mt}}(1+r)t} \, . \tag{1.9}$$

From (1.8) and (1.9), we immediately find

Proposition 1: If some exogenous share of public net revenue ($\phi_{mt} > 0$) is spent on foreigners, it is optimal for natives to run a budget deficit and accumulate public debt. If $\phi_{mt} = 0$, natives choose a balanced budget. The budget deficit and public debt are independent of endogenous spending on foreigners.

In the absence of exogenous spending on foreigners, it is optimal for natives to have a balanced budget and to incur no debt. This is the equivalent of zero optimal debt in Barro (1979). If, however, exogenous spending on foreigners occurs, it becomes optimal for natives to run a deficit. Note that, unlike for example in Velasco (2000), groups do not compete for their shares of overall revenue here. Yet, natives prefer to run a deficit and bear the corresponding interest burden rather than adjust to the exogenous spending on foreigners by reducing their own spending.[12] The reason is that deficits diminish the funds available for spending not only for natives, but also for foreigners. Foreigners share the cost of debt service. This increases the optimal budget deficit to some value above zero.

Natives do decrease their spending share with an increase in α such that the budget remains balanced (in case of $\phi_{mt} = 0$).[13] In this case, it is cheaper for natives (in utility terms) to adjust to an increase in the (endogenous) spending on foreigners by reducing their own spending share, rather than by paying interest on debt. This is because by reducing ϕ_{nt}, natives can also reduce the foreign share of spending $\alpha\phi_{nt}$, which is not possible in the case of an exogenous spending share ϕ_{mt}.

[11] Or, equivalently, differentiating (1.8) with respect to time t.

[12] Natives do not reduce their own share in spending with an increase in ϕ_{mt}, see (1.7).

[13] See (1.7).

As a consequence of a positive budget deficit in the presence of exogenous spending on foreigners, public debt is positive and increasing in ϕ_{mt} (see 1.8). Like the budget deficit, public debt is independent of the factor α of foreign spending.

So far, we have derived the optimal time paths of spending and the budget deficit. The next three propositions tell us how the optimal budget deficit changes with 1) exogenous spending on immigrants, 2) government income and 3) the interest rate at a given point in time. For simplicity, we consider $t=1$ below. From (1.9), we find

Proposition 2: Take $t=1$***. Then, the budget deficit is increasing in the share of exogenous spending on foreigners*** ϕ_{mt} ***at a decreasing rate, if*** $\phi_{mt} < \frac{1}{(1+r)}$***. It is decreasing in*** ϕ_{mt} ***at a decreasing rate, if*** $\frac{1}{(1+r)} < \phi_{mt} < \frac{2}{(1+r)}$***. And it is decreasing in*** ϕ_{mt} ***at an increasing rate, if*** $\frac{2}{(1+r)} < \phi_{mt}$**.**

The optimal budget deficit is increasing in ϕ_{mt}, as long as ϕ_{mt} is not too large. While a budget deficit can increase the utility of natives by cutting back exogenous spending on foreigners, the resulting interest burden of debt service can grow too high to make a policy of increasing deficits optimal. At any given point in time, deficits decline the sooner, the higher the share of exogenous spending on foreigners ϕ_{mt} [14] and the higher the interest rate r, ceteris paribus. For plausible parameter values (see Section 3 below), the condition for the budget deficit to be increasing in exogenous spending is fulfilled.

Proposition 3: An increase (decrease) in government income τ ***increases (decreases) the budget deficit and public debt, if*** $\phi_{mt} > 0$**.**

This is in contrast to the tax-smoothing rule of keeping the budget balanced in case of a permanent change in income. Here, an increase in government income increases the amount

[14] The higher ϕ_m is, the higher is public debt, see (1.8).

β_t that is going to foreigners for any given ϕ_{mt}. Natives can cut back on that spending by increasing the budget deficit and, in consequence, public debt.[15]

Proposition 4: An increase (decrease) in the interest rate r decreases (increases) the budget deficit and public debt, if $\phi_{mt} > 0$.

An increase (decrease) in the interest rate makes deficit-spending more (less) expensive for natives and therefore decreases (increases) the optimal budget deficit. Tax-smoothing would suggest keeping the budget balanced in case of a permanent change in the interest rate.

3. Simulations

For illustration, we now assess quantitatively the optimal value of the budget deficit and debt (in per cent of GDP) for a range of possible values of ϕ_{mt} and for plausible values of the interest rate r and period income τ (in per cent of GDP), which we assume to be constant over time. We look at only one period: t = 1 for readability.

In Table 1, we report the simulation results on the optimal budget deficit in per cent of GDP, for values of ϕ_{mt} from 0 to 0.16. We assume that initial debt b_0 is zero.[16] The simulation shows that the optimal deficit is 2.95 per cent of GDP for an exogenous spending share of 8 per cent, when the interest rate is 3 per cent and the share of public revenue in GDP is 40 per cent. The optimal deficit increases to 5.43 per cent for $\phi_{mt} = 0.16$. The budget deficit decreases in the interest rate and increases in public revenue.

The average budget deficit of 1.57 per cent in our sample of OECD countries in 1995 (see Section 4 below) together with the average sample interest rate (long-term government bond yield) of 7.98 per cent and public revenue (tax revenue) of 36.87 per cent of GDP would be consistent with an exogenous foreign spending share of 4.47 per cent of net income.

[15] In Velasco (2000), a temporary windfall is also compatible with a budget deficit.
[16] For $b_0 > 0$, the deficit at time t is given by $\dot{b}_t = \phi_{mt}\, e^{-\phi_{mt}(1+r)t}\left[\tau + (1+r)b_0\right]$.

In Table 2, we report the simulation results on the optimal public debt in per cent of GDP, for the above values of ϕ_{mt}, r and τ. We again assume that initial debt b_0 is zero.[17] The simulation shows an optimal debt-output ratio of 1.57 per cent for an exogenous spending share of 25 per cent, for the baseline parameterisation of r and τ - given zero initial debt. Optimal debt decreases in the interest rate and increases in exogenous spending and public revenue. The average debt-output ratio of 60 per cent from our sample of OECD countries in 1995 together with an average interest rate of 7.98 per cent and public revenue of 36.87 per cent of GDP would, for example, be consistent with an exogenous foreign spending share of 3.51 per cent of net income and 61 per cent initial debt (not shown).

The simulations show how a small exogenous spending share can potentially explain a considerable amount of public debt and deficit. In the following, we will consider immigration as a cause for exogenous spending and evaluate empirically the relation between immigration and budget deficits.

4. Empirical evidence

In this section, we look at OECD countries' experience of public debt accumulation after World War II. Figure 1 shows that in many countries there has been a trend of dramatically declining debt starting after World War II until around 1972 and an equally dramatic reversal to increasing debt thereafter. The size of debt accumulation, however, has varied a lot across countries.[18] For example, by 1995, debt was contained at a level of 50 per cent of GDP or below in the USA, United Kingdom, France and Germany (panel a), while it exceeded 100 per cent of GDP in Belgium, Italy and Ireland (panel b).

Data on the shares of foreigners are scarcer, and are commonly available on a yearly basis only from 1980 onwards. Figure 2 shows that within the OECD, the shares of foreigners have increased ever since. In the following, we test whether immigration can serve as an explanatory variable for the cross-country and time variation in public debt accumulation in

[17] For $b_0 > 0$, public debt at time t is given by $b_t = \frac{\tau}{(1+r)}\left[1 - e^{-\phi_{mt}(1+r)t}\right] + e^{-\phi_{mt}(1+r)t} b_0$.

[18] According to Franzese (1998), who uses a panel data set of 20 OECD countries during 1956 – 1990, cross-national differences in post-war average debt comprise about 55 per cent of the total variation in the OECD post-war debt experiences.

20 OECD countries[19] during 1980-1995. The time horizon is constrained by the availability of data on immigration, which are commonly available only from 1980 onwards, and of the data used from Franzese (1998)[20], which are available only until 1995.

Immigration might give rise to budget deficits for two reasons. First, immigration might constitute a spending or revenue 'shock' that is temporary and, following a policy of tax-smoothing, require temporary budget deficits or surpluses. In this case, if changes in immigration represent temporary deviations from a certain permanent level, we should observe budget deficits to increase or decrease with changes in immigration (ΔIMM).

Second, immigration might raise a common-pool problem as described by our model in Section 2. The model predicts that immigration can increase budget deficits, if it increases the share of spending on immigrants. We use the stock of foreigners in per cent of the total population (IMM) as a measure for the share of spending on immigrants and also add IMM^2 to test for our hypotheses stated in Proposition 2.

4.1 Estimation Strategy

Public debt exhibits a strong temporal persistence, calling for estimation in first differences. We estimate the change in debt (ΔD_t), using two lagged changes in debt ($\Delta D_{t-1}, \Delta D_{t-2}$) and the lagged debt level (D_{t-1}) as explanatory variables. Z is a vector comprising the standard economic variables suggested by tax-smoothing: unemployment, growth, the interest rate, openness, terms of trade and an interaction term for openness and terms of trade, all in changes and in lagged levels. Table 3 shows the descriptive statistics of all variables. Variable definitions and sources can be found in Appendix B. We assume that permanent levels are constant across all sample country-times, rendering all movements unexpected as well as temporary. The variables are also added in lags to allow for long-run equilibrium relationships. Finally, we add the change and lagged level in the share of foreigners in the total population, to test for the tax-smoothing hypothesis of optimal budget deficits (surpluses) related to spending (revenue) shocks caused by immigration.

[19] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the USA.
[20] See variable description and sources in Appendix B below.

Our regression of the change in public debt is the following:

$$\Delta D_{i,t} = \alpha + \beta_1 \Delta D_{i,t-1} + \beta_2 \Delta D_{i,t-2} + \beta_3 D_{i,t-1} + \beta_4 Z_{i,t} + \beta_5 \Delta IMM_{i,t} + \beta_6 IMM_{i,t-1} + \varepsilon_{i,t} \quad (1.10)$$

As (1.10) is modelled in first differences, it takes out country differences in debt rates like a fixed-effects model. Countries are indexed by i. Time, defined in terms of years, is indexed by t, α is the constant and $\varepsilon_{i,t}$ is the idiosyncratic error term. The β_1 to β_6 parameters are to be determined by the data.

According to the theory of tax-smoothing, weak (strong) economic performance due to adverse (beneficial) shocks in each of these variables should induce governments to increase (decrease) debt. We would therefore expect budget deficits to increase with unemployment and the interest rate, to decrease with growth and to increase (decrease) with openness and the terms-of-trade, if these are associated with a spending (revenue) shock. We further expect budget deficits to increase with the interaction of openness and terms-of-trade, since a reduction of international competitiveness in the form of an increase in the terms-of-trade is more likely to constitute a revenue shock the more open a country is. We further expect budget deficits to increase (decrease) with the change and lag in immigration, if immigration induces a spending (revenue) shock.

In a second regression, we test whether immigration might cause budget deficits (surpluses) due to associated external spending (revenue). Here, we add the share of immigrants and its square instead of the change and the lag:

$$\Delta D_{i,t} = \alpha + \beta_1 \Delta D_{i,t-1} + \beta_2 \Delta D_{i,t-2} + \beta_3 D_{i,t-1} + \beta_4 Z_{i,t} + \beta_5 IMM_{i,t} + \beta_6 IMM^2_{i,t} + \varepsilon_{i,t} \quad (1.11)$$

We expect budget deficits to increase (decrease) with the stock of immigrants, if it increases (decreases) the share of spending on immigrants, given that this share is not too large (see Proposition 2). Likewise, the sign of IMM^2 will depend on two things: first, on the effect of immigration on ϕ_{mt}, and second, on the magnitude of ϕ_{mt} (see Proposition 2). Taking the stock of immigrants as a proxy for spending on immigrants, the expected sign of the former is positive and the one on the latter is negative, given plausible parameter values (see Section 3). The expected signs of all other coefficients remain the same as above.

4.2 Results

Table 4 shows the results for our estimations of the change in public debt. Specifications (1) and (2) correspond to the estimation equations (1.3) and (1.4) described above, testing whether immigration gives rise to budget deficits (or surpluses) for reasons of tax-smoothing or external spending. In specifications (3) and (4), we add a variety of political economy variables as explanatory variables for robustness checks, respectively.

First, looking at specification (1), we see that neither the change nor the lag in immigration is significant. This contradicts the tax-smoothing hypothesis of a positive or negative spending shock associated with immigration. The first lagged change in debt, lagged debt, the change and lag in unemployment, the change in openness, terms-of-trade and the interaction term for openness and terms-of-trade are all significant and signed as expected. An increase in openness and the terms-of-trade decreases budget deficits, which, according to the theory of tax-smoothing, indicates that more openness and an increase in export relative to import prices constitute positive 'revenue shocks'. However, an increase in the terms-of-trade increases the budget deficit the more, the more open a country is (and vice versa). For open countries, increases in relative prices apparently constitute a 'spending shock'. Growth and the interest rate turn out to be insignificant. This, however, is likely to be a result of small sample size, since both variables are highly significant in both changes and lags in a larger sample size obtained by excluding immigration.[21]

In specification (2), we use the current immigrant share and its square, as hypothesised by our theory on external spending. These variables are (weakly) significant, which we take as evidence for an external spending effect. The coefficient on the share of immigrants is positive, suggesting that, according to our model, immigration increases the exogenous spending share, which is small. Given that the exogenous spending share is small, we know from our model that the second-order effect of exogenous spending on the deficit should be negative. We find the coefficient on the square of the immigrant stock to be negative, which is compatible with our model. Results on the other variables are very similar to specification (1).

[21] Immigration restricts the sample size and reduces estimation precision, but does not significantly affect the coefficients of variables. Using the larger sample without immigration, we find that the interest rate increases the budget deficit, while economic growth reduces it, as predicted by the theory of tax-smoothing in case of temporary 'shocks' to the interest rate and economic growth.

4.3 Robustness checks

To check for robustness, we also run the two estimation models after adding several political economy controls. Results remain fairly robust. Our immigration variables in the external spending model of budget deficits are now more significant than before. Among the political economy variables used, the number of federal regions and its square, and the effective number of electoral districts and its square as well as central bank autonomy are significant, the number of parties in government is weakly significant, and all coefficients are signed consistent with theory.

The number of regions in effectively federal states[22] and the effective number of electoral districts[23] are used as indicators for the number of constituencies in a country. According to the theory of multiple constituencies and distributive politics by Weingast, Shepsle and Johnsen (1981) and Velasco (1995), policymakers who represent geographically distinct constituencies tend to over-estimate the benefits of local spending ('pork-barrel spending') and under-estimate the costs of financing them. The higher the number of constituencies, the higher is deficit-financed spending suggested to be. However, federalism might decrease budget deficits by substituting central government debt (which is what we measure) with sub-national debt. Further, both of our measures of multiple constituencies have highly outlying countries in their empirical distributions (i.e. there are many unitary systems and few federal ones), which is why they are also added in their squares. Results show that the number of federal regions decreases budget deficits, which suggests that central government debt might be substituted. It does increasingly so, the larger the number of federal regions.[24] The number of electoral districts increases budget deficits as expected. It does decreasingly so, the larger the number of districts. The hypothesis that autonomous and conservative central banks decrease budget deficits, because they rule out inflationary debt-finance, is supported in specification (4).

[22] See Franzese (1998, footnote 17) for a detailed description.
[23] See Franzese (1998, footnote 21) for a detailed description.
[24] In the sample, the U.S. and Switzerland are the countries with most federal regions, followed by Spain, Germany and Canada.

We further add the number of parties, because a high number of parties is suggested to hinder fiscal stabilisation according to the war-of-attrition models of Roubini and Sachs (1989ab) and Alesina and Drazen (1991)[25]. In the face of high outstanding debt and/or persistent deficits, parties in government are likely to dispute over who will bear the costs of fiscal adjustment, and budget deficits will increase the more strongly, the more fragmented and polarised governments are. The positive coefficient of the number of parties in our estimation supports this hypothesis.

Political economy theories that suggest that budget deficits are increasing during pre-election years[26], in democracies with higher income disparities[27] and in fiscal illusion as measured by the share of indirect taxes in total current revenue[28] are not supported by our data, or only weakly so.

6. Conclusion

Public debt in OECD countries has grown exceptionally during the last few decades. So has the share of immigrants. If immigration constitutes a temporary spending shock, it will make temporary budget deficits optimal according to the theory of tax-smoothing. If immigration uses up a certain given amount of spending, it will make budget deficits optimal as well, according to our theory of external spending. We empirically test for these two hypotheses, which suggest a positive link between immigration and budget deficits. We find evidence for the external-spending hypothesis, but not for the tax-smoothing hypothesis on immigration and budget deficits.

[25] See also Drazen and Grilli (1993) and Spolaore (1993).
[26] Nordhaus (1975), Tufte (1978).
[27] Cukierman and Meltzer (1989), Tabellini (1991).
[28] Buchanan and Wagner (1977) argue that fiscal illusion among voters creates incentives for governments to accumulate debt. It is assumed that fiscal illusion increases in the share of indirect taxes, because the costs of indirect taxes should be more difficult to assess than those of other taxes.

Tables

Table 1. Simulated optimal budget deficit (per cent of GDP), b_0=0 and t=1.

Baseline parameterisation: τ = 40 (per cent of GDP)**.**					
Interest rate r	ϕ_{mt} = 0	ϕ_{mt} = 0.04	ϕ_{mt} = 0.08	ϕ_{mt} = 0.12	ϕ_{mt} = 0.16
0.03	0	1.54	2.95	4.24	5.43
0.05	0	1.53	2.94	4.23	5.41
0.07	0	1.53	2.94	4.22	5.39
Increase in τ **:** τ = 50 (per cent of GDP)**.**					
0.03	0	1.92	3.68	5.30	6.78
0.05	0	1.92	3.68	5.29	6.76
0.07	0	1.92	3.67	5.28	6.74
Increase in τ **:** τ = 60 (per cent of GDP)**.**					
0.03	0	2.30	4.42	6.36	8.14
0.05	0	2.30	4.41	6.35	8.12
0.07	0	2.30	4.41	6.33	8.09

Table 2. Simulated optimal public debt (per cent of GDP), b_0=0 and t=1.

Baseline parameterisation: τ = 40 (per cent of GDP)**.**					
Interest rate r	ϕ_{mt} = 0	ϕ_{mt} = 0.25	ϕ_{mt} = 0.5	ϕ_{mt} = 0.75	ϕ_{mt} = 1
0.03	0	1.57	3.07	4.52	5.90
0.05	0	1.57	3.07	4.51	5.89
0.07	0	1.57	3.07	4.50	5.88
Increase in τ **:** τ = 50 (per cent of GDP)**.**					
0.03	0	1.96	3.84	5.64	7.38
0.05	0	1.96	3.84	5.64	7.36
0.07	0	1.96	3.83	5.63	7.35
Increase in τ **:** τ = 60 (per cent of GDP)**.**					
0.03	0	2.35	4.61	6.77	8.85
0.05	0	2.35	4.60	6.76	8.84
0.07	0	2.35	4.60	6.76	8.82

Table 3. Summary statistics of estimating sample, N=240.

	Mean	S.D.	Min.	Max.
Public debt (per cent of GDP)	46.14	30.21	9.40	132.01
Budget deficit (change in public debt, per cent of GDP)	0.45	3.50	-18.86	17.78
Immigration (stock of foreigners, per cent of total population)	4.72	4.82	0.27	23.00
Unemployment rate	7.79	4.61	0.16	23.66
Real GDP growth rate	2.19	2.40	-9.15	13.56
Real interest rate	4.36	2.87	-5.96	14.42
Trade openness	0.56	0.26	0.14	1.40
Terms of trade	0.98	0.10	0.70	1.38
Number of parties in government	2.35	1.30	1	5.64
Pre-election year	0.30	0.35	0	1.83
Income disparity	0.85	0.19	0.50	1.35
Indirect taxes (as a fraction of total current revenue)	0.30	0.07	0.14	0.44
Number of federal regions	4.94	8.17	1	50
Effective number of electoral districts	42.33	72.60	1	328.93
Central bank autonomy and conservatism (index)*	0.47	0.21	0.16	0.93

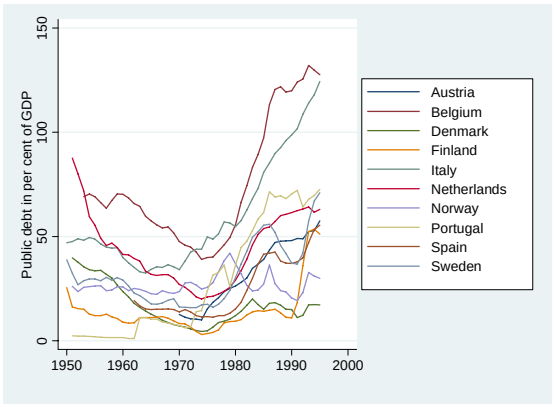
*Note: Sample size is 239 observations.

Table 4. Estimation results: change in public debt (per thousand of GDP).

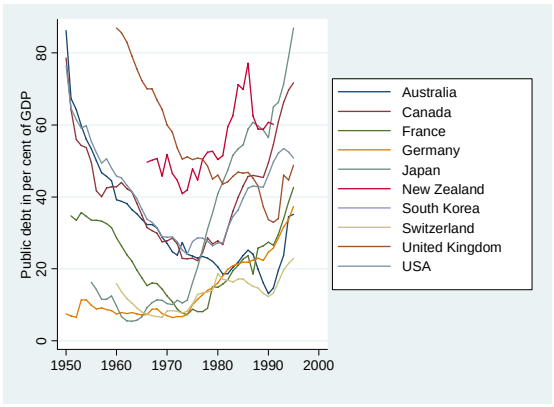
	(1) Tax-smoothing	(2) External spending	(3) Tax-smoothing & pol. economy	(4) Ext. spending & pol. economy
	Coeff. [t-stat]	Coeff. [t-stat]	Coeff. [t-stat]	Coeff. [t-stat]
Immigration variables				
Change in immigrant stock	-0.041 [-0.41]		-0.052 [-0.52]	
Lag in immigrant stock	0.006 [0.37]		0.005 [0.22]	
Immigrant stock		0.066 [1.46]		0.010 [1.55]
Immigrant stock, square		-0.003 [-1.55]		-0.005 [-1.72]
Debt variables				
First lagged change in debt	2.561 [4.05]	2.427 [4.07]	2.104 [3.20]	2.108 [3.48]
Second lagged change in debt	0.894 [1.35]	0.878 [1.36]	1.021 [1.49]	1.077 [1.62]
Lag in debt	-0.023 [-6.51]	-0.024 [-7.37]	-0.023 [-5.77]	-0.025 [-6.75]
Economic variables				
Change in unemployment	0.132 [4.22]	0.134 [4.02]	0.130 [4.03]	0.121 [3.85]
Lag in unemployment	0.075 [5.19]	0.082 [6.03]	0.092 [5.02]	0.096 [5.83]
Change in real growth	-0.930 [-0.73]	-0.974 [-0.79]	-1.717 [-1.29]	-1.818 [-1.42]
Lag in real growth	0.508 [0.29]	0.487 [0.29]	-0.770 [-0.41]	-0.813 [-0.46]
Change in real interest rate	-0.000 [-0.02]	0.003 [0.27]	0.005 [0.45]	0.011 [0.98]
Lag in real interest rate	0.007 [0.67]	0.013 [1.25]	0.017 [1.37]	0.027 [2.19]
Change in openness	-7.104 [-2.69]	-5.118 [-2.01]	-8.082 [-2.92]	-7.314 [-2.65]
Lag in openness	0.147 [0.09]	-1.105 [-0.72]	-0.996 [-0.50]	-2.473 [-1.34]
Change in terms of trade	-3.838 [-2.52]	-2.630 [-1.83]	-4.660 [-2.89]	-4.221 [-2.65]
Lag in terms of trade	1.043 [1.15]	0.332 [0.40]	0.201 [0.18]	-0.695 [-0.70]
Change in (openness x terms of trade)	5.917 [2.17]	4.079 [1.56]	6.814 [2.35]	6.206 [2.18]
Lag in (openness x terms of trade)	-0.539 [-0.31]	0.661 [0.40]	0.187 [0.09]	1.612 [0.82]
Political economy variables				
Number of parties			0.045 [1.60]	0.037 [1.38]
Pre-election year			0.013 [0.23]	0.017 [0.34]
Income disparity			0.876 [1.13]	0.956 [1.45]
Lag in indirect tax share			0.225 [0.16]	0.642 [0.48]
Number of federal regions			-0.276 [-2.77]	-0.264 [-3.05]
Number of federal regions, square			0.011 [2.78]	0.010 [2.94]
Effective number of electoral districts			0.011 [2.11]	0.011 [2.41]
Effective number of electoral districts, square			-0.000 [-2.13]	-0.000 [-2.40]
Central bank autonomy and conservatism			-0.593 [-1.30]	-0.839 [-1.97]
Country-specific time trends	included	included	included	included
Constant	-0.835 [-1.07]	-0.093 [-0.12]	-0.199 [0.17]	0.972 [0.90]
Observations	221	240	220	239
R-squared adjusted	0.56	0.55	0.57	0.57

Figures

Figure 1. Public debt accumulation in OECD countries, 1950 – 1995.

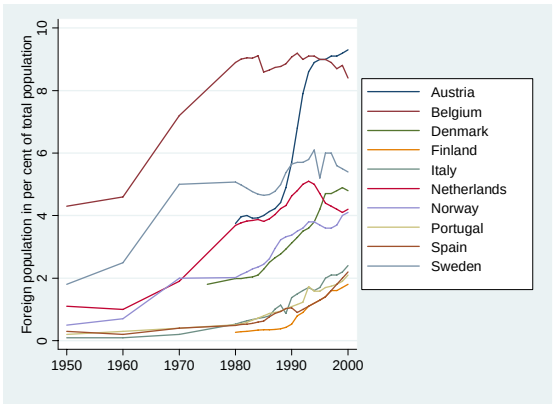


(a)

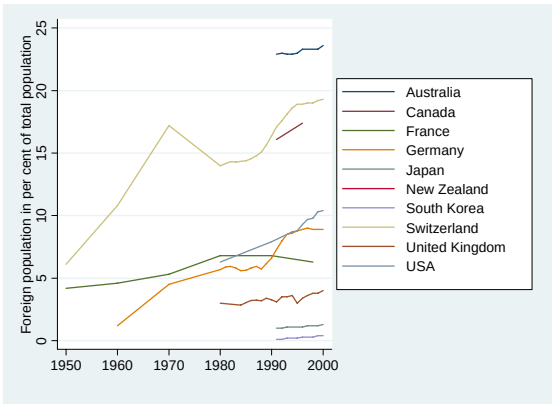


(b)

Figure 2. Shares of foreign populations in OECD countries, 1950 – 2000.



(a)



(b)

Note: Shares of foreign populations before 1980 are decennial and not available for all countries.

Appendix A

The Hamiltonian corresponding to our optimal control problem is the following:

$$H = e^{-rt}\log\left[\phi_{nt}(\tau-(1+r)b_t\right]+p_t\left[rb_t-\tau+((1+\alpha)\phi_{nt}+\phi_{mt})(\tau-(1+r)b_t)\right]. \qquad (A.1)$$

The time paths of the control variable, the share of spending on natives ϕ_{nt}, the state variable, public debt b_t, and the value of public debt p_t are jointly determined by the following three formulas:

$$\frac{e^{-rt}}{\phi_{nt}}+p_t(1+\alpha)(\tau-(1+r)b_t)=0, \qquad (A.2)$$

$$\dot{b}_t = rb_t-\tau+\left[(1+\alpha)\phi_{nt}+\phi_{mt}\right](\tau-(1+r)b_t), \qquad (A.3)$$

$$\dot{p}_t = \frac{e^{-rt}(1+r)}{\tau-(1+r)b_t}+p_t\left[(1+r)((1+\alpha)\phi_{nt}+\phi_{mt})-r\right]. \qquad (A.4)$$

Solving the three equations for the three unknowns yields the optimal value for the control

$$\phi_{nt}=\frac{\tau-rb_t}{(1+\alpha)(\tau-(1+r)b_t)}, \qquad (A.5)$$

which results in positive values for public debt, given that $b_0=0$:

$$b_t=\frac{\tau}{1+r}\left[1-\mathrm{e}^{-\phi_{mt}(1+r)t}\right] \qquad (A.6)$$

and the deficit

$$\dot{b}_t=\tau\phi_{mt}\,\mathrm{e}^{-\phi_{mt}(1+r)t} \qquad (A.7)$$

for $\phi_{mt}>0$.

Appendix B – Variable Description and Sources

Variable	Description	Source
Public debt	Gross consolidated central government debt (per cent of GDP)	Franzese (1998).
Budget deficit	Change in gross consolidated central government debt (per cent of GDP)	Franzese (1998).
Immigrant stock	Stock of foreigners (per cent of total population)	OECD International Migration Statistics. OECD Trends in International Migration, various issues. Various national statistical databases.
Economic explanatory variables		
Unemployment rate	OECD definition	OECD (2004) Economic Outlook 75. OECD (2004) Labour Force Statistics. OECD (2005) Main Economic Indicators.
Real GDP growth rate		Penn World Tables 6.1.
Real interest rate	Long-term government bond yield minus inflation	Franzese (1998).
Openness	Exports plus imports as a fraction of GDP	Penn World Tables 6.1.
Terms of trade	Export price index/import price index	Franzese (1998).
Political economy explanatory variables		
Number of parties in government		Franzese (1998).
Pre-election year	Indicator	Franzese (1998).
Income disparity	Nominal GDP per capita relative to real wages of manufacturing workers	Franzese (1998).
Lag in indirect taxes (as a fraction of total current revenue)		Franzese (1998).
Number of federal regions	Number of regions in effectively federal states	Franzese (1998).
Effective number of electoral districts		Franzese (1998).
Central bank autonomy and conservatism	Index	Franzese (1998).

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