International tax competition and the deficit bias*

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Abstract

The paper studies the joint evolution of public debt, corporate taxation and income inequality in a political economy model of dynamic tax competition. International financial liberalization increases capital mobility generating static rents for capital owners. Capital accumulation further amplifies these rents. Median voter driven policies mitigate the increased inequality by redistributing from capital to labor owners through higher public debt that partially captures the dynamic rents of capital mobility. Policy coordination generates lower debt but remains suboptimal unless capital mobility is high. The theoretical predictions are consistent with observed patterns in the OECD countries during the last three decades.

Keywords: International tax competition, political economy, deficit bias, redistribution

JEL codes: E60, F40, F50, F62

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1 Introduction

The paper proposes a dynamic tax competition model to understand the joint evolution of corporate taxation, public debt and income inequality in the developed countries during the last three decades. During this period public finance in the developed world displays two notable trends. On the one hand, panel a of figure 1 shows a steady decline in the statutory rates of the corporate income tax, from nearly 50% in the early 80s to below 30% in 2008.\(^1\) On the other hand, as shown in panel b of the same figure, the stock of public debt as a share of GDP in the OECD countries has doubled during the same period.

The economic literature, both theoretical and empirical, has successfully accounted for the first fact by showing that higher capital mobility can induce competitive reductions in capital taxation as countries attempt to expand their domestic tax base. Indeed, the dotted line in figure 1 shows a strong increase in financial openness starting in the mid 80s, triggered by deregulation in the financial sector and the removal of capital controls.\(^2\)

The effects of tax competition on the mix of tax revenues as well as on the level and structure of public spending are rather well understood (see e.g. Bucovetsky and Wilson (1991), Keen and Marchand (1997), Wildasin (2003), Devereux et al. (2008)). However, despite the systematic buildup of public debt in developed economies, the potential interactions between tax competition and the intertemporal government budget constraint have been largely ignored.

This paper helps bridge the gap by connecting two standard problems: on the one hand, the static choice of tax rates under capital mobility which is at the heart of the tax competition literature, and on the other hand, the dynamic optimization over tax and debt policies underlying public finance theories.

Importantly, while focusing on the linkages between international capital mobility, taxation and the public budget deficits, the proposed theory is also consistent, as explained below, with another fundamental trend in the global economy, namely the steady increase in income inequality (see panel b of figure 1, also Atkinson et al. (2011)).

Specifically, I build a political economy model of dynamic tax competition in a multi-country open economy setup with capital accumulation and public debt. The world lasts for two periods. Each country is endowed with a mobile factor (capital) and an immobile one (labor). Capital owners are a minority relative to workers. They can invest their capital domestically or, at a cost, abroad. Both labor and capital income are taxed but only source

\(^1\) The overall statutory tax rate on distributed profit and the effective average tax rate on capital display similar trends.

\(^2\) The index measures a country’s degree of capital account openness. See Chinn and Ito (2006) for details.
Panel a shows average OECD corporate tax rates (on the left axis, in percentages) and the Chinn-Ito financial openness index (on the right axis). Panel b shows the average OECD Gini coefficient in the mid 80s, mid 90s and mid 2000s (on the left axis) and the central government debt share in GDP (on the left axis in percentages). The capital taxation and public debt measures are computed as GDP weighted averages in each year. The Gini coefficients are computed for OECD 22 countries, i.e. exclude Mexico and Turkey. Source: OECD, Chinn and Ito (2006)

taxation of capital income can be implemented. Moreover, capital taxation generates a domestic deadweight loss. Output is produced with linear technologies, so factor prices are given. In each country, a government uses capital and labor taxes together with public
debt to finance an exogenous level of public spending. The government maximizes the aggregate life-time utility of the median voter, which is a worker. International capital mobility implies the domestic tax base depends on foreign policy allocations.

In this framework, I study how independently set fiscal policies respond to higher capital mobility (e.g. brought by international financial deregulation). I then contrast these policies to those arising from international policy coordination.

The first contribution of the paper is to show that a fiscal deficit bias arises as a dynamic effect of tax competition. The main conclusion of the paper has a twofold interpretation. Focusing on the role of financial development, the results suggest that when countries compete in tax rates, a permanent increase in capital mobility can lead not only to lower capital tax rates but also to higher public budget deficits. A different perspective, centered on global governance rules, implies that international fiscal policy coordination generates lower deficits than uncoordinated policies at a given level of capital mobility.

The second contribution of the paper is to provide a normative analysis of policy coordination. Comparing the welfare levels attainable by the median voter under coordinated vs independent policies, I show that international policy coordination is not implemented by democratically elected governments unless the level of capital mobility is higher than some threshold, in other words if the world capital markets are functioning well enough.

Finally, allowing for heterogeneity in capital mobility across countries, the model predicts that higher capital mobility is associated with lower capital taxation and lower public budget deficits. The theoretical analysis highlights the role of tax competition in generating international imbalances in addition to the deficit bias. An empirical analysis using OECD data shows strong support for the predictions of the theoretical model.

The intuition behind the first result is straightforward. In an open economy, permanently higher capital mobility implies the domestic capital supply is more elastic with respect to local taxes. This lowers capital tax rates in both periods, which increases the income of capital owners. Capital accumulation amplifies these gains as it increases the tax base in the second period, thus further magnifying income disparities in the economy. Everything else equal, workers are worse-off in both periods as higher labor income taxes are needed to compensate for the reduction in the capital income tax.

As a consequence, policies aligned to the interests of workers attempt to increase redistribution from the mobile to the immobile factor. Crucially, while tax competition keeps capital income tax rates down in all periods, capital accumulation generates, ceteris paribus, an increase in the second period tax base. Given tax rates, capital owners bear a higher share of the tax burden in the second period. Therefore, rather than increasing capital income taxation directly, it may be preferable to raise public debt in the first period.
In this way, a higher share of total public spending (in present value terms) is financed with capital income taxes while the tax burden on labor is reduced in all periods.

When capital mobility increases from lower levels, public debt can be efficiently used as an intertemporal shift of tax distortions to partially capture the (dynamic) rents of mobility. However, at high levels of capital mobility, capital income is already taxed very lightly while labor income taxes are very high. In this case, capital taxation responds less to higher capital mobility and public debt goes down. Nonetheless, relative to coordinated policies, tax competition yields higher levels of public debt at any level of capital mobility.

Importantly, these results are derived under a permanent increase in capital mobility. If, moreover, foreign investment becomes less costly over time, additional income gains for capital owners in later periods strengthen the redistribution through public debt.

Notice that while financial liberalization acts as a trigger of tax competition, what actually leads to higher public budget deficits is the increase of income disparities between workers and capital owners, driving up the former group’s preferences for redistribution. Thus, this political economy theory of fiscal policy in a strategic environment rationalizes both the recent trends in international capital mobility, capital taxation and public debt and the creep up of income inequality that has paralleled the public debt build-up in developed economies.

The second result hints at the impossibility to implement policy coordination below a threshold level of capital mobility. Moreover, provided the domestic income loss from capital taxation is severe enough, I show that coordinated policies become attractive, from the point of view of the median voter, only after the peak debt level has been attained (and thus lower capital mobility decreases the level of debt).

Interestingly, strategic policies can be optimal for the median voter at lower levels of financial openness because, by limiting capital income taxation, they also act as a sort of commitment to reduce domestic deadweight loss. Such a constraint is absent under coordinated policies, which internalize the tax competition motive. This discourages capital accumulation, lowering total revenues from capital income taxation, which in turn requires higher taxes on labor income.

1.1 Related literature

The paper contributes to two different strands of economic literature.

Within the tax competition literature\(^3\), while few previous studies have looked at the

dynamic effects of tax competition (e.g. Wildasin and Wilson (1996), Wildasin (2003) and Koethenbuerger and Lockwood (2010)), they have not analyzed equilibrium public debt in such environments. An exception is Jensen and Toma (1991). They study public debt in a model of tax competition but exclude capital accumulation, which is central to the current paper. More generally, Wildasin (2003) shows that in a world of imperfectly mobile factors, tax competition can trigger redistribution in favor of the owners of immobile resources. While relying on a different mechanism, the current paper generates a similar redistribution motive.

The paper also contributes to the political economy literature on fiscal policy (Alesina and Tabellini (1990), Persson and Svensson (1989), Battaglini and Coate (2008), Caballero and Yared (2010), Aguiar and Amador (2011), Cukierman and Meltzer (1989), Song et al. (2009)). While most of this literature looks at domestic policy issues, the current paper focuses on the link between equilibrium domestic redistribution and the transmission of fiscal policies between countries.

Some of the papers that consider open economy environments, look at taxation related spillovers but do not model public debt (e.g. Kehoe (1989), Kehoe (1989), Rodrik and van Ypersele (2001) and Mendoza and Tesar (2005)). Other, such as Chang (1990), Baxter and King (2005) or Cooper et al. (2008), allow for unbalanced public budgets but do not feature strategic tax policies. Moreover, in general the strategic interactions between countries occur through the interest rate while here I focus on the role of tax competition between countries taking factor prices as given.

More recently, Arcalean (2007) and Azzimonti et al. (2012) also focus on the interest rate channel to study political economy models of fiscal policy in integrated capital markets.

Arcalean (2007) uses a multi-country dynamic general equilibrium model to study fiscal policy interactions arising between countries that share an integrated capital market but retain independence of their fiscal policies. Public spending and its financing through taxes and public debt are chosen through a probabilistic voting mechanism. Seeking mobile private capital, countries use productive public spending as an instrument of fiscal competition. This race at the top in public spending stimulates private capital accumulation and thus acts as a positive externality. However, due to the common capital market, public debt generates a negative price externality, i.e. higher debt in one country raises the interest rate for all the others. The net welfare effect of these fiscal externalities determines the coordination regime implemented by governments.

Azzimonti et al. (2012) studies a stochastic environment with risk averse entrepreneurs who purchase public debt as a safe asset. Relative to autarky, under capital market integration, governments do not fully internalize the effects of own debt on the interest rate and
thus increase the stock of debt. An increase in the entrepreneurs’ uninsurable risks, which is interpreted as an increase in income inequality, increases the demand for safe assets and reduces the interest rate. Thus, the issuance of debt is beneficial for both entrepreneurs and workers as it allows more consumption smoothing for the former and lower borrowing costs for the latter.

Relative to the previous contributions, this paper emphasizes a distinct and complementary explanation focusing on the role of public debt as a redistributive device in a perfect foresight environment without cross-border interest rate externalities.

Whereas in the previous papers capital markets are considered either to be completely open or closed, financial openness is modelled here as a gradual process that intensifies tax competition and creates both static and dynamics windfalls for the capital owners. The static externality arises in the form of lower tax rates on capital income in all periods while the dynamic gain arises through capital accumulation increasing the tax base in later periods. At the same time, labor tax rates go up. Thus, higher income inequality arises endogenously and leads to higher redistribution demands from the workers. While the static externality can only be internalized through international policy coordination (which may or may not be preferred by the median voter), the dynamic externality can always be corrected domestically with intertemporal transfers, in other words by increasing public debt.

The next section of the paper presents a two country model of dynamic tax competition and defines the uncoordinated and the coordinated equilibria. A generalization of the model to the case of \( n \) economies is relegated to the appendix. Section 3 derives equilibrium policies and analyzes the effect of an increase in capital mobility. Section 4 studies under what circumstances is policy coordination chosen. In section 5, I extend the model to asymmetric countries and analyze the effects of heterogeneity in capital mobility. Section 6 tests some of the model’s predictions on data from the OECD countries. The following section discusses the main assumptions of the model and the next concludes. Proofs are included in the appendix.

2 The model

The world consists of two ex-ante identical countries. Asterisks denote the foreign country. Both are imperfectly open economies, i.e. foreign capital investments are costly. Each country is endowed with linear technologies in capital and labor so the wage, the interest rate are fixed. The final good is costlessly tradeable. The world lasts for two periods indexed by \( t = 1, 2 \). The population of each country is constant and normalized to
one. There are two types of agents, a measure one of workers (denoted by superscript L) and a measure \( \alpha \) of capital owners (superscripted K). Workers constitute a majority, i.e. \( \alpha < 1 \). Both agent types live for two periods but only K agents save. Capital owners can invest their resources both at home and, at a cost, abroad. Only source based taxation of capital income is possible. Labor and capital income taxes finance an exogenous stream of public spending. In the benchmark model, national governments engage in corporate tax competition and can issue public debt to maximize the lifetime welfare of the median voter which is a worker. Alternatively, under international policy coordination, equilibrium fiscal policies are the result of a joint welfare maximization problem. In both scenarios, governments can credibly commit to repay public debt. To ease notation, whenever possible, I only describe the home economy.

2.1 Households

L-type agents. Workers supply each period one unit of labor services so \( L_t = 1 \). They have no capital endowments and do not save. I later show that given equilibrium public policies, L agents would not save even if allowed to.

Labor income is taxed at the rate \( \tau_t \). Workers’ consumption flows are:

\[
c^L_t = w(1 - \tau_t),
\]

where \( w \) is the per period wage. Their lifetime utility is:

\[
V^L = \ln c^L_1 + \beta \ln c^L_2, \ 0 < \beta \leq 1.
\]  

K-type agents. The world interest rate, gross of tax, is constant and equal to \( r \). Capital owners start with \( a_0 = 1 \) units of capital. Thus, aggregate domestic capital supply in each economy is equal to \( \alpha \), the measure of capital owners. Each period, they invest their capital internationally so as to maximize net of tax income. Capital invested at home, \( d_t \) is taxed at the domestic tax rate \( \theta_t \), while capital invested abroad, \( f_t \) is taxed at the foreign rate \( \theta^F_t \) and is subject to some transaction costs \( T(f_t), T_f > 0 \) and \( T_{ff} > 0 \).

To keep the model tractable, I assume quadratic transaction costs (see e.g. Persson and Tabellini (2002))

\[
T(f_t) = \frac{f_t^2}{2\phi}, \ \phi \geq 0.
\]  

Here \( \phi \) measures the mobility of domestic capital, or equivalently, the lack of barriers in investing abroad. The limiting case \( \phi = 0 \) implies infinite costs of investing abroad and
thus can be interpreted as financial autarky. The larger $\phi$, the higher the capital mobility.

The income of $K$ agents is

$$ I_t = d_t(r - \theta_t) + f_t(r - \theta_t^*) - T(f_t), \tag{3} $$

where $r$ is the interest rate, $d_t + f_t = a_{t-1}$, $f_t \geq 0$ for $t = 1, 2$. For simplicity and without loss of generality, all consumption takes place in the last period so all income is saved at the end of the first period.

$$ a_1 = I_1 \tag{4} $$

$$ c_2^K = I_2 \tag{5} $$

While workers consume their disposable income every period, capital owners maximize second period utility from consumption. Their problem can be decomposed into two portfolio allocation problems, choosing $d_t$ and $f_t$ to maximize net of tax income in each period:

$$ \max_{d_t, f_t} d_t(r - \theta_t) + f_t(r - \theta_t^*) - \frac{f_t^2}{2\phi}. \tag{6} $$

Substituting (2) in (3) and solving (6) yields the levels of foreign and domestic investment respectively:

$$ f_t = \max \{\phi(\theta_t - \theta_t^*), 0\} \text{ and } d_t = a_{t-1} - f_t. \tag{7} $$

As expected, lower transaction costs increase investment abroad as do higher domestic capital tax rates. For simplicity, private borrowing is excluded so that $f_t \geq 0$. Assuming an interior solution, the income of $K$ agents in period $t$ is therefore

$$ I_t = a_{t-1}(r - \theta_t) + \frac{\phi(\theta_t - \theta_t^*)^2}{2}. \tag{8} $$

The first term in (8) reflects the direct benefits from lower taxation in a closed economy while the second term captures the extra benefits from financial openness, via tax competition.

Denote with $k_t$ the stock of capital available for private investment in the home economy. Capital market clearing implies:

$$ \alpha(d_t + f_t^*) = k_t + b_{t-1} \tag{9} $$

where $d_t = a_{t-1} - f_t$ and $f_t^*$ are the domestic and the foreign investments in the home country, respectively, and $b_{t-1}$ is the stock of outstanding public debt. Similar allocations
are found for the foreign country.

2.2 Production

In each country, a homogeneous consumption good is produced with two distinct linear technologies using capital $k_t$ and labor $l_t$ respectively:

$$y_{k,t} = k_t,$$
$$y_{l,t} = l_t.$$  

Assuming competitive markets implies constant per unit factor prices, which are normalized to $w = r = 1$. Furthermore, given $l_t = 1$, total output in the economy is:

$$y_t = 1 + k_t.$$  

(10)

2.3 Government

In each country there is a government that uses labor and capital income taxes, $\tau_t$ and $\theta_t$ respectively, in addition to public debt to finance a constant stream of public spending $g$. Governments can credibly commit to repay public debt. Source based taxation implies the domestic tax rate $\theta_t$ applies to both private and public claims located in that country, irrespective of the nationality of the owner. Moreover, capital taxation entails a monetary cost that can be thought of as expenditures with the tax administration or as a deadweight loss due to tax evasion:

$$D(\theta) = \frac{\theta^2}{2}, \quad \gamma > 0.$$  

(11)

The cost is directly proportional with the capital income tax. A higher $\gamma$ implies the technology used to collect capital income taxes is less efficient.

At $t = 1$, the government can run an unbalanced budget. In the case of deficit ($b_1 > 0$), the government has to match the expected rate of return on private capital in the second period in order to raise funds. Thus, given $r = 1$, savings earn $1 - \theta_2$ net of taxes irrespective of whether they finance public debt or private investment.

At $t = 2$, any outstanding debt is repaid and the budget is balanced so $b_2 = 0$. The government budget constraints read:

$$g = \tau_1 + \theta_1 \alpha (d_1 + f_1^*) - b_0 r + b_1 - D(\theta_1)$$  

(12)

$$g = \tau_2 + \theta_2 \alpha (d_2 + f_2^*) - b_1 r - D(\theta_2).$$  

(13)
With \( g \) fixed, the constraints define \( \tau_1 \) and \( \tau_2 \) as functions of \( \theta_1, \theta_2 \) and \( b_1 \). In the following I denote the policy vector in the home country by \( \omega = \{ \tau_1, \theta_1, \tau_2, \theta_2, b_1 \} \) and the set of feasible policies with \( \Omega \). For simplicity I assume no initial debt \( b_0 = 0 \) and set \( g = 1 \).

2.4 Timing

At the beginning of period 1 capital owners decide on \( d_1 \) and \( f_1 \). Production takes place. Agents make private consumption and saving decisions. Policies \( \theta_1, \tau_1, \theta_2, \tau_2 \) and \( b_1 \) are chosen at the end of period 1 and public spending is realized. Capital owners decide on \( d_2 \) and \( f_2 \). In each country, resources are invested in private \( (k_2) \) or public claims \( (b_1) \), both delivering the same expected rate of return. Second period production takes place. Agents consume, tax revenues are collected, public spending is realized and debt is repaid.

2.5 Political Economy Equilibrium

First, I use the framework presented before to analyze the case of uncoordinated policies. Then I study the case of coordinated policies.

**Uncoordinated policies.** In this case, policies are set independently in each country, by majority voting at \( t = 1 \). Thus, implemented policies maximize the lifetime utility of the median voter. Since \( \alpha < 1 \), the median voter is a worker.

As capital can be invested abroad and only source taxation can be implemented, the domestic tax base depends on the tax rates abroad. This gives rise to a tax externality and thus to strategic setting of fiscal policies. From (12) and (13) it is clear that domestic workers’ welfare depends, through (7), on both domestic and foreign fiscal policies.

Specifically, governments maximize the lifetime utility of the domestic median voter \( V^L = \ln c^L_1 + \beta \ln c^L_2 \) taking as given the foreign policies. In the case of the home country the problem is:

\[
\max_{\omega \in \Omega} V^L(\omega|a_0, \omega^*) \text{ s.t. (12) and (13)}. \tag{14}
\]

The foreign government solves an analogous problem.

I focus on the case of symmetric Cournot-Nash equilibria.

**Definition 1.** Under uncoordinated policies, a political economy equilibrium with international capital mobility consists of a sequence of private choices on consumption, saving and country specific investment allocations \( \{c^L_1, c^K_1, d_t, f_t\} \) and \( \{c^{L*}_1, c^{K*}_1, d^*_t, f^*_t\} \), and a sequence of public policies \( \{\omega, \omega^*\} \in \Omega \) for \( t = 1, 2 \) such that, in both the home and the foreign country:

i) each period households choose optimally, taking current and future policies as given;
ii) governments solve (14). Focusing on the home country, equilibrium policies, superscripted $S$ are given by:

$$\omega^S = \{\omega \in \Omega | V^L(\omega|a_0, \omega^S) \geq V^L(\overline{\omega}|a_0, \omega^S), \forall \overline{\omega} \in \Omega\}. \quad (15)$$

The foreign country government solves a similar problem.

**Coordinated policies.** In this case, policies are chosen so that to maximize a social welfare function giving equal weight to the median voter in each country and subject to all national budget constraints. Coordinated policies, denoted by superscript $C$ are given by:

$$\omega^C = \arg \max_{\omega, \omega^* \in \Omega} \{V^L(\omega|a_0, \omega^*) + V^L(\omega^*|a_0^*, \omega)\} \text{ s.t. (12) and (13)} \quad (16)$$

In this case the externality induced by international capital mobility is removed.

### 3 Equilibrium analysis

#### 3.1 Uncoordinated policies

Solving for the uncoordinated (or strategic) policies defined by (15) yields the following symmetric allocations, superscripted $S$:

$$\tau^S_1 = 1 - \frac{\alpha^2(\alpha + \gamma + 4\alpha \phi)}{(1 + \beta)(\alpha + \gamma + 2\alpha \phi)^2}, \quad (17)$$

$$\tau^S_2 = 1 - \frac{\alpha^2 \beta(\alpha + \gamma + 4\alpha \phi)}{(1 + \beta)(\alpha + \gamma + 2\alpha \phi)^2}, \quad (18)$$

$$\theta^S_1 = \theta^S_2 = \frac{\alpha}{\alpha + \gamma + 2\alpha \phi}, \quad (19)$$

$$b^S_1 = \frac{\alpha^2(\gamma(1 - \beta) - 2\alpha(\beta - 2\phi)(1 - \beta))}{2(1 + \beta)(\alpha + \gamma + 2\alpha \phi)^2}. \quad (20)$$

The government faces two types of costs associated with capital income taxation. Due to international capital mobility, described by $\phi$, a higher capital income tax rate depresses the tax base. Moreover, capital taxation is costly even in the absence of tax competition, due to domestic deadweight losses, summarized by $\gamma$. Both these costs have distributional implications as lower capital income taxes need to be compensated by higher labor taxation. Thus capital taxes decrease with both $\phi$ and $\gamma$, while labor taxes are increasing in these frictions. A higher capital supply $\alpha$ increases capital taxation and reduces labor taxation.

With symmetric countries, tax rates are equal across countries and therefore, *in equilib-
rium, there is no reason to incur the transaction costs associated with foreign investment. Thus, \( f_t = 0 \). However, equilibrium fiscal policies are affected by the availability of foreign investment.

Finally, given the government maximizes the workers’ lifetime utility, their marginal utilities are equalized across time. Thus, given such a tax structure, even if workers could save, they would choose not to.

Before analyzing the effects of higher capital mobility, it is useful to understand the determinants of public debt in this model.

**Lemma 1.** If \( \gamma > \gamma^S = 2\alpha\beta/(1 - \beta), b_1^S > 0, \forall \phi \geq 0 \). A similar result can be derived for the share of debt in output.

When the domestic deadweight loss from capital taxation is large enough relative to the supply of capital \( \alpha \), the government chooses a public budget deficits at any capital mobility level \( \phi \).

For exposition purposes, in the following I assume this condition holds. However, the results below apply equally to the case of budgetary surpluses.

The two types of frictions faced by governments, summarized by \( \gamma \) and \( \phi \), are static in nature. With constant factor prices, in the absence of other channels, the marginal utility of the median voter would be equalized across periods, all taxes would be constant over time and there would be no scope for intertemporal consumption smoothing through debt.

Here, the critical channel is capital accumulation.\(^4\) First period income gains by capital owners due to low taxation increase the second period tax base. Thus, in the second period, at any tax rate, capital owners bear a higher share of the cost of financing \( g \). This implies lower labor tax rates in the second period. Furthermore, since the objective of the government is to smooth tax distortions on labor across periods, this also generates an intertemporal shift of tax burden from the first period, implemented through an increase in the public debt. In Lemma 1 a higher capital supply \( \alpha \) makes capital taxation less costly every period, thus increasing the importance of intraperiod redistribution relative to intertemporal transfers.

### 3.2 How do (uncoordinated) policies change with capital mobility?

The cost of cross border capital investments decreases with \( \phi \). I first consider the case of a permanent increase in \( \phi \) at \( t = 1 \). Simple algebra helps establish the following results.

\(^4\)The assumption that \( K \) agents consume only in the second period implies the entire increase in income is saved. However, the main results continue to hold in a more general model with consumption in both periods as long as savings respond to the increase in current income.
Proposition 1. When national governments do not coordinate fiscal policies, higher international capital mobility generates i) higher labor taxation ($\partial \tau^S_1/\partial \phi > 0$) and ii) lower capital taxation ($\partial \tau^S_2/\partial \phi < 0$).

Results in i) and ii) are well-known static effects of tax competition: the more mobile capital is, the lower the capital tax and the higher the labor tax. I turn now to the effects on public debt.

Proposition 2. Under uncoordinated fiscal policies, higher international capital mobility generates higher public budget deficits: $\partial b^S_t/\partial \phi > 0$ if $\phi \leq \hat{\phi}$ where $\hat{\phi} = (1 + \beta)/(2 - 2\beta)$. Otherwise, an increase in $\phi$ lowers the deficit. The share of debt in output, $sb^S_t$ behaves similarly.

The result in Proposition 2 clarifies the role of debt in dynamic fiscal competition. It shows that starting at low levels of $\phi$, a marginal increase in capital mobility increases the public budget deficit. After a given threshold $\hat{\phi}$, further capital mobility is associated with lower public budget deficits. Interestingly, the deficit moderating effects of international capital mobility depend on the discount rate of the workers: the more patient they are, the more willing to accept higher labor taxes today ($\partial \tau^S_1/\partial \beta > 0$) and thus to foster capital accumulation by K-agents in exchange for intertemporal redistribution through debt and lower taxation in the second period ($\partial \tau^S_2/\partial \beta < 0$). Since $\partial \hat{\phi}/\partial \beta > 0$, more patient workers imply public budget deficits obtain at higher levels of capital mobility.

The non-monotonic behavior of public debt with respect to capital mobility is due to the changing strength of two different effects. On the one hand, to increase the welfare of the median voter in every period, the government can mandate *intraperiod redistribution* from capital to labor through taxes. On the other hand, capital accumulation by K-agents generates a positive externality, i.e. a less elastic capital tax base in the second period, which in turn can be used via *intertemporal redistribution* to increase welfare in both periods. At low capital mobility levels, the marginal change in transaction costs by increasing $\phi$ is large. This makes the capital more elastic with respect to domestic taxation. Lower capital taxation, in turn, favors capital accumulation and higher labor tax rates. Together, these effects translate into a stronger motive for intertemporal redistribution. At high levels of capital mobility, capital is relatively less tax elastic and at the same time labor taxes are already high so any additional increases lower workers’ utility a lot. Thus, the motive for intraperiod redistribution becomes stronger. Labor tax rates increase by less, the first period windfall of K-agents is lower and so are the (marginal) benefits of public debt.

So far, I have assumed a permanent increase capital mobility at $t = 1$. If, moreover, foreign investment becomes less costly in the second period, i.e. $\phi_2 > \phi_1$, this produces
additional income gains for capital owners thus strengthening the redistribution through public debt. Moreover, in this particular case, a deficit would arise even in the absence of capital accumulation. The higher the capital mobility, the lower the equilibrium capital tax rates. As capital owners get richer in later periods, governments can smooth the tax distortions on labor by increasing public debt.

In the appendix, I show that similar results obtain when higher capital mobility also increases \( \gamma \) the cost of collecting capital income taxes.

3.3 Coordinated policies

I now turn to the coordinated policies, denoted by \( C \). Solving \((16)\) yields:

\[
\begin{align*}
\tau_1^C &= 1 - \frac{\alpha^2}{(1 + 2\beta)(\alpha + \gamma)}, \\
\tau_2^C &= 1 - \frac{2\alpha^2\beta}{(1 + 2\beta)(\alpha + \gamma)}, \\
\theta_1^C &= \theta_2^C = -\frac{\alpha}{\alpha + \gamma}, \\
b_1^C &= \frac{\alpha^2(\gamma - 2\beta(2\alpha + \gamma))}{2(1 + 2\beta)(\alpha + \gamma)^2}.
\end{align*}
\]

Coordinated policies are independent of the international capital mobility. One can easily show that under coordination capital taxes are higher and labor taxes are lower, relative to strategic policies. Whether the public budget has a surplus or a deficit depends, as before, on the size of the domestic frictions.

**Lemma 2.** If \( \gamma > \gamma^C = 4\alpha\beta/(1 - 2\beta), \) \( b_1^C > 0. \)

Comparing the results in Lemma 1 and 2, it is straightforward to verify that \( \gamma^C > \gamma^S. \) Thus, whenever coordinated policies result in deficits, the strategic policies are also choosing deficits.

Under coordination, capital income taxes decrease with the domestic deadweight loss \( \gamma \) and increase with the capital supply \( \alpha. \) Notice that \( \gamma \) fulfills a similar role to \( \phi \) in the case of uncoordinated policies since it makes the supply of capital more tax elastic. Therefore, a similar argument can be formulated to explain the choice of public budget deficits under coordinated policies. Whenever \( \gamma \) is large enough, it pays off to abstain from taxing capital income at very high levels in order to benefit from the dynamic effect through the future tax base.

It is instructive to consider the limiting cases \( \phi \to 0 \) and \( \phi \to \infty. \) First, \( \phi \to 0 \) implies
the costs of moving capital across borders become infinitely high and thus countries can be considered in autarky.

**Proposition 3.** Assume financial autarky ($\phi \to 0$). Uncoordinated policies result in higher public budget deficits than coordinated policies: $b_1^S > b_1^C$, \forall \gamma > 0$.

These results confirm the intuition developed in the previous propositions. Starting in financial autarky, higher capital mobility generates higher intertemporal redistribution through public debt under tax competition than under coordinated policies.

Second, $\phi \to \infty$ implies the costs of moving capital across borders vanish.\(^5\) In this case, while $b_1^S \to 0$, $b_1^C$ can still be positive, if the condition in Lemma 2 is satisfied. In other words, policy coordination can result in higher deficits relative to uncoordinated policies. This happens because uncoordinated policies redistribute less through public debt as $\phi$ increases, while coordinated policies are set on a fixed level of redistribution determined by the domestic deadweight loss parameter $\gamma$.

### 4 When do governments choose to coordinate fiscal policies?

The previous analysis has looked into the effects of higher capital mobility on both coordinated and uncoordinated policies. Despite being very stylized, the model can be used to provide some insight into the implementability of international fiscal policy coordination under capital mobility.

In this section I compare the median voter’s welfare under strategic and coordinated regimes and at different capital mobility levels. Using the allocations (17)-(20) and (21)-(24) respectively in $V^L$ yields the indirect utilities under the two policy regimes:

\[
W_1^S = (1 + \beta) \log \frac{\alpha^2\beta(\alpha + \gamma + 4\alpha\phi)}{(1 + \beta)(\alpha + \gamma + 2\alpha\phi)^2} + \beta \log \beta \\
W_1^C = (1 + \beta) \log \frac{2\alpha^2\beta}{(1 + 2\beta)(\alpha + \gamma)} + \beta \log 2\beta.
\]

**Proposition 4.** There exists a threshold level of capital mobility $\tilde{\phi}$ such that for low capital mobility ($\phi < \tilde{\phi}$) uncoordinated policies are preferred ($W_1^S > W_1^C$) whereas coordination is chosen ($W_1^S \leq W_1^C$) for high capital mobility ($\phi \geq \tilde{\phi}$).

\(^5\)As $\phi \to \infty$, capital income tax rates go to zero and labor income taxes go to one. While the latter result is a particular case due to $g = 1$, this is without loss of generality for the main results. At any $g < 1$, $\lim_{\phi \to \infty} \tau_2^S < 1$. 

16
Together with Proposition 1 that established a deficit bias for \( \phi < \tilde{\phi} \), this result suggests that the deficit bias that arises under capital mobility with uncoordinated policies can be optimal from the point of view of the median voter.

To see why this arises, notice that under uncoordinated policies \( \phi \) increases the tax elasticity of the capital income whereas coordinated policies internalize this effect. Since lower capital income taxation favors capital accumulation, which in turn leads to redistribution through public debt, for \( \phi < \tilde{\phi} \), uncoordinated policies generate higher lifetime redistribution and thus make the workers better off. As explained above, at high levels of \( \phi \), the dynamic effects of tax competition are less important and thus, the welfare gain from strategic policies is dominated by the stronger static redistribution through taxes under coordination.

Also, it can be shown that for \( \gamma \) large enough, \( \tilde{\phi} < \tilde{\phi} \). A second implication emerges in this case: in democracies, fiscal policy coordination is implemented only when capital mobility, and therefore the public budget deficits, are large enough.

The result in Proposition 4 has some additional implications regarding optimal capital taxation. As noted before, \( \lim_{\phi \to \infty} \theta_i^S = 0 \) as capital mobility forces strategic policies to lower capital income taxation. A similar result was derived by Judd (1985) in a closed economy model when policy is decided only by labor owners. In the current framework, this policy is optimal for the median voter only if policy coordination is not available. As soon as this option is allowed, governments representing the median voter in each country switch to coordinated policies, which implement non zero capital income taxation \( \tau_t^F = \alpha/(\alpha + \gamma) \), at any capital mobility level.

5 Heterogeneous countries

With symmetric countries, the tax rates are equal and therefore, in equilibrium, \( f_t = 0 \), i.e. there is no reason to incur the transaction costs associated with foreign investment. In general, if the symmetry breaks down, the equilibrium tax policies are different and therefore \( f_t \neq f_t^* \neq 0 \). In this case, the model can be used to study how equilibrium international capital flows affect tax competition and public budget deficits.

In order to extend the analysis to the case of heterogeneous countries in a tractable manner, I modify the initial framework as follows.

I assume that foreign investment earns a premium \( z \) relative to domestic returns \( r \). This is the case if foreign investment takes place through firms that are more efficient, larger or less financially constrained than domestic firms. The theoretical literature on international trade with heterogeneous firms (see for example Melitz and Ottaviano (2008)) shows how
selection effects generate such productivity wedges, which are also amply documented by the empirical literature on multinationals (e.g. Haskel et al. (2007)). In the current model, this premium is a tractable way to generate gains from trade and thus to ensure positive bilateral foreign investment flows, even in the case of symmetric countries.

Given the initial investment cost (2), the income of a domestic capital owner becomes:

$$I_t = d_t(r - \theta_t) + f_t(r - \theta^*_t + z) - \frac{f_t^2}{2\phi}.$$  \hfill (27)

Solving the static problem of the capital owner each period yields

$$f_t = \max\{\phi(z + \theta_t - \theta^*_t), 0\}. \hfill (28)$$

In other words, when gains from foreign investment are large, capital outflows are positive even when domestic capital taxation is relatively low.

At an interior solution, after substituting (28) in (27), the income of capital owners becomes:

$$I_t = a_{t-1}(r - \theta_t) + \frac{\phi(z + \theta_t - \theta^*_t)^2}{2}. \hfill (29)$$

As before, the first term in (29) represents the direct gains due to lower domestic taxation while the second term contains the extra gains brought by financial openness, related to market \((z)\) or fiscal policies \((\theta_t - \theta^*_t)\).

Finally, I assume that capital owners’ preferences are such that they save \(a_{t-1}(r - \theta_t)\) and consume the rest. The assumption that savings react only to the direct effect of taxation greatly simplifies the dynamic analysis without loss of generality. Also, I set \(z = 1\).

### 5.1 Heterogeneity in capital mobility

In this section I study uncoordinated policies when countries differ in the level of capital mobility. Recall that for domestic capital owners, foreign investment involves a cost inversely proportional to \(\phi\). In the following, I assume foreign investment is less costly for capital owners in the home country than for those in the foreign country.

**Assumption 1.** *Capital outflows from the home country are less costly: \(\phi > \phi^*\).*
Solving the model under this assumption yields the following policies:

\[
\begin{align*}
\theta_1 &= \theta_2 = \frac{\alpha}{\alpha + \gamma + \alpha(\phi + \phi^*)} + \frac{1}{3} - \frac{\alpha + \gamma + 6\alpha\phi}{3(\alpha + \gamma + 6\alpha\frac{\phi + \phi^*}{2})}, \\
\theta_1^* &= \theta_2^* = \frac{\alpha}{\alpha + \gamma + \alpha(\phi + \phi^*)} - \frac{1}{3} + \frac{\alpha + \gamma + 6\alpha\phi}{3(\alpha + \gamma + 6\alpha\frac{\phi + \phi^*}{2})}, \\
b_1 &= \alpha^2 N^2 \frac{(1 - \beta)(\gamma + 2\alpha(\phi + \phi^*)) - 2\alpha\beta}{2(1 + \beta)D^2}, \\
b_1^* &= \alpha^2 N^*2 \frac{(1 - \beta)(\gamma + 2\alpha(\phi + \phi^*)) - 2\alpha\beta}{2(1 + \beta)D^2}.
\end{align*}
\]

where:

\[
\begin{align*}
N &= \gamma(1 - (\phi - \phi^*)) + \alpha(1 + 2\phi + 4\phi^* - (\phi^2 - \phi^{*2})), \\
N^* &= \gamma(1 + (\phi - \phi^*)) + \alpha(1 + 2\phi^* + 4\phi + (\phi^2 - \phi^{*2})), \\
D &= (\alpha + \gamma + 3\alpha(\phi + \phi^*))(\alpha + \gamma + \alpha(\phi + \phi^*)).
\end{align*}
\]

The benchmark allocations (19) and (20) obtain for \( \phi = \phi^* \). Analyzing the expressions for \( \theta \) and \( \theta^* \) shows that the domestic tax rates depend on how the home country compares to the average capital mobility level \( (\phi + \phi^*)/2 \). Equations (32) and (33) show that the public budget deficits are driven both by differences in capital mobility across countries (through the terms \( N \) and \( N^* \)) but also by the world mobility level, \( \phi + \phi^* \).

Consider the difference between the local and the foreign capital income tax:

\[
\Delta\theta = \theta - \theta^* = -\frac{2\alpha(\phi - \phi^*)}{\alpha + \gamma + 3\alpha(\phi + \phi^*)}.
\]

**Proposition 5.** Lower costs of investing abroad imply lower domestic tax rates on capital income: \( \phi > \phi^* \) \( \Rightarrow \) \( \theta < \theta^* \).

Notice that, as overall capital mobility \( \phi + \phi^* \) goes up, the denominator of \( \Delta\theta \) increases and tax rates become more similar in the two countries. Interestingly, assuming international differences in capital mobility do not become very large, i.e. \( \phi - \phi^* \) is finite, \( \lim_{\phi+\phi^* \to \infty} \Delta\theta = 0 \), so continued financial liberalization increases the tax elasticity of capital in both countries and thus reduces the asymmetries in capital taxation even under non-coordinated policies.

The expressions for public budget deficits (32) and (33) are similar to (20) and it can be shown that Proposition 2 continues to apply in the case of heterogeneous countries. In other words, public debt first increases and then decreases with capital mobility.

19
In the following I study how different levels of capital mobility affect relative public debt.

$$\Delta b = -\frac{2\alpha^2(\phi - \phi^*)((1 - \beta)(\gamma + 2\alpha(\phi + \phi^*)) - 2\alpha\beta)}{(1 + \beta)D}. \quad (36)$$

**Proposition 6.** Lower costs of investing abroad imply lower domestic public budget deficits if \( \gamma > 2\alpha(\beta - (\phi + \phi^*)(1 - \beta))/(1 - \beta), \forall \phi > \phi^* > 0. \) Otherwise, they imply higher deficits only at low world levels of capital mobility, i.e. when \( \phi + \phi^* < \beta/(1 - \beta) - \gamma/(2\alpha). \)

If frictions arising from capital taxation are low, at low world levels of capital mobility, the theory predicts lower public budget deficits in countries with lower costs of investing abroad. However, a further increase in capital mobility reverses the ranking in public debt. This is because high \( \phi \) countries implement lower capital income taxes and thus, stand to lose less tax base under higher capital mobility. As \( \phi + \phi^* \) increases, \( \theta \) decreases less than \( \theta^* \) and thus public debt can be lower.

I now turn to consider the implications for the equilibrium net international capital flows. For the home country, net capital outflows are:

$$F_t = f_t - f^*_t = z(\phi - \phi^*) + (\phi + \phi^*)(\theta_t - \theta^*_t). \quad (37)$$

From equation (37) it is clear that external imbalances arise if either \( \phi \neq \phi^* \) or \( \theta_t \neq \theta^*_t \), in other words, they are driven by two distinct, yet related, factors: financial openness and fiscal policies.

Assuming identical fiscal policies, net capital outflows arise if \( \phi > \phi^* \), i.e. the capital originating in the home country is more mobile. On the other hand, assuming equal mobility levels, net outflows from the home country can also arise if \( \theta_t > \theta^*_t \), i.e. the home country has higher capital income tax rates. In the latter case, the higher the aggregate capital mobility, \( \phi + \phi^* \), the higher the imbalances arising from different capital taxation.

Using the equilibrium tax policies (30) and (31) in (37) yields the equilibrium net flows.

$$F_t = F = \frac{(\phi - \phi^*)(\gamma + \alpha(1 + \phi + \phi^*))}{\alpha + \gamma + 3\alpha(\phi + \phi^*)}. \quad (38)$$

As expected, low costs of investing abroad, relative to the rest of the world, generate net capital outflows while an increase in aggregate capital mobility lowers them.

To summarize, differences in the barriers to foreign investment across countries generate, through tax competition, systematic differences in fiscal policies. The result on the existence of a deficit bias induced by tax competition can now be qualified further: this bias is magnified in countries with relatively high costs of investing abroad.
6 Empirical evidence

The previous analysis provides a theory of public debt and taxation in a world where capital is mobile across national borders. The theory has testable predictions regarding the relationship between international capital mobility, public budget deficits and capital taxation. Specifically, countries with relatively low costs of investing abroad set lower capital income taxes, have lower public budget deficits and experience net capital outflows, or equivalently, a positive current account. In this section, I test some of these results on data from the OECD countries.

I focus on the countries that were OECD members in 1980. Luxembourg is excluded due to lack of data. The sample covers the period 1980-2007.

As a measure of capital mobility, I use the financial openness index proposed by Chinn and Ito (2006). This index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Higher values of this index indicate that a country is more open to cross-border capital transactions.

In the theoretical framework, \(1/\phi\) quantifies the overall barriers to foreign investment faced by domestic capital owners. To capture the empirical measure of financial openness corresponding to \(\phi\), for each country and year, I compute the financial openness of the rest of the world, as an average financial openness index in the other sample countries, weighted by GDP.

The net government lending share in GDP and the current account balance are available from the OECD Statistics. As a measure of capital taxation I first use the statutory capital income tax rate, available from OECD. As alternative measures I use the benchmark value of the effective average tax rate (EATR) computed by Devereux et al. (2002) and the overall statutory tax rate on distributed profits, also from OECD.

Table 1 shows results from panel regressions estimated on the OECD data. The dependent variables are the statutory tax rate on capital income (column 1), the effective average tax rate (column 2), the overall statutory tax rate on dividends (column 3), expressed as percentages, the public budget balance (columns 4 and 5), and the current account balance (column 6) as percentages of GDP. Beside the financial openness index, regressions control for the market size, proxied by lagged real GDP and the lagged growth rate of real GDP, in order to capture business cycle movements. All specifications included country fixed effects. Robust standard errors are included within parentheses.

---

6 Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Iceland, Italy, Japan, Luxembourg, Netherlands, Norway, New Zealand, Portugal, Sweden, United States.
Table 1: Fiscal policy and financial openness

<table>
<thead>
<tr>
<th>Financial Openness Index</th>
<th>-18.30***</th>
<th>-15.18***</th>
<th>-34.49***</th>
<th>4.96***</th>
<th>1.33</th>
<th>6.08**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(3.84)</td>
<td>(3.30)</td>
<td>(4.59)</td>
<td>(1.51)</td>
<td>(1.65)</td>
<td>(2.38)</td>
</tr>
<tr>
<td>Fin.Open.Index * I_{year&gt;2000}</td>
<td>1.31***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country size</td>
<td>0.72</td>
<td>1.28*</td>
<td>0.40</td>
<td>-0.02</td>
<td>-0.08</td>
<td>-1.62***</td>
</tr>
<tr>
<td></td>
<td>(0.63)</td>
<td>(0.68)</td>
<td>(0.73)</td>
<td>(0.25)</td>
<td>(0.25)</td>
<td>(0.42)</td>
</tr>
<tr>
<td>Lag GDP growth rate</td>
<td>-11.83</td>
<td>2.91</td>
<td>8.35</td>
<td>64.96***</td>
<td>62.38***</td>
<td>-8.76</td>
</tr>
<tr>
<td></td>
<td>(20.14)</td>
<td>(17.23)</td>
<td>(26.81)</td>
<td>(10.07)</td>
<td>(8.98)</td>
<td>(13.11)</td>
</tr>
<tr>
<td>No. obs.</td>
<td>516</td>
<td>456</td>
<td>516</td>
<td>541</td>
<td>541</td>
<td>431</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.41</td>
<td>0.43</td>
<td>0.50</td>
<td>0.27</td>
<td>0.36</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Notes: The dependent variables are: the statutory corporate income tax, the effective average tax rate (EATR) on capital income computed by Devereux et al (2002), the statutory dividend tax rate, in percentages and the public budget balance and the current account balance, as percentages of GDP. For each country and year, the financial openness index is the rest-of-the-world GDP weighted average of the capital account openness index computed by Chinn and Ito (2006). I represents an indicator for years after 2000. The country size is proxied by the lagged value of the real GDP. Robust standard errors are reported within parentheses. All specifications include country fixed effects. * indicates significance at the 10 percent level, ** indicates significance at the 5 percent level, *** indicates significance at the 1 percent level.

Across specifications, the coefficients of the financial openness index are significant and have the signs predicted by the theory. All three measures of capital income taxation decrease with financial openness whereas the public budget balance and the current account increase with openness. While the openness coefficient in column (4) suggests a positive association with public budget surpluses, Proposition 6 established that given the frictions from capital income taxation are not very large, more open countries issue more debt at low levels of financial openness. Interacting the openness index with an indicator variable taking value one after 2000 and zero otherwise shows indeed a statistically significant, response of public budget balance to an increase in financial openness after 2000 while the baseline coefficient becomes statistically insignificant.

Controlling for the country per capita income level, the level of government efficiency proxied by the perceived level of corruption or including the lagged public budget deficit yields similar results. In order to control for the change in fiscal discipline induced by the creation of the euro-zone, I construct a categorical variable taking value one for the member countries in the year of their entry to the EMU. Also, to capture possible differences in the
demand for public goods and redistribution, I also control for the dependency ratio, the
share of those over 65 in total active population (between 15 and 65 years old). Including
the lags of these variables does not change the results.

As explained in Chinn and Ito (2006), their index of financial openness does not dis-
tinguish between restrictions depending on the direction of capital flows. While in the
theoretical framework, the measure of capital mobility concerned the costs associated with
foreign investment, in general, these costs are proportional to financial openness in the rest of world (inasmuch as capital inflows are not restricted in other countries) but also to
the domestic financial openness (to the extent capital outflows are concerned). To capture
this possibility, I also compute, for each year, the average financial openness index in all
the sample countries, weighted by GDP, and use this measure instead of the initial rest-of-
the-world index. I obtain similar results, suggesting that indeed domestic capital mobility
is affected both by national regulations as well as by financial openness in the rest of the
world.

Whereas the above results do not necessarily prove a causal effect from financial open-
ness to fiscal policies, the conditional correlations are consistent with those derived from
the theoretical framework, indicating that the channels emphasized in the model are indeed
of empirical relevance.

7 Discussion

In order to highlight the mechanisms at work and to keep the analysis as clear as
possible, the theoretical model has been simplified along a number of dimensions. However,
the core mechanisms underlying the results survive a number of generalizations.

The benchmark results are derived for a two country economy. The appendix shows
how these results generalize to a multi-country environment. While higher capital mobility
due to financial innovation or deregulation can be thought of as an intensive margin for
fiscal competition, a change in the number of countries that belong to the integrated
capital market can be considered as an extensive margin of capital mobility. Also, even
with symmetric countries, a change in $n$ implies each country becomes smaller relative to
the rest of the economy, thus casting some light on the role of asymmetric size in this
framework.

The analysis reveals that the degree of financial openness ($\phi$) and the market size
($n$, the number of countries) play similar roles with respect to the fiscal policy choices.
An interesting implication arises regarding the capital mobility threshold $\phi^*$, derived in
Proposition 2, below which public debt increases with financial openness. If higher capital
mobility (an increase in $\phi$) can be achieved only by reducing the geographical scope of economic integration $n$, (e.g. the Euro-zone countries within the European Union), public budget deficits can increase further with financial integration since $\phi^*$ is decreasing in $n$.

While the net effect on public debt depends on the relative magnitudes of the intensive and respectively, the extensive margin of market integration, the multi-country model points towards an intriguing link between deeper financial integration and public budget deficits.

Capital owners consume only during the second period. As explained before, under a permanent increase in capital mobility, allowing capital owners to consume during the first period would deliver the same qualitative results, as long as the first period fiscal competition increases capital accumulation. On the other hand, higher capital mobility in the second period would imply an exogenous increase in future tax bases and thus would generate similar responses in public debt, even in the absence of private savings.

Majority voting on fiscal policies implies that only the welfare of the workers is taken into account. However, the assumption is not very restrictive since both international capital mobility and the domestic losses associated with capital taxation prevent confiscatory tax rates on capital income. Moreover, the domestic deadweight loss from capital income taxation can be interpreted as an inefficiency induced by the lobbying activities of K agents. Also, while in general redistribution is also realized through public spending, the argument developed in this paper relies on efficient dynamic tax collection. Thus, endogenizing spending would not alter the main conclusions of the analysis.

Whereas a two period economy might appear as an oversimplification, recall that all the results are derived under the assumption of a permanent increase in capital mobility in period one. Feeding a multiperiod model with a decreasing sequence of capital mobility costs, calibrated to match the observed financial openness indices, would only strengthen the income gains in later periods and thus further bias public policy towards deficits. However, exploring quantitatively the model’s predictions in the context of strategic policies would be of distinct interest.

The analysis of asymmetric openness levels explained how different capital mobility across countries can account for differences in taxation as well as the size of the public budget deficit. The subsequent analysis, using data on the OECD countries, provided empirical support for the theoretical predictions. While this analysis has made some progress towards understanding how financial globalization affects domestic fiscal policies and international capital flows, exploring further, both theoretically and empirically, the implications of different types of heterogeneity would be of considerable interest.

Finally, the current framework can also be used to study the effects of capital mobility
and tax competition on output fluctuations (see for example Aghion et al. (2004)). These and other extensions are left for further research.

8 Conclusion

In this paper I have presented a theory that rationalizes the joint evolution of corporate taxation and public debt in the industrialized countries during the last 30 years.

First, complementary to the existing literature focusing on the role of uncertainty in open economies, this theory uses a political economy mechanism to show that public debt can increase with the level of capital mobility even in a symmetric, perfect foresight world. In order to emphasize this mechanism, the paper focuses on a stylized model of dynamic tax competition, capital accumulation and public debt. Whereas higher capital mobility yields both static and dynamic benefits for a minority of capital owners, tax rates and public debt are set by majority voting and thus are controlled by the workers. While international tax competition prevents workers from redistributing the static rents of capital owners, the availability of public debt enables them to capture some of the dynamic rents arising through capital accumulation.

Importantly, the two main ingredients of the model, capital mobility and tax competition, generate (endogenously) an increase in income inequality which is in line with the observed pattern in the OECD countries.

Second, the theoretical framework distinguishes between, on the one hand, changes in policy regimes (coordination vs non-coordination) which are choice variables for national governments and, on the other hand, changes in the level of overall capital mobility, which in general acts as a constraint on public policies. The comparative welfare analysis of the two regime types shows that high capital mobility is a precondition for international policy coordination and suggests the bias towards public budget deficits may be optimal from the point of view of the median voter.

Recently, Broner and Ventura (2010) have challenged the conventional view on the benefits of financial liberalization for developing countries. In a different context, this paper shows that international tax competition can give rise to a generalized fiscal deficit bias and that different levels of financial openness across countries create external imbalances that can magnify this bias. Most importantly, these imbalances arise as a political economy equilibrium, driven by the median voter’s preference for redistribution. Thus, it remains an open question how far can democratically chosen policies reduce such imbalances.
References


9 Appendix

9.1 Derivation of equilibrium policies

From (7) it is clear that the equilibrium portfolio allocations $d_1, d_2, f_1^*$ and $f_2^*$ are functions of both domestic and foreign tax and public debt policies. Using these expressions in
the government budget constraints (12) and (13) to solve for \( \tau_1 \) and \( \tau_2 \) and substituting the resulting expressions in the welfare function (1) yields the government objective function \( V^L(\omega, \omega^*) \) where now \( \omega = \{ \theta_1, \theta_2, b_1 \} \). Taking the first order conditions and imposing symmetry yields, for the home country:

\[
\frac{2\alpha \beta \theta_2}{2\alpha b_1 + \theta_2(\gamma \theta_2 - 2\alpha(1 - \theta_1))} = \frac{2\gamma \theta_1 - \alpha(2 - 4\phi \theta_1)}{2\alpha b_1 + \theta_1(2\alpha - \gamma \theta_1)}; \quad (39)
\]

\[
\frac{2\gamma \theta_2}{2\alpha b_1 + \theta_2(\gamma \theta_2 - 2\alpha(1 - \theta_1))} = \frac{\alpha(2(1 - \theta_1) - 4\phi \theta_2)}{-1}; \quad (40)
\]

\[
\beta = \frac{1}{2\alpha b_1 + \theta_1(2\alpha - \gamma \theta_1)}. \quad (41)
\]

Solving (39)-(41) yields the uncoordinated policy rules (17)-(20). Coordinated policies are obtained by constructing \( V^L(\omega, \omega^*) + V^L(\omega^*, \omega) \) and solving for symmetric policies in a similar manner.

9.2 Proofs

**Proof of Lemma 1:** While the denominator of (20) is positive, the numerator can be rewritten as \((\gamma + 4\alpha \phi)(1 - \beta) - 2\alpha \beta \) which is larger than zero even for \( \phi = 0 \) if \( \gamma > \gamma^S = 2\alpha \beta/(1 - \beta) \). The share of debt in total output, denoted by \( sb^S_1 \) is given by:

\[
sb^S_1 = \frac{b^S_1}{y^S_2} = \frac{\alpha^2(\gamma(1 - \beta) - 2\alpha(\beta - 2\phi(1 - \beta)))}{D},
\]

where

\[
D = 2\gamma^2(1 + \beta) + 2\alpha \gamma(1 + \beta)(2 + \gamma + 4\phi) + 2\alpha^3(\beta + 4\beta \phi + 4(1 + \beta)\phi^2) + \alpha^2(2 + 2\beta + \gamma + 3\beta \gamma + 8\phi(1 + \beta)(1 + \gamma) + 8\phi^2(1 + \beta)).
\]

Since \( D \) is positive, the sign of \( sb^S_1 \) is determined by the same condition. \( \blacksquare \)

**Proof of Proposition 1:** \( \partial \tau^I_1 / \partial \phi = \frac{8\alpha^4 \phi^{\beta^r - 1}}{(1 + \beta)(\alpha + \gamma + 2\alpha \phi)^3} > 0; \partial \theta^S_1 / \partial \phi = -\frac{2\alpha^2}{(\alpha + \gamma + 2\alpha \phi)^2} < 0. \) \( \blacksquare \)

**Proof of Lemma 2:** \( b^C_1 > 0 \iff \gamma - 2\beta(2\alpha + \gamma) > 0 \iff \gamma > \gamma^C = 4\alpha \beta/(1 - 2\beta). \) \( \blacksquare \)

**Proof of Proposition 2:** \( \partial b^S_1 / \partial \phi = \frac{2\alpha^3(1 + \beta - 2(1 - \beta)\phi)}{(1 + \beta)(\alpha + \gamma + 2\alpha \phi)^3}. \) Setting the numerator to zero in the last result, yields \( \hat{\phi} = (1 + \beta)/(2 - 2\beta) \). Using (9), evaluated at the symmetric equilibrium in the definition of output (10), \( \partial B^S_1 / \partial \phi = \partial (b^S_1/(1 + \alpha s_1 - b^S_1)) / \partial \phi = ((1 + \alpha s_1)/(1 + \alpha s_1 - b^S_1)^2) (\partial b^S_1 / \partial \phi) \). Therefore, \( \text{sign}(\partial B^S_1 / \partial \phi) = \text{sign}(\partial b^S_1 / \partial \phi). \) \( \blacksquare \)

**Proof of Proposition 3:**
\[
 lim_{\phi \to 0} b_S^1 = \frac{\alpha(\gamma(1 - \beta) - 2\alpha\beta)}{2(1 + \beta)(\alpha + \gamma)^2} > \frac{\alpha(\gamma - 2\beta(2\alpha + \gamma))}{2(1 + 2\beta)(\alpha + \gamma)^2} = b_C^1,
\]

since the denominator in (24) is smaller than the one in (20) for \(\phi \to 0\), \(2(1+2\beta)(\alpha+\gamma)^2 < 2(1+\beta)(\alpha+\gamma+2\alpha\phi)^2\). Then, \(\gamma(1-\beta) - 2\alpha\beta > \gamma - 2\beta(2\alpha + \gamma) \iff \gamma > -2\alpha\), which holds \(\forall \gamma > 0\). Two more specific statements can also be proved as direct implications of Lemmas 1 and 2.

i) If \(\gamma > \gamma^C > \gamma^S\), uncoordinated policies result in higher public budget deficits than coordinated policies.

ii) If \(\gamma^C > \gamma > \gamma^S\), coordination generates public budget surpluses while uncoordinated policies imply deficits.

Proof of Proposition 4: \(W_S^1 - W_C^1 = 0 \iff \frac{\alpha^2(\alpha+\gamma+4\alpha\phi)}{(1+\beta)(\alpha+\gamma+2\alpha\phi)^2} = x\) where \(x = \frac{2^\frac{\beta}{(1+\beta)}}{(1+2\beta)(\alpha+\gamma)}\). Solving the second order equation in \(\phi\) and observing that its discriminant is between zero and one, the only feasible solution for \(\phi = \frac{z+\alpha\sqrt{2}}{2\alpha(1+\beta)} > 0\) where \(z = \alpha^2 - x(1+\beta)(\alpha + \gamma)\). The latter observation is equivalent to showing \(0 < \alpha^2 \left( 1 - \frac{2^\frac{\beta}{(1+\beta)}}{(1+2\beta)} \right) < 1\) after using the expression for \(x\) in \(z\). First, \(0 < \alpha < 1\). Second, denoting \(f(\beta) = 2^\frac{\beta}{(1+\beta)}\) and \(g(\beta) = \frac{1+2\beta}{1+\beta}\), \(f(0) = g(0) = 1\) and \(f' = \frac{2^\frac{\beta}{(1+\beta)} \log 2}{(1+\beta)^2} > 0\), \(g' = \frac{1}{(1+\beta)^2} > 0\) while \(f' < g' \forall \beta \in (0, 1)\). Thus \(0 < f/g < 1\) and \(0 < 1 - f/g < 1\).

Proof of Proposition 5: A direct result from:
\[
\Delta \theta = \theta - \theta^* = -\frac{2\alpha(\phi - \phi^*)}{\alpha + \gamma + 3\alpha(\phi + \phi^*)}.
\]

Proof of Proposition 6: Imposing \((1-\beta)(\gamma + 2\alpha(\phi + \phi^*)) - 2\alpha\beta > 0\) delivers the first part of the statement. Solving \((1-\beta)(\gamma + 2\alpha(\phi + \phi^*)) - 2\alpha\beta = 0\) for aggregate openness level \(\phi + \phi^*\) yields the second part of the result.

Proof of Proposition 7: If \(\gamma = \phi\),
\[
b_S^1 = \frac{\alpha((1 + 4\alpha)(1-\beta)\phi - 2\alpha\beta)}{2(1+\beta)(\alpha + \phi + 2\alpha\phi)^2} \quad \text{and} \quad b_C^1 = \frac{\alpha(\phi(1 - 2\beta) - 4\alpha\beta)}{2(1 + 2\beta)(\alpha + \phi)^2}
\]

Then \(\partial b_C^1/\partial \phi > 0 \iff \phi(2\beta - 1) + \alpha(1 + 6\beta) > 0\). A sufficient condition for this inequality to hold \(\forall \phi > 0\) is \(\beta > 1/2\).

To show \(b_S^1 > b_C^1\), it suffices to show that \(2(1+\beta)(\alpha + \phi + 2\alpha\phi)^2 < 2(1+2\beta)(\alpha + \phi)^2\) and \(\alpha((1 + 4\alpha)(1-\beta)\phi - 2\alpha\beta) > \alpha(\phi(1 - 2\beta) - 4\alpha\beta)\). The former inequality is rewritten
as
\[
\left(\frac{1 + \beta}{1 + 2\beta}\right)^{1/2} < \frac{\alpha + \phi}{\alpha + \phi + 2\alpha \phi}.
\]

The right hand side of this is decreasing in \(\phi\), reaching a maximum of 1 at \(\phi = 0\) and a minimum of \(1/(2\alpha + 1)\) for \(\phi \to \infty\). Thus a sufficient condition is \(\alpha < \frac{1}{2} \left(\left(\frac{1+2\beta}{1+\beta}\right)^{1/2} - 1\right)\).

The latter inequality can be rewritten as \(\phi((1 - \beta)(1 + 4\alpha) - (1 - 2\beta)) > -2\alpha\beta\) and since \(\phi \geq 0\), it holds for all \(\alpha > 0\) assuming \(\beta > 1/2\).}

\[9.3\] Capital mobility increases the cost of taxing capital income

The previous analysis revealed that \(\phi\), the international capital mobility parameter and \(\gamma\), the parameter on the capital tax deadweight loss play similar roles in increasing the tax elasticity of the domestic capital. While this paper focuses on the effects of changing \(\phi\) at given levels of \(\gamma\), it is nonetheless interesting to analyze the case when \(\gamma\) moves in the same direction with \(\phi\). This makes sense as higher capital mobility is likely to make tax evasion easier.

**Proposition 7.** Assume \(\gamma = \phi\). If \(\beta > 1/2\), higher international capital mobility generates lower public budget surpluses under coordinated policies: \(\partial b^C_1/\partial \phi > 0\), \(\forall \phi > 0\). Moreover, if \(\alpha < \frac{1}{2} \left(\left(\frac{1+2\beta}{1+\beta}\right)^{1/2} - 1\right)\), \(b^S_1 > b^C_1\).

In this scenario, financial development affects both the investment costs of private agents and the tax collection costs faced by the government. Proposition 2 demonstrated a deficit bias in the case of uncoordinated policies. The last result implies a deficit bias, in the sense of lower surpluses, can arise due to increased capital mobility, even under policy coordination, at \textit{any} level of \(\phi\). The sufficient conditions require a relatively patient median voter and a relatively low capital supply.

\[9.4\] The case of multiple countries

In this section, I extend model to the case of \(n\) symmetric countries.

Denote with \(f^i_t\) the investment of a domestic agent in country \(i\). Assuming each country entails a separate transaction cost \(T(f^i_t)\), the income of a domestic \(K\) agent becomes:

\[
I_t = d_t (r - \theta_t) + \sum_{i=1}^{n-1} (f^i_t (r - \theta^i_t) - T(f^i_t)),
\]

where \(d_t + \sum_{i=1}^{n-1} f^i_t = a_{t-1},\ f^i_t \geq 0\) for \(t = 1, 2\) and \(i = \{1, 2, \ldots, n-1\}\).
Assuming symmetric foreign countries i.e. \( \theta_i^* = \theta_i^* \) yields \( f_i^* \) allocations identical to those in the two country case. Equation (42) becomes:

\[
I_t = a_{t-1}(r - \theta_t) + (n - 1)\frac{\phi(\theta_t - \theta_t^*)^2}{2}.
\]

The government budget constraints become:

\[
g = \tau_1 + \theta_1 \alpha(d_1 + (n - 1)f_1^*) + b_1 - D(\theta_1) \quad (43)
g = \tau_2 + \theta_2 \alpha(d_2 + (n - 1)f_2^*) - b_1 r - D(\theta_2). \quad (44)
\]

The corresponding policies under tax competition are:

\[
\tau_1^S = 1 - \frac{\alpha^2(\alpha + \gamma + 2n\alpha\phi)}{(1 + \beta)(\alpha + \gamma + n\alpha\phi)^2}, \quad (45)
\]

\[
\tau_2^S = 1 - \frac{\alpha^2\beta(\alpha + \gamma + 2n\alpha\phi)}{(1 + \beta)(\alpha + \gamma + 2n\alpha\phi)^2}, \quad (46)
\]

\[
\theta_1^S = \theta_2^S = \frac{\alpha}{\alpha + \gamma + n\alpha \phi}, \quad (47)
\]

\[
b_1^S = \frac{\alpha^2(\gamma(1 - \beta) - 2\alpha(\beta - n\phi(1 - \beta)))}{2(1 + \beta)(\alpha + \gamma + n\alpha\phi)^2}. \quad (48)
\]

Inspection of (45)-(48) reveals that in this framework market size \( n \) and the degree of financial openness \( \phi \) play similar roles with respect to the fiscal policy choices.

Consider the capital mobility threshold \( \phi^* \), derived in Proposition 2, below which public debt increases with financial openness. In the case of \( n \) countries, it becomes \( \phi^*(n) = (1 + \beta)/(n(1 - \beta)) \). Interestingly, if higher capital mobility (an increase in \( \phi \)) can be achieved only by reducing the geographical scope of economic integration \( n \), (e.g. the Euro-zone countries within the European Union), public budget deficits can increase further with \( \phi \) since \( \partial \phi^*/\partial n < 0 \).