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## The remedy may be worse than the disease

A critical account of The Code of Conduct

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## Abstract

The Code of Conduct for business taxation may, diametrically opposed to its intention, aggravate tax competition between EU Member States. The reason is that it induces, by restricting harmful tax practices, cuts in generic tax rates that may reduce tax revenue even further. If one presupposes a benevolent utility maximising government, then this worsens the underprovision of public goods. We show within a standard tax competition framework that this scenario is more likely to unfold with a higher upper bound for nondistortionary taxes, a higher responsiveness of mobile capital to tax rate differentials, and a smaller endowment of internationally mobile capital.

# 1 Introduction

Tax authorities of EU Member States bid against each other in an attempt to attract internationally footloose business activity. They design tax measures that often conspicuously favor certain types of highly mobile capital. Many believe that these measures are the upshot for a tax race to the bottom that erodes public good provision. Indeed, the threat of such a race has prompted the European Union to adopt a Code of Conduct for business taxation (Council of the European Communities, 1998). It defines harmful tax practices as measures that: (1) "affect, or may affect, in a significant way the location of business activity in the Community"; (2) "provide for a significantly lower effective level of taxation, including zero taxation, than those levels that generally apply in the Member State in question." The Code adds: "Member States commit themselves not to introduce new measures which are harmful within the meaning of this code", and "Member States commit themselves to re-examining their existing laws and established practices" (Council of the European Union, 1999, pp. 2-3). In short, the Code rules out preferential tax measures.

A working group, chaired by the British paymaster general Dawn Primarolo, blacklisted 66 harmful tax practices in the European Union. Table 1.1 lists these practices. They include for example the reduced corporate income tax rate for royalty income in France, the generous provision for reinsurance companies in Luxembourg, and the reduced tax base for co-ordination centers in Belgium. Other salient practices are the Dutch advance ruling on the applicability of the participation exemption and the Irish ten percent corporate income tax rate for manufacturing companies. The common denominator of these tax measures is their focus on highly mobile business activity: a multinational can shift the holding of a patent right with its corresponding inflow of royalties relatively easily between subsidiaries; the same holds true for reinsurance and other intra group services of co-ordination centers. This focus makes sense from the perspective of an individual Member State: it can, by targeting its tax policy, engage in tax competition without having to overhaul its entire tax system. The Code of Conduct intends to curb this kind of competitive behavior.

Some Member States appear to compete more aggressively than others. The United Kingdom accounts for as many as nineteen harmful tax practices, while Sweden goes scot-free. If one excludes, however, overseas territories such as the British Virgin Islands, then the Netherlands top the list with ten practices, followed by Ireland with five. These numbers give only an indication of a Member State's toughness in tax competition. The size of the capital flows induced by these practices is more important. Nevertheless, as this size is unknown, the debate concentrates on the numbers of practices. Therefore, the Netherlands and Ireland are under considerable political pressure from their peers. They have to scrap, or at least to amend, their harmful tax practices. There are signs that the Code is effective: the Netherlands brings its advance rulings system under discussion, while Ireland discards its ten percent corporate

**Table 1.1 Harmful tax practices**

| | i | ii | iii | iv | v | vi | total |
|---|---|---|---|---|---|---|---|
| Austria | | | | 2 | | | 2 |
| Belgium | | | 4 | | | 1 | 5 |
| Denmark | | | | 1 | | | 1 |
| Finland | | 1 | | | | | 1 |
| France | 1 | | 1 | | | 2 | 4 |
| Germany | | | 1 | | | | 1 |
| Greece | | | | | 1 | | 1 |
| Ireland | 2 | | | 1 | | 2 | 5 |
| Italy | 1 | | | | | | 1 |
| Luxembourg | 2 | 1 | 1 | 1 | | | 5 |
| The Netherlands[a] | 4 | 2 | 4 | 1 | 3 | 3 | 17 |
| Portugal[b] | 1 | | | | | | 1 |
| Spain | | | 2 | | | 1 | 3 |
| Sweden | | | | | | | 0 |
| The United Kingdom[c] | 4 | 6 | | 1 | 8 | | 19 |
| Total | 15 | 10 | 13 | 7 | 12 | 9 | 66 |

i: financial services to third parties, group financing, royalty payments
ii: insurance, reinsurance, captive insurance
iii: intra group services
iv: holding companies
v: exempt and offshore companies
vi: miscellaneous

[a] including the Netherlands Antilles and Aruba

[b] including Madeira and the Azores

[c] including Gibraltar, Guernsey, Jersey, the British Virgin islands, and the Isle of Man

income tax rate for manufacturing companies. In both Member States there is, however, downward pressure on the generic corporate income tax rate. In the Netherlands, the 'Van Rooy' committee (Studiegroep vennootschapsbelasting in internationaal perspectief, 2001) advised the government to reduce its rate from 35 to 30 percent, while Ireland is already committed to phase down its rate from 24.5 to 12.5 percent.

The coincidence of these developments is most probably intentional. If the Code of Conduct rules out preferential tax measures, then tax competition with the generic tax rate may become a viable strategy. In that case the Code of Conduct may aggravate tax competition because it extends the tax race to the bottom to all business activity. Tax jurists were among the first to put this idea forward (Ellis, 1999, 2000). Does it also stand up to formal economic reasoning? Keen (2001), and Janeba and Smart (2001) put it to the test in models of tax competition and tax coordination. Keen finds, under somewhat strict assumptions, that a Code of Conduct always reduces tax revenue. Janeba and Smart find, in a more general framework, that it does so under certain conditions. Indeed, both papers lend support to the idea that the Code of Conduct may set the cart before the horse. Two aspects remain to be settled. First, both Keen, and Janeba and Smart directly relate tax bases to tax rates. This considerably simplifies the structure of their models. It does, however, obscure the economic behavior underlying these relations. Second, since the relation between tax bases and tax rates lacks a micro foundation, it is impossible to impute a government objective other than tax maximisation. This is consistent with the Leviathan government that emerges from much of the public choice literature. It does, however, beg the question why tax competition is a problem in the first place. To put it differently, if national governments are opportunistic tax maximisers, then why would a supra-national body be interested in safeguarding their capacity to raise tax revenue? Therefore, to assume utility maximisation comes naturally in the present context.

We address both aspects by featuring a representative agent. It allows us to simultaneously provide the micro foundation and assume utility maximisation. We find, in accordance with Keen and Janeba and Smart, that the Code of Conduct may aggravate tax competition. Thus, our analysis is to be interpreted as a strengthening of their findings. We build the basic model in chapter 2, establish an optimal taxation benchmark in chapter 3, and consider unconstrained tax competition in chapter 4. We also find underprovision of public goods. This provides the rationale for intervention by a supra-national body such as the European Union. We consider constrained tax maximisation in chapter 5. In particular, we model the Code of Conduct as an additional restriction on the strategy space of individual governments: they must set equal tax rates on distinct types of capital. We show in chapter 6 that this restriction reduces tax revenue -and thus aggravates underprovision of public goods- if a certain condition is satisfied. It tells us that a perverse outcome of this form of tax coordination is more likely to materialise if the upper bound on non-distortionary taxes are high, if mobile capital is responsive to tax rate differentials, and if the endowment of mobile capital is small. We explore a tax maximisation in chapter 7. It

turns out that in such a world the Code of Conduct reduces tax revenue if and only if exactly the same condition is satisfied. This shows that the result is robust to changes in government behavior. It also shows that the results are comparable, albeit not exactly equal, to those of Keen and Janeba and Smart. We conclude in chapter 8, and prove, finally, the existence and uniqueness of the equilibria in the appendix.

# 2 The model

We assume a world of two identical countries. They each produce a homogeneous good, by employing mobile and immobile capital. In addition, they each finance the provision of a national public good by levying a source-based tax on either type capital. Since taxation involves a positive externality -it drives mobile capital abroad, thereby increasing foreign tax bases- tax rates tend to be too low from a world perspective.

## 2.1 Endowments and technology

Each resident country is endowed with one unit of immobile capital, and $K$ units of mobile capital. Immobile capital is to be supplied on the national capital market, whereas mobile capital may be supplied anywhere. One should think of immobile capital as linked to normal business activity, while mobile capital as linked to the "highly mobile" business activity that Member States attempt to attract by their harmful tax practices. Since both countries are symmetrical, and since the world supply of mobile capital is fixed, it is true that

$$\frac{1}{2}k_1 + \frac{1}{2}k_2 = K \tag{2.1}$$

where $k_i$ denotes the amount of mobile capital per capita invested in country $i$, and the factors $\frac{1}{2}$ refer to the relative size of either country.

Each type of capital is an imperfectly substitutable input for the production of homogeneous national products. We follow Bucovetsky (1991) in assuming that the underlying technology can be summarised by a quadratic production function

$$f(k_i) = (a - bk_i)\,k_i \tag{2.2}$$

where $f(k_i)$ denotes national product per capita in country $i$, and $a$ and $b$ are positive parameters. This makes the model tractable while it preserves desired production function properties such as concavity in inputs and continuous differentiability.

## 2.2 Capital markets

Capital arbitrage equalises net rates of return to mobile capital across countries. Furthermore, perfect competition equalises these rates to the marginal productivity of mobile capital. Thus, the capital market equilibrium is characterised by

$$r = a - 2bk_i - t_i \tag{2.3}$$

where the 'interest rate' $r$ denotes the net return to mobile capital, and $t_i$ the tax rate on the return to mobile capital invested in country $i$.

Solving for $k_i$ yields

$$k_i = K + \frac{1}{4b}\left(t_j - t_i\right) \tag{2.4}$$

and for $r$

$$r = a - 2bK - \frac{1}{2}(t_1 + t_2) \tag{2.5}$$

We assume that $a$ is large enough such that the interest rate is nonnegative, in and out of equilibrium. In particular, we assume [1]

$$a - 4bK - 1 \geq 0 \tag{2.6}$$

Since immobile capital is a fixed factor, its remuneration equals whatever remains of national product after the return to mobile capital and taxes have been paid. Thus,

$$\rho_i = bk_i^2 - \tau_i \tag{2.7}$$

where $\rho_i$ denotes the net rate of return to immobile capital in country $i$, and $\tau_i$ the corresponding tax rate. One arrives at this expression by subtracting from the per capita national product $f(k_i)$, the per capita return to mobile capital $\frac{\partial f(k_i)}{\partial k_i} k_i$, and the tax rate $\tau_i$. Substituting $k_i$ yields

$$\rho_i = b\left(K + \frac{1}{4b}\left(t_j - t_i\right)\right)^2 - \tau_i \tag{2.8}$$

However crude, the model is capable of mimicking some important aspects of international capital markets. First, equation (2.5) says that an increase in either tax rate decreases the interest rate. This is of course a corollary of defining the interest rate as the net rate of return to mobile capital. Second, equation (2.4) says increasing one's own tax rate drives mobile capital abroad. Similarly, an increase of the other country's tax rate attracts mobile capital from abroad. The backstop to these international capital movements are decreasing return to scale: a capital exporting country experiences an increase of the gross rate of return; a capital importing country experiences the reverse. This process continues until a capital market equilibrium will have been established. The importance of decreasing returns to scale is reflected by the fact that capital flight, for a given change in tax rates, decreases in the parameter $b$. This parameter can therefore be interpreted as the (reciprocal) responsiveness of mobile capital to tax rate differentials.

## 2.3 Public and private goods

Governments put tax revenue to use by producing public goods according to a 'one to one' technology. This implies

$$g_i = \tau_i + t_i k_i \tag{2.9}$$

[1] Note that the lowest possible interest rate materialises if all mobile capital is invested in a country that levies a 100 tax rate. Substituting $k_i = 2K$ and $t_i = 1$, and imposing $r \geq 0$ yields the inequality restriction. It also ensures that investment will never be wasteful, i.e. that the economies will always be on the increasing part of the production function.

where $g_i$ denotes per capita public good provision in country $i$. By substituting $k_i$ we get

$$g_i = t_i \left( K + \frac{1}{4b} \left( t_j - t_i \right) \right) + \tau_i \tag{2.10}$$

Note that increasing the tax rate on internationally mobile capital leads to a less than proportional increase (or even a decrease) in public good provision due to capital flight. Taxing immobile capital is therefore more efficient.

Residents spend their net income on private goods, thus

$$x_i = \rho_i + rK \tag{2.11}$$

Substituting $\rho_i$ and $k_i$ yields

$$x_i = b \left( K + \frac{1}{4b} \left( t_j - t_i \right) \right)^2 - \tau_i + \left( a - 2bK - \frac{1}{2} \left( t_i + t_j \right) \right) K \tag{2.12}$$

On a world scale private good consumption is simply total production minus public good consumption. However, on a national scale this is not necessarily true. The reason is that residents receive foreign source income, and that absentee capital must be paid. If a country is a net exporter of mobile capital then private consumption exceeds the difference between national product and public good consumption; similarly, if a country is a net importer the reverse holds true. Which situation prevails depends of course on the constellation of tax rates on mobile capital.

## 2.4 Preferences and the government objective

We follow Cremer and Gahvari (2000) in assuming that residents' preferences can be summarised by a semi-log utility function

$$u(g_i, x_i) = x_i + \alpha \ln g_i \tag{2.13}$$

where $\alpha$ is a parameter between 0 and 1 that measures the preference for public relative to private good consumption. This function allows us to derive a closed form solution while it preserves a decreasing marginal rate of substitution.

Each government maximises the utility of its own residents. It does so by strategically setting a pair of tax rates $(t_i, \tau_i)$ such as to ensure an optimal mix of public and private goods. We impose, however, a restriction on $\tau_i$:

$$\tau_i \leq \overline{\tau} < \alpha < \overline{\tau} + \overline{\tau} K \tag{2.14}$$

The three constituent inequalities of the restriction have a natural interpretation: the first inequality $\tau_i \leq \overline{\tau}$ says that there is an upper bound to the tax rate on immobile capital; the second inequality $\overline{\tau} < \alpha$ ensures that this upper bound is low enough to force governments to raise at

least some revenue by taxing mobile capital, and thus to engage in tax competition; the third inequality $\alpha < \overline{\tau} + \overline{\tau}K$ implies, finally, that the preference for public goods is not so strong that governments cannot raise sufficient revenue to finance the desired amount of public goods, even if they tax both types of capital maximally.

# 3 The global optimum

Before delving into tax competition and the Code of Conduct, it is useful to look at optimal taxation. This provides a benchmark by which to measure taxation under two distinct regimes: one in which both governments are unconstrained in setting their tax rates, of course within the confounds of restriction (2.14), and another in which they are subject to the Code of Conduct that rules out harmful tax practices. We arrive at the following result:

**Proposition 1** *Any set of tax rates that satisfies $g_i = \alpha$ and $t_i = t_j$ maximises global welfare, defined as the sum of the utilities of the residents of both countries.*

**Proof.** The maximisation problem of a benevolent supranational body with the discretion to set all tax rates is

$$\max_{t_1,t_2,\tau_1,\tau_2} u_1(t_1,t_2,\tau_1) + u_2(t_2,t_1,\tau_2)$$

From equation (2.13) follows that the first order condition [1] for a maximum is

$$\frac{\partial x_i}{\partial v_i} + \alpha \frac{\partial g_i}{\partial v_i} g_i^{-1} + \frac{\partial x_j}{\partial v_i} + \alpha \frac{\partial g_j}{\partial v_i} g_j^{-1} = 0 \qquad v_i = t_i, \tau_i, \quad i = 1,2$$

Equations (2.9) and (2.11) yield the partial derivatives

$$\frac{\partial g_i}{\partial t_i} = K + \frac{t_j - 2t_i}{4b}, \frac{\partial g_i}{\partial \tau_i} = 1, \frac{\partial g_i}{\partial t_j} = \frac{t_i}{4b}, \frac{\partial g_i}{\partial \tau_i} = 0$$

and

$$\frac{\partial x_i}{\partial t_i} = -K - \frac{t_j - t_i}{8b}, \frac{\partial x_i}{\partial \tau_i} = -1, \frac{\partial x_i}{\partial t_j} = \frac{t_j - t_i}{8b}, \frac{\partial x_i}{\partial \tau_i} = 0$$

substituting these reduces the first order condition to the set of equations

$$\begin{aligned} \frac{\alpha}{g_i} &= 1 \\ \frac{t_j - t_i}{4b} &= 0 \end{aligned}$$

which holds if

$$g_i = \alpha$$

and

$$t_i = t_j$$

■

[1] The second order condition will also be satisfied (see the appendix).

The result can be understood as follows: equality of tax rates on mobile capital ensures, by equation (2.4), that neither country is a net capital importer or exporter. This implies that world production is at its maximum. Furthermore, optimal public good provision should depend on the preference for public goods. The condition here is particularly simple: optimal public good provision equals the preference parameter $\alpha$. Thus, both total production and the mix of public and private goods are optimal. Effectively, the supranational body sets world-wide tax on mobile capital that acts like an efficient lump sum tax since the overall supply of capital is exogenously fixed.

# 4 Laissez faire

We first consider a 'laissez faire' regime in which governments are unconstrained in setting tax rates on mobile and immobile capital. This regime likens the European situation before the adoption of the Code of Conduct: apart from a few directives on international double taxation of dividends and royalties, there was no tax coordination in that era. We find

**Proposition 2** *The Nash equilibrium tax rates equal* $\tau_i^l = \overline{\tau}$ *and* $t_i^l = \frac{4bK(\alpha-\overline{\tau})}{4bK^2+\alpha}$ *where the index l refers to the laissez faire regime. The tax rate on mobile capital is relatively low since* $t_i^l < \tau_i^l$*, and there is underprovision of public goods as* $g_i^l < \alpha$*.*

**Proof.** The maximisation problem of government *i* is

$$\max_{\tau_i,t_i} u_i(t_i,t_j,\tau_i) = bk_i^2 - \tau_i + rK + \alpha \ln(\tau_i + t_i k_i)$$

$$st \quad \begin{cases} \tau_i \leq \overline{\tau} & (i) \\ t_i \leq 1 & (ii) \end{cases}$$

In order to avoid notational clutter we have omitted the index *l*. The interesting regime is when constraint (i) is binding. The problem can then be re-expressed as

$$\max_{t_i} u_i(t_i,t_j,\overline{\tau}) = bk_i^2 - \overline{\tau} + rK + \alpha \ln(\overline{\tau} + t_i k_i)$$

where we omit constraint (ii) and verify ex post that it holds. The first order condition with respect to $t_i$ is

$$\frac{\alpha}{\overline{\tau} + t_i\left(K + \frac{t_j - t_i}{4b}\right)}\left(-\frac{t_i}{4b} + K + \frac{t_j - t_i}{4b}\right) - K - \frac{t_j - t_i}{8b} = 0$$

which is the best response function of government *i*. Imposing symmetry yields the Nash equilibrium tax rate

$$t_i^l = \frac{4bK(\alpha - \overline{\tau})}{4bK^2 + \alpha}$$

The smallest possible difference $\overline{\tau} - t_i^l$ is, by the fact that $t_i^l$ increases in $\alpha$ and by inequality (2.14), equal to

$$\lim_{\alpha \downarrow \overline{\tau} + \overline{\tau}K} \overline{\tau} - t_i^l = \frac{(K+1)\overline{\tau}^2}{4bK^2 + \alpha}$$

This implies

$$t_i^l < \overline{\tau}$$

as well as that constraint (ii) holds. The Nash equilibrium public good provision equals

$$g_i^l = \overline{\tau} + \frac{4bK^2(\alpha - \overline{\tau})}{4bK^2 + \alpha}$$

Finally, inequality (2.14) implies

$$g_i^l < \alpha$$

■

The intuition behind the result is that governments set the highest possible tax rate on immobile capital. They do this to minimise the excess burden of taxation, i.e. to minimise capital flight. Nevertheless, the demand for public goods, in conjunction with the upper bound on non-distortionary taxes, forces governments to tax mobile capital. Tax competition prompts them, however, to set tax rates that are relatively low. Note that this qualifies as a harmful tax practice as defined by the Code of Conduct working group: the lower tax rate both "may affect the location of business activity", and "provides for a lower level of taxation than those levels that generally apply." The stronger is the preference for public goods, the more governments are inclined to set a high tax rate on mobile capital, ceteris paribus. Unfortunately, the higher tax rate never catches up with the stronger preference: there always will be underprovision of public goods. This is, of course, in line with the main finding from the tax competition literature[1].

[1] For a survey of this literature see Wilson (1999).

# 5 Primarolo

In this chapter we consider a regime in which the strategy space of individual governments is constrained. In particular, within their own country they must set the same tax rate on mobile and immobile capital; between countries tax rates may differ. Thus

$$t_i = \tau_i \tag{5.1}$$

This constraint captures the thrust of the Code of Conduct which rules out preferential regimes but leaves national sovereignty in tax matters untouched. For this reason we dub this regime 'Primarolo', after the chairwoman of the Code of Conduct working group. We arrive at the following result:

**Proposition 3** *The Nash equilibrium tax rate equals* $t_i^p = \frac{4b(K+1)\alpha}{4b(K+1)^2+\alpha}$ *where the index p refers to the Primarolo regime. It lies in between the tax rates on mobile and immobile capital under the laissez faire regime, i.e.* $t_i^l < t_i^p < \tau_i^l$ *and implies underprovision of public goods as the inequality* $g_i^p < \alpha$ *remains to hold true.*

**Proof.** The maximisation problem of government *i* is

$$\max_{\tau_i, t_i} u_i(t_i, t_j, \tau_i) = bk_i^2 - \tau_i + rK + \alpha \ln(\tau_i + t_i k_i)$$

$$st \quad \begin{cases} \tau_i \leq \overline{\tau} & (i) \\ t_i \leq 1 & (ii) \\ t_i = \tau_i & (iii) \end{cases}$$

We solve the problem by substituting constraint (iii) in the maximand [1]. We verify ex post that constraints (i) and (ii) hold. The first order condition, to be interpreted as the best response function of government *i* then becomes

$$\frac{\alpha}{t_i + t_i\left(K + \frac{t_j - t_i}{4b}\right)}\left(1 + \frac{t_i}{4b} + K + \frac{t_j - t_i}{4b}\right) - K - \frac{t_j - t_i}{8b} - 1 = 0$$

Imposing symmetry gives the Nash equilibrium tax rate

$$t_i^p = \tau_i^p = \frac{4b(K+1)\alpha}{4b(K+1)^2 + \alpha}$$

Since $0 < \alpha < 1$ it is true that

$$4b(K+1)\alpha < 4b(K+1) \leq 4b(K+1)^2 < 4b(K+1)^2 + \alpha$$

which implies that constraint (ii) holds. Furthermore, the difference

$$\overline{\tau} - \tau_i^p = \frac{4b(K+1)(\overline{\tau} + \overline{\tau}K - \alpha) + \alpha\overline{\tau}}{4b(K+1)^2 + \alpha}$$

[1] This is harmless since there are no cross terms between $t_i$ and $\tau_i$.

is strictly positive by inequality (2.14), which implies that constraint (i) is also holds. The difference

$$t_i^p - t_i^l = \frac{4b(K+1)\alpha}{4b(K+1)^2+\alpha} - \frac{4bK(\alpha-\overline{\tau})}{4bK^2+\alpha}$$

can be rewritten into

$$t_i^p - t_i^l = 4b\frac{\alpha^2+\alpha K\overline{\tau}-4bK(K+1)((K+1)\overline{\tau}-\alpha)}{(4bK^2+\alpha)\left(4b(K+1)^2+\alpha\right)}$$

Since constraint (i) is not binding we know that

$$4b(K+1)((K+1)\overline{\tau}-\alpha) > -\alpha\overline{\tau}$$

This in turn implies that

$$t_i^p - t_i^l \geq \alpha(\alpha-\overline{\tau}) + \alpha K\overline{\tau}$$

which is by inequality (2.14) strictly positive. Hence, we have

$$t_i^l < t_i^p < \tau_i^l$$

Finally, substituting $t_i^p$ yields

$$g_i^p = \frac{4b(K+1)^2\alpha}{4b(K+1)^2+\alpha}$$

dividing by $\alpha$ reveals that

$$g_i^p < \alpha$$

■

We suggested in the introduction that the Code of Conduct has two opposing effects: it alleviates underprovision of public goods because it prompts governments to raise tax rates on mobile capital; it also aggravates, however, underprovision because it prompts governments to lower tax rates on immobile capital. The result shows that both effects are present: the Nash equilibrium tax rate under the Primarolo regime lies in between the tax rates on mobile and immobile capital under the laissez faire regime. Since the Code of Conduct never entirely solves underprovision of public goods remains it remains a second best form of tax coordination.

## 6 When does the Code of Conduct fail?

One cannot be certain about whether the Code of Conduct aggravates or alleviates underprovision of public goods. Either outcome may prevail, depending on whether the downward pressure on the tax rate on immobile capital, or the upward pressure on the tax rate on mobile capital dominates. The model does allow the derivation of a condition that constitutes the borderline between failure and success. We find:

**Proposition 4** *The Code of Conduct aggravates underprovision of public goods if the negative effect on government revenue of a lower tax on immobile capital outweighs the positive effect of a higher tax rate on mobile capital. A sufficient condition for this to hold true is* $4b(2K+1)-\overline{\tau}\leq 0$

**Proof.** In equilibrium all capital is invested, and there is no net capital import or export. Thus private good consumption equals

$$x_i = f(K) - g_i$$

and utility

$$u_i = f(K) - g_i + \alpha \ln g_i$$

It follows that

$$u_i^p - u_i^l < 0 \Longleftrightarrow g_i^p - g_i^l < 0$$

In other words, the Code of Conduct decreases utility if and only if it decreases revenue and thus public good provision. The change in public good provision is

$$g_i^p - g_i^l = \frac{4b(K+1)^2\alpha}{4b(K+1)+\alpha} - \overline{\tau} - \frac{4bK^2(\alpha-\overline{\tau})}{4bK^2+\alpha}$$

Bringing terms on a common denominator yields

$$g_i^p - g_i^l = \frac{4b(K+1)^2\alpha A - \overline{\tau}AB - 4bK^2(\alpha-\overline{\tau})B}{AB}$$

where $A = 4b(K+1)^2+\alpha$ and $B = 4bK^2+\alpha$. Since $A$ and $B$ are strictly positive, public good provision decreases if the nominator is negative. This holds true if

$$A(\alpha-\overline{\tau}) - B\alpha < 0$$

where we have used the notion that $4b(K+1)^2 = A - B\alpha$ and $B - 4bK^2 = \alpha$ to simplify the expression. Substituting $A$ and $B$ yields

$$\alpha(4b(2K+1)-\overline{\tau}) - \overline{\tau}4b(K+1)^2 < 0$$

The second term on the left hand side is strictly negative. Thus for the inequality to hold it is sufficient that

$$4b(2K+1) - \overline{\tau} \leq 0$$

■

The result reveals that the likelihood of a perverse outcome of the Code of Conduct depends on political institutions that determine the upper bound on the tax rate on immobile capital $\overline{\tau}$, the (reciprocal) responsiveness of mobile capital to tax rate differentials $b$, and the endowment of mobile capital $K$. The intuition behind the result is not immediately obvious. Why would, for example, a relatively high upper bound on the tax rate on immobile capital (a high $\overline{\tau}$) increase the likelihood of failure?

The answer is that the bulk of the public goods can be financed by nondistortionary taxes on mobile capital, a state of affairs that comes close to first best taxation. The Code of Conduct, which is only second best, is then more likely to aggravate underprovision of public goods.

A high responsiveness of mobile capital to tax rate differentials (a low $b$) also increases the likelihood of failure. At first glance it seems it should work in the opposite direction. After all, it makes tax competition for mobile capital fierce, suggesting a potentially positive role for a Code of Conduct. Note, however, that a high responsiveness also undermines the benefit of a Code of Conduct: just as it prompts governments to set low tax rates on mobile capital in the laissez faire regime, it prompts governments to set a low generic tax rate under the Primarolo regime. What the condition tells us is that the loss of tax revenue under the latter regime is larger.

Finally, a low endowment of mobile capital (a low $K$) also makes failure more likely. Admittedly, a small 'mass' of mobile capital implies that the corresponding tax rate is volatile. It seems, therefore, that the Code of Conduct should be successful in raising it. A low K would then make failure less, rather than more likely. The flip side of the coin is, however, that a small mass of mobile capital implies that even a large increase of the corresponding tax rate has only a small impact on tax revenue. The condition tells us is that the narrowness of the tax base is more important than the volatility of the tax rate.

In short, a consistent policy maker cannot believe that the business activities to which harmful tax practices correspond are highly mobile, or constitute an insignificant part of the economy, and simultaneously support of the Code of Conduct.

# 7 A different government objective

In this chapter we assume that governments maximise tax revenue. This allows us to check whether the results are sensitive to changes in government behavior as well as to make a better comparison with the results of Keen (2001) and Janeba and Smart (2001). By ignoring the terms referring to $x_i$ in the objective functions we arrive at the equilibrium tax rates under the laissez faire and Primarolo regimes: $t_i^l = 4bK$ and $t_i^p = 4b(K+1)$. The corresponding tax revenues equal $g_i^l = 4bK^2 + \overline{\tau}$ and $g_i^p = 4b(K+1)^2$, and the increase in tax revenue is $g_i^p - g_i^l = 4b(2K+1) - \overline{\tau}$. Thus, the condition for the Code of Conduct to aggravate tax competition is

$$4b(2K+1) - \overline{\tau} \leq 0 \tag{7.1}$$

This condition is identical to the one we obtained under utility maximisation. Here it is, however, necessary and sufficient whereas before it was sufficient but not necessary, hence

**Proposition 5** *If the Code of Conduct alleviates tax competition under utility maximisation, then it also does so under tax maximisation. The reverse is, however, not necessarily true.*

In short, the impact of the Code of Conduct is similar under both types of government behavior: it aggravates tax competition under exactly the same condition on the model parameters. This constitutes a slight departure from Keen (2001). He finds that the Code of Conduct *always* aggravates tax competition. It seems more in accordance with Janeba and Smart (2001): they find, just as we do, that it only does so under certain conditions. The conditionality in their model depends, however, on the endogenousness of the total supply of capital. In any event, the message that their papers as well as ours bring across is that there are good reasons to doubt the Code of Conduct helps to solve tax competition.

# 8 Conclusion

The Code of Conduct working group appears to evade the dilemma of tax coordination versus national sovereignty. It restricts preferential tax measures for internationally footloose business activity, while it allows governments to decide upon their generic tax systems. Unfortunately, there is no guarantee that the Code alleviates tax competition. In fact, it may put the cart before the horse by prompting governments to compete with their generic tax rates.

This suggests that the dilemma is inevitable: curbing tax competition requires the sacrifice of sovereignty. In particular, this suggests that safeguarding tax revenue requires that the EU should look more closely into further reaching forms of tax coordination instead of pressing on with the recommendations of the Code of Conduct working group. We do not wish, however, to stress this conclusion as there are a few caveats.

The first is related to one's view of the government. It may, contrary to what the model presupposes, fail to maximise the utility of their residents, for example because it is interested in tax revenue for its own sake, or because it allows slack in the provision of public goods. In that case tax competition fulfills the useful purpose of disciplining the government. Clearly, the conclusion above can then not be drawn. Among political scientists and economists there is, however, no consensus on the nature of the government. Thus, for the time being one's view remains the result of personal opinion and political convictions about which we have little to say.

The second caveat has to do with the focus of the model. In line with the policy debate it highlights the impact of tax competition and tax coordination on tax revenue. This implies, however, that important issues, such as the impact of tax competition and tax coordination on the allocation of capital over countries and industries, or the impact on the accumulation of capital and growth, disappear from sight. This focus is necessary: without it the model would become intractable. Nevertheless, it does imply that the results are of partial nature: they only highlight one aspect of the problem.

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## Appendix. Existence and uniqueness of the equilibria

In the equilibrium of the benevolent social planner the following expressions hold

$$\frac{\partial^2 U_i}{\partial t_i^2} = -\frac{3}{8b} - \frac{K^2}{\alpha} < 0$$

$$\frac{\partial^2 U_i}{\partial \tau_i^2} = -\frac{1}{\alpha} < 0$$

$$\frac{\partial^2 U_i}{\partial t_i \partial \tau_i} \frac{\partial^2 U_i}{\partial \tau_i \partial t_i} = -\frac{K}{\alpha}$$

$$\frac{\partial^2 U_i}{\partial t_i^2} \frac{\partial^2 U_i}{\partial \tau_i^2} - \frac{\partial^2 U_i}{\partial t_i \partial \tau_i} \frac{\partial^2 U_i}{\partial \tau_i \partial t_i} = \frac{3}{8b\alpha} > 0$$

which implies that Hessian matrix of the objective function is negative definite and thus that the second order condition for a maximum are satisfied.

Under the laissez faire regime it is true that

$$\frac{\partial^2 U_i}{\partial t_i^2} = -\frac{K\left(4bK^2 + \alpha\right)}{\alpha\left(4bK^2 + \overline{\tau}\right)} < 0$$

and under the Primarolo that

$$\frac{\partial^2 U_i}{\partial t_i^2} = \frac{\partial^2 U_i}{\partial \tau_i^2} = -\frac{K^2 + 1}{\alpha} - \frac{3b\left(K+1\right)^2 + \alpha}{8b^2\left(K+1\right)^2} < 0$$

These conditions, in conjunction with the continuity concavity of the objective functions ensure the existence and uniqueness of the equilibria under the different regimes.