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Tax competition and Leviathan

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Abstract

Attitudes towards downward pressure on tax rates from international tax competition depend on attitudes towards government. This paper synthesises the two extremes which, as in other areas of public finance, have dominated the debate, typically being presented as stark alternatives: the view of government as a Leviathan (from which tax competition emerges as a useful constraint on policy-makers) and the view of government as a benevolent maximiser of their citizens' welfare (from which it emerges as a source of inefficiency). Conditions are derived under which, when policy-makers are neither entirely benevolent nor wholly self-serving, tax coordination benefits the representative citizen.

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1. Introduction

In enhancing the mobility of capital, goods and people, increasing international economic integration means, to a large extent, increasing the international mobility of tax bases. This, in turn, raises the prospect of increasingly fierce international tax competition, as national authorities attempt to expand their tax bases by offering more favourable tax treatment than is available elsewhere. [1] Taxes on capital income, in particular, look increasingly vulnerable to international tax

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competition. Indeed such competition may already be a reality, with the worldwide tax reforms of the 1980s leaving the average rate of corporate taxation in the OECD about 6 points lower at the end of the decade than at its start (a proportionate reduction of about 12 percent), and the average top rate on interest income 13 points lower (a proportionate reduction of about 25 percent). [2] The recent experience of tax reform in the Nordic countries is even more striking. [3] In 1991, Sweden moved to a schedular tax system with a 30% flat rate tax on capital income (far below the previous top marginal rate); in 1992, Norway introduced a similar system but at the lower rate of 28%; Finland followed suit in 1993, but at the still lower rate of 25%. The proper interpretation of these developments is not clear-cut. It is hard to believe, however, that international tax competition is not an important part of the story. The perception that international tax competition is likely to become increasingly cut-throat has, in any event, come to play a major role in tax policy discussions, the question then arising as to whether some form of international tax coordination is appropriate. In the European Union, in particular, such measures have already been adopted in relation to commodity taxation (the abolition, at the start of 1993, of restrictions on the importation for personal use of tax-paid goods being accompanied by the imposition of minimum rates of indirect taxation) and, even more controversially, are under consideration for capital income taxation (with the proposal for a minimum withholding tax on interest income).

This paper addresses the deceptively simple question at the heart of these policy issues: Is international tax competition – or, by the same token, tax competition between lower-level governments in a federal structure – a good thing or a bad thing? Or, to put the point more precisely (and in the form that it will be addressed): Starting from the non-cooperative equilibrium, would the representative citizen benefit from, or be harmed by, some degree of international tax coordination?

Two widely divergent views dominate both the academic literature and the policy debate. In one, tax competition is an essentially straightforward instance of the presumption that non-cooperative behaviour will lead to inefficient outcomes. [4] Thus Sinn (1994), for instance, foresees a future for the European Union in which

[1] In addition to this 'base-stealing' motive, pointing to excessively low tax rates, there may be a 'tax exportation' motive pointing towards excessively high rates (a point emphasised in the context of commodity taxation by Mintz and Tulkens (1986)). In practice, however, it is the former concern that typically dominates the policy debate (the latter arising only for countries that are, in the relevant sense, 'large').

[2] The figures, from Owens (1993), are for 18 OECD countries.

[3] See, for instance, Sørenson (1994) and Tikka (1993).

[4] This is again a sweeping generalisation. There are circumstances in which non-cooperative behaviour by national welfare-maximisers leads to a constrained efficient outcome: with mobile labour, for instance, the Tiebout mechanism can generate an efficient outcome (albeit only under restrictive conditions); another example is the result of Kehoe (1989) discussed in the text below.

"...fiscal competition will wipe out redistributive taxes on mobile factors and reduce the tax system to one of mere benefit taxation". With this view of the world, attention focusses on the appropriate form of policy coordination: on the imposition of minimum tax rates, for example (analysed in Kanbur and Keen (1993)), or the use of corrective subsidies (analysed in Wildasin (1989)). The second view is radically different. It sees tax competition as serving a valuable purpose in supplementing inadequate constitutional constraints on the intrinsic pressures towards excessively high tax rates implied by policy-makers' pursuit of their own interests. Thus Brennan and Buchanan (1980) argue that "...the intergovernmental competition that a genuinely federal structure offers may be constitutionally 'efficient', regardless of the more familiar considerations of interunit spillovers examined in the orthodox theory of fiscal federalism" (p. 185), and that consequently "...tax competition among separate units ...is an objective to be sought in its own right" (p. 186; italics suppressed). This view of the world has become increasingly influential. [5] The British government, for example, resisted the European Commission's initial proposals for indirect tax coordination on the grounds that without them "[t]he pressure on tax rates would in general be downwards, providing an essential antidote to the in-built pressures for increased public expenditure and taxation" (UK Treasury (1988); hyphen added).

These two, sharply contrasting views clearly reflect profoundly different perceptions of policy-making. In the first, governments are benevolent maximisers of their citizens' welfare. In the second, they are intrinsically untrustworthy revenue-maximisers. Perhaps not surprisingly, the conflict between these two views of tax competition has typically reduced to a conflict between these two perceptions of government. But these perceptions, at least in the present state of knowledge, are in turn little more than simple articles of faith. The conflict between the two views of tax competition has, consequently, proved rather sterile, with no clear guidance emerging for the pressing issues of practical policy-making.

The central purpose of this paper is to provide a framework within which these two sharply contrasting views of tax competition can be articulated and compared. For both, clearly, are extreme cases of a more general – and presumably more plausible – formulation in which policy-makers attach some value both to the welfare of their citizens and to the surplus that they are able to extract from the citizenry and put to their own uses. It is the analysis of this more general case that is undertaken here.

Clearly, one cannot hope to find any unambiguous answer to the central question – the desirability or otherwise of unfettered tax competition – from a model that is specifically designed to encompass both the case in which policy-makers are entirely benevolent (towards their own nationals), in which it is almost

[5] It has also spawned a large (and largely inconclusive) empirical literature: see, for example, Oates (1985).

certainly undesirable, and the case in which they are self-seeking revenue-maximisers, in which the opposite is almost certainly true. (We shall though see that there are interesting intermediate cases in which, surprisingly, one can give a definite answer). One can, however, hope to clarify the deeper economic forces at work, developing some sense, for example, of the conditions under which tax coordination is likely to be desirable even when policy-makers fall short of perfection. Discussion of these issues can then move on to argument over the likely magnitudes of critical variables, a more productive exercise than the usual exchange of prejudices as to the nature of government. There may, indeed, be circumstances in which those with very different views of the world can nevertheless agree that there is a prima facie case for (or against) coordination.

There has previously been no formal analysis, so far as we are aware, of these two contrasting views of international tax coordination, and nor have the two stark views of government previously been nested in a more general characterisation of policy-makers' preferences. There are, nevertheless, several strands of literature to which the present analysis is related. The fiscal federalism literature has long recognised the potential inefficiencies from non-cooperative tax-setting by lower-level jurisdictions when there is some mobility of tax base between them: see for instance Oates (1972), Wildasin (1989) and Zodrow and Mieszkowski (1986). The latter, in particular, articulate the gains from partial movements towards lump-sum taxation and away from the taxation on mobile capital when policy-makers are benevolent despots. Indeed the model used here is essentially that of Zodrow and Mieszkowski, with the critical difference that policy-makers' preferences incorporate some degree of self-interest. Whilst coordination of capital taxation generally emerges in a favourable light from this literature, Kehoe (1989) shows that this may not be the case, even when policy-makers are benevolent, if they are unable to commit to future tax rates: the pressure towards low tax rates implied by unrestricted tax competition mitigates the time consistency problem that would arise with cooperative tax-setting. Here, however, there will be assumed to be no commitment problem: the potential undesirability of coordination comes only from the element of self-interest in policy-makers' preferences. Perhaps closest to the present paper in its concern with both political economy and capital tax competition is Persson and Tabellini (1992). There, however, interest centres on the potential impact of increased mobility on the characteristics of the policy-maker to whom – in the presumed absence of coordination – the citizenry chooses to delegate decision-making. Here the identity of the policy-maker is taken as given, and interest centres on how her characteristics affect the appeal to the citizenry of coordination between them. [6]

Section 2 develops the basic model, which is one of competition for internationally mobile capital. As just mentioned, its structure is essentially standard and familiar in all except the very general form assumed for the policy-makers' preferences. Section 3 then examines the case for international tax coordination when the tax on mobile capital is the only revenue source available to policy-

makers. Section 4 sketches an extension of the analysis to the (more complex) case in which they also have access to an immobile tax base. Section 5 develops some general intuition, encompassing the circumstances of the preceding two sections. Section 6 summarises and concludes.

2. The basic model

The model is one of tax competition among many identical small jurisdictions ('countries'). In each there is a representative citizen–consumer, with strictly quasi-concave preferences $U(X,G)$ defined over a private good X and a local public good G. Each citizen is endowed with a quantity $\bar{K}$ of capital, which may be invested at home or abroad; citizens themselves are completely immobile. Denoting by K^i the quantity of capital employed in country i, output in i is given by $F(K^i)$, with $F' > 0$ and $F'' < 0$. [7] Country i imposes a source-based tax on capital employed of T^i per unit. Capital being freely mobile, its after-tax return must, in equilibrium, be the same in all locations. Denoting that common net return by ρ, employment of capital in i is thus determined by the arbitrage condition

$$F'(K^i) - T^i = \rho, \tag{2.1}$$

which implicitly defines $K^i = K(\rho + T^i)$, with

$$K' = 1/F'' < 0. \tag{2.2}$$

Ownership of fixed factors is entirely domestic, and rents are untaxed. The price of X is assumed to be constant and normalised to unity, so that the representative citizen's budget constraint is

$$X = F(K) - F'(K)K + \rho\bar{K}. \tag{2.3}$$

To this point, the model is essentially standard. Our central departure from previous models of tax competition is in the assumed objective function of the policy-maker in each country. To explore the tension between the two views of the world described in the Introduction, we suppose that policy-makers – a term that we interpret broadly, potentially encompassing politicians, bureaucrats and powerful lobbies – are neither wholly benevolent nor wholly self-serving. Instead they

[6] Thus we do not address the possibility, raised by the work of Persson and Tabellini and others on delegation games, that the citizenry would choose to have decisions made by policy-makers whose concerns are partly self-interested rather than entirely benevolent. This seems a real possibility when tax competition involves only a few countries, since each can then hope to influence the tax rates chosen by others through the choice of its policy-maker, perhaps choosing one whose Leviathan-like tendencies will mitigate the downward pressure on tax rates. In order to focus sharply on the coordination issues raised above, however, the model used here is one in which each country is small.

[7] Derivatives are indicated by primes for functions of one variable, and by subscripts for functions of several.

have quasi-concave preferences $V(C, U)$ defined over some item of public expenditure C which, while financed from general revenues, benefits only the policy-maker, and the welfare U of their representative citizen [8] (reflecting perhaps a genuine empathy, perhaps a favourable impact of increases in U on the policy-maker's chances of re-election or promotion). It should be emphasised that these preferences – which, for simplicity, we assume to be the same for all policy-makers – are defined over a particular representation of the representative citizen's preferences. This representation is assumed to have the feature that $U_{GG} < 0$; that is, the policy-maker's preferences incorporate a view that the citizen has diminishing marginal utility from the public good.

Though essentially ad hoc, this characterisation of policy-makers' preferences is a convenient way of encompassing a wide range of possibilities. It obviously captures as special cases the two extremes on which previous discussions have focussed: with $V(C, U) = U$, the formulation reduces to simple welfare maximisation; with $V(C, U) = C$, it reduces to the maximisation of tax revenue. The particular appeal of the device, however, is that it enables one to explore the implications of less extreme views of the policy process. One obvious possibility to consider, for instance, is that $V(C, U) = \alpha C + (1 - \alpha)U$, with $\alpha \in (0, 1)$, so that the policy-maker's maximand is simply a weighted average of the expenditure diverted to her own uses and the welfare of the consumer. Another is that in which the policy-maker derives benefit $A(C)$ from wasteful public expenditure when in office and is re-elected with probability $p(U)$; normalising the pay-off when out of office to zero, one might then take $V(C, U) = p(U)A(C)$. To focus on cases intermediate to the extremes of welfare and revenue maximisation, and to avoid tedious qualifying statements, it will be assumed throughout the paper that V_C and V_U are both strictly positive. This does preclude the polar extremes of revenue and welfare maximisation just mentioned. Encompassing them would be straightforward – it is only necessary to add non-negativity constraints on G and C [9] – but would clutter the exposition. The price of neglecting these constraints is small, but should be borne in mind: the various conditions and expressions to be derived do not in general apply unamended to the extreme cases of welfare and revenue maximisation.

The tax and spending decisions of each country are thus taken so as to maximise $V(C, U)$ subject to both optimisation by the representative citizen and the revenue constraint

$$C + G = TK, \tag{2.4}$$

where we assume the producer prices of C and G to be constant, and normalise

[8] They attach no importance to the well-being of citizens abroad.

[9] When $V(C, U) = U$, it is the constraint $C \geq 0$ that bites; when $V(C, U) = C$, it is that $G \geq 0$.

both to unity. [10] Each policy-maker perceives her country to be small; thus ρ, while determined endogenously in the general equilibrium of the model, is taken by each policy-maker to be given.

3. Coordination when the tax base is wholly mobile

The strategy of the analysis that follows is first to characterise the symmetric non-cooperative equilibrium that emerges from uncoordinated decision-making by the many policy-makers, and then to consider the effects of a small multilateral increase in the tax on mobile capital. The central question is: Bearing in mind the policy-makers' ability to reoptimise their spending decisions in the face of a collective increase in T, does tax coordination ultimately increase or reduce U, the well-being of the representative citizen?

3.1. The non-cooperative equilibrium

In the absence of coordination between them, each policy-maker's problem is to choose the amount of 'wasteful' expenditure [11] C and the tax rate on capital T so as to maximise $V[C, U(X, G)]$ subject to (2.1), (2.3) and (2.4). It is useful – for both intuition and the later analysis of coordination – to conceive of the representative policy-maker solving this problem in two stages.

In the first stage, the policy-maker chooses T and the amount of 'beneficial' public expenditure G so as to maximise C subject to the constraint that the representative citizen attains some specified level of utility U. It is convenient to formulate this as an unconstrained problem, for this purpose inverting direct utility $U(X, G)$ to give $G(X, U)$, the quantity of G needed to achieve utility U when private consumption is X. Note, for later use, that [12]

$$G_X = -\frac{U_X}{U_G}, \tag{3.1}$$

$$G_U = \frac{1}{U_G}. \tag{3.2}$$

[10] Combining (2.1), (2.3) and (2.4) gives $C + G + X = F + \rho(\bar{K} - K)$, so that the resource constraint for the aggregate economy is satisfied: national expenditure at world prices equals national output plus property income from abroad.

[11] It is a convenient shorthand to refer to C as 'waste', though doing so is wholly inaccurate, of course, in terms of the policy-maker's interests.

[12] Eqs. (3.1) and (3.2) follow on differentiating $U(X, G(X, U)) = U$ with respect to X and U respectively.

From the revenue constraint (2.4), and substituting for X from (2.3), the first-stage problem of maximising C given ρ and U is then simply to

$$\max_T C(\rho, T, U) \tag{3.3}$$

where

$$C(\rho, T, U) = TK(\rho + T) - G\big(F[K(\rho + T)] - F'[K(\rho + T)]K(\rho + T) + \rho\bar{K}, U\big). \tag{3.4}$$

The first-order condition for this problem,

$$C_T(\rho, T, U) = 0, \tag{3.5}$$

implies, using (2.2) and (3.1), that

$$\frac{U_G}{U_X} = \frac{K}{K + TK'} > 1. \tag{3.6}$$

It is sufficient for the second-order condition to be satisfied that $K'' < 0$. [13]

Condition (3.6) is exactly the condition for a constrained efficient allocation of consumption between public and private goods when the policy-maker is entirely benevolent: it is exactly analogous, for instance, to the standard expression for the marginal social cost of public funds when the only tax available is one on elastically supplied labour. [14] Intuitively, since the policy-maker derives some benefit from U she will ensure that any resources she chooses to leave in the private sector are allocated efficiently between G and X; but her pursuit of C will mean that some resources are taken out of the private sector and diverted to her own use.

Denoting the maximum value function for the first-stage problem – the conditionally maximised level of wasteful expenditure – by $C(\rho, U)$, the second stage of the policy-maker's problem is then to

$$\max_U V[C(\rho, U), U]. \tag{3.7}$$

The solution to this problem is illustrated in Fig. 1, which will be a source of simple intuition in much that follows. The first-order condition for (3.7) is

$$V_C[C(\rho, U), U]C_U(\rho, U) + V_U[C(\rho, U), U] = 0, \tag{3.8}$$

whilst the assumption that $U_{GG} < 0$ is readily shown [15] to ensure that the feasible set in Fig. 1 is strictly convex as drawn, and hence that the second-order condition is satisfied. At the second stage, the policy-maker thus simply equates her

[13] The proof of this is available from the authors on request.

[14] Ballard and Fullerton (1992) provide a intuitive rationale of that condition, one that applies just as well here.

[15] By differentiating in (3.9) below and using (3.2).

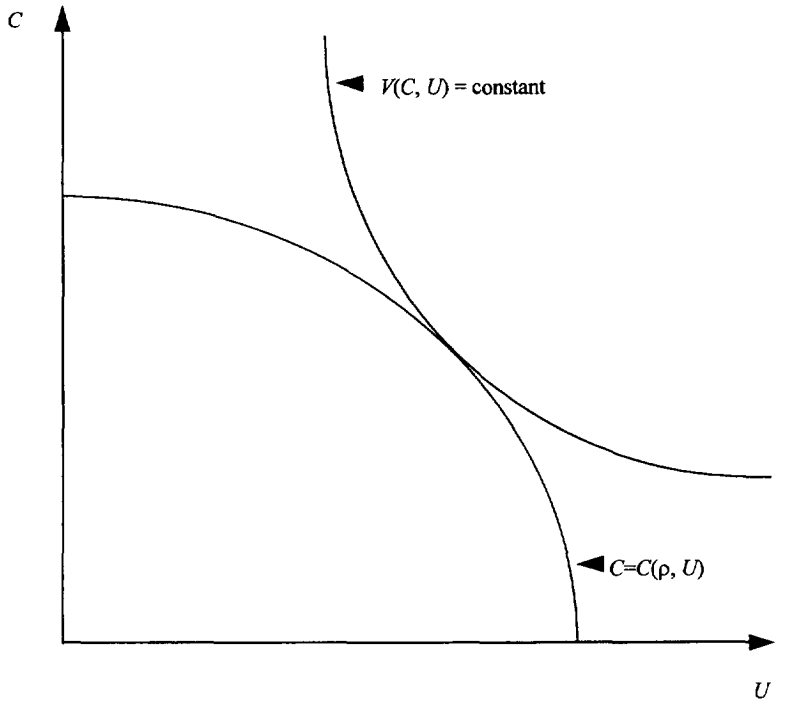

Fig. 1. The second stage of the policy-maker's problem.

marginal rate of substitution between wasteful public expenditure and the citizen's utility, V_U/V_C, to the marginal price that she must pay for U in terms of wasteful public expenditure foregone, $-C_U$. Differentiating with respect to U in (3.4) and using (3.2) shows that marginal price to be

$$-C_U = G_U = \left(\frac{1}{U_G}\right). \tag{3.9}$$

To interpret $-C_U$ and the behaviour of the policy-maker that underlies it, note that there are two ways in which she can increase U. The first is by increasing G. Raising U by one unit in this way requires C to be cut by $1/U_G$; hence (3.9). The second is by reducing T so as to increase X; from (2.2) and (2.3), a unit increase in U requires that the tax be cut by $1/U_X K$, reducing revenue by $(K + TK')/U_X K$. Condition (3.6) then ensures that the costs to the policy-maker of these two methods of buying popularity, measured in terms of C foregone, are equated in equilibrium.

We assume the existence of a symmetric non-cooperative equilibrium. Each policy-maker then sets the same tax T, and the net rate of return ρ is such that the amount of capital employed in each country is exactly $\bar{K}$.

3.2. The effects of coordination

Suppose now that, starting from the non-cooperative equilibrium, all policy-makers agree to a small increase dT in the tax on mobile capital, whilst retaining their discretion as to the pattern of public expenditure.

To identify the effects on V and – our particular interest – U, consider the problem that the typical policy-maker now faces. Rather than choosing her country's T^i in pursuit of her own interests, each now agrees to set some common T. The only decision that each policy-maker then has to make is the level of G. This leaves only the analogue to the second-stage problem of the preceding sub-section:

$$\max_U V[C(\rho,T,U),U] \tag{3.10}$$

which differs from (3.7) in that T is now fixed at some, for the moment arbitrary, level. The first-order condition for (3.10) differs in an analogous way from (3.8), and is written

$$\Omega(\rho,T,U) \equiv V_C[C(\rho,T,U),U]C_U(\rho,T,U) + V_U[C(\rho,T,U),U] = 0, \tag{3.11}$$

which implicitly defines U as a function of the common tax rate T and the world net return ρ.

To establish the consequences for the representative citizen of a coordinated increase in T from the non-cooperative equilibrium, the strategy is to perturb (3.11) and evaluate the effect on U at the non-cooperative equilibrium. The key in doing so is to note that such a coordinated increase in T will leave capital employed in each country unchanged, at $\bar{K}$, so that the arbitrage condition (2.1) implies

$$d\rho = -dT. \tag{3.12}$$

Proceeding in this way for U, and by a more direct argument for V, one arrives at:

Proposition 1. Starting from the non-cooperative equilibrium, a small multilateral increase in the tax on mobile capital:

(a) unambiguously increases V, the welfare of the policy-maker;

(b) increases U, the welfare of the representative citizen, if and only if

$$\left(1-\frac{U_G}{U_X}\right)\left\{V_{CC}-V_{UC}\left(\frac{V_C}{V_U}\right)\right\}+V_U\left\{U_{GG}-U_{GX}\left(\frac{U_G}{U_X}\right)\right\}>0. \tag{3.13}$$

Proof. See Appendix A.

Part (a) of the Proposition – that the policy-makers unambiguously gain from coordination – is hardly surprising: since coordination does not affect the international allocation of capital, it is clear from (2.3) and (2.4) that coordination implies a lump-sum transfer, of an amount $\bar{K}\mathrm{d}T$, from the citizen to the policy-maker.

Part (b) of the Proposition is more complex, at least at first sight. Eq. (3.13) shows the effect of coordination on the citizen's welfare to turn on the balance between two effects. These look somewhat forbidding, but have simple interpretations; we discuss each in turn.

Recalling from (3.6) that $(U_G/U_X) > 1$ in the non-cooperative equilibrium, the first term in (3.13) is strictly positive – that is, is conducive to a welfare gain for the citizen from coordination – if and only if

$$V_{CC} - V_{UC}(V_C/V_U) < 0. \tag{3.14}$$

This condition – which is unaffected by a monotonic transformation of $V(\cdot)$ – is necessary and sufficient for U to be normal in the policy-maker's preferences, [16] which one would presumably expect to be the case. In the particular case $V(C,U) = p(U)A(C)$ mentioned earlier, for example, normality simply requires that $A(\cdot)$ be strictly concave. The explanation for this presumptively beneficial effect of coordination is straightforward. As noted above, the impact effect of coordination is a lump-sum transfer from the citizen to the policy-maker. If U is normal in the policy-maker's preferences, she will spend part of this increase in her lump-sum income on raising U. (Note, for later purposes, that the only way in which she can do this is by increasing expenditure on G). Diagrammatically, this shift towards lump-sum taxation implied by coordination leads to an outward shift of the opportunity locus in Fig. 1: for any given level of C, for instance, the transfer reduces the representative citizen's welfare by $U_X\bar{K}\mathrm{d}T$; but since $U_G > U_X$ at the non-cooperative equilibrium, this is more than offset by the welfare gain of $U_G\bar{K}\mathrm{d}T$ from the additional public expenditure which that transfer finances. Assuming U to be normal, coordination thus exerts an 'income effect' on the policy-maker that acts to the advantage of the citizen.

The second term in (3.13) takes the same sign as $U_{GG} - U_{GX}(U_G/U_X)$. If the public good G is normal in the preferences of the representative citizen, coordination is therefore on this account detrimental. With the first term in (3.13) naturally thought of as an income effect, this second effect is most usefully interpreted as a 'relative price' effect, the relevant price being that of C in terms of U. To develop this interpretation, suppose that the policy-maker's income elasticity of demand for

[16] The result invoked here and used further below can be found, for instance, in Hicks (1939, p. 308): in the standard problem of maximising a smooth utility function $u(x, y)$ subject to the budget constraint $p_x x + p_y y = m$, a necessary and sufficient condition for x to be normal (given $u_x, u_y > 0$) is that $u_{yy} - u_{xy}(u_y/u_x) < 0$.

U is zero, so that the first term in (3.13) vanishes. In response to the receipt of lump-sum revenue associated with the impact effect of coordination, the policy-maker will then seek to keep U unchanged. This will involve spending just enough of that additional revenue on G to maintain U unchanged in the face of the reduction in private consumption $\mathrm{d}X$. But this act of compensation will in itself change the relative price, in terms of C, that the policy-maker perceives she must pay for U. For recall from (3.9) that this relative price is given by $-C_U = 1/U_G$. With X falling and G rising in such a way as to leave U unchanged, the relative price of U will rise if and only if [17] $U_{GG} - U_{GX}(U_G/U_X) < 0$; which is precisely the condition for this second effect to be harmful. Diagrammatically, the opportunity locus in Fig. 1 not only shifts outward: so long as G is normal, it becomes steeper, pushing towards a reduction in U. Put very crudely, the intuition is straightforward. To the extent that the policy-maker compensates the representative citizen for the increased tax on capital (or indeed over-compensates him, when U is normal in her preferences) by spending some of the revenue it yields on G, the consequent reduction in the citizen's marginal valuation of G makes it less expensive, in terms of foregone U, for the policy-maker to divert revenue away from G and towards her own uses.

The overall effect of coordination on the citizen's welfare thus depends on the balance between an income effect that would be presumed advantageous and a relative price effect that would be presumed harmful. The income effect is stronger (coordination more likely to be beneficial), other things being equal:

1. the greater is the policy-maker's income elasticity of demand for U, and
2. the greater is the marginal social cost of public funds, U_G/U_X, in the non-cooperative equilibrium (since the greater is then the potential efficiency gain from the element of lump-sum taxation implied by coordination).

The relative price effect is more marked (coordination more likely to be harmful), other things equal, the more rapidly the citizen's (compensated) marginal willingness to pay for the public good is perceived by the policy-maker to decrease with the level provided.

As one would expect, the effect of coordination on the citizen's welfare is thus, in general, ambiguous. There are, however, two special cases in which it can be signed by simple preference restrictions. The first is that in which $V(C,U)$ is quasi-linear in C, taking the form $f(C+g(U))$ (with both $f(\cdot)$ and $g(\cdot)$ increasing). The policy-maker's income elasticity of demand for U is then zero, so that the beneficial income effect of coordination – the first term in (3.13) – vanishes. Coordination is consequently unambiguously harmful to the citizen, so long only as G is normal in his preferences. As a corollary, coordination is certain to damage the representative citizen in the seemingly natural special case, referred

[17] This follows on differentiating $U_G(X,G(X,U))$ with respect to X and using (3.1).

to earlier, in which the policy-maker simply maximises some weighted average of C and U. [18]

The second special case in which there is no ambiguity is that in which the marginal utility that the representative citizen is perceived to derive from G is almost [19] independent of G. In this case the relative price effect of coordination – the second term in (3.13) – vanishes. So long only as U is normal in the policy-maker's preferences, coordination is then unambiguously beneficial for the citizen.

3.3. A simple rule

Proposition 1 brings out the fundamental determinants of the final welfare effect of coordination. But there is another useful way of expressing the condition for that effect to be beneficial; one which is in a formal sense more superficial, yet which has appeal as a simple rule of thumb, even though (or perhaps because) it does not make full use of the restrictions of the model. To develop this, note first that the effect of coordination on U is simply

$$dU = U_X dX + U_G dG. \tag{3.15}$$

Since $dX = -\bar{K}dT = -dR$, where $R = TK$ denotes total revenue, and $dG = dR - dC$, (3.15) can be written as

$$dU = \left\{1 - \left(\frac{U_X}{U_G}\right) - \frac{dC}{dR}\right\} U_G dR. \tag{3.16}$$

Using (3.6) in (3.16) then gives:

Proposition 2. Starting from the non-cooperative equilibrium, a small multilateral increase in the tax on mobile capital increases the welfare of the representative citizen if and only if:

$$-\frac{TK'}{K} > \frac{dC}{dR}. \tag{3.17}$$

Coordination is thus beneficial if and only if the elasticity of the tax base exceeds the policy-maker's marginal propensity to waste tax revenue.

The appeal of this kind of condition, as discussed in the introduction, is in helping to move discussion of the very practical policy issues raised there away from the unproductive exchange of views on the nature of government and on to

[18] Note that this is so irrespective of the weight α: coordination is damaging so long as the policy-maker attaches some positive weight, however small, to C.

[19] Recall that the limiting case in which $U_{GG} = 0$ has been precluded by assumption.

the evaluation of quantities which, though by no means easy to measure, are at least relatively well-defined. By the same token, it opens up room for consensus even between those with divergent views. Suppose, for instance, that it is agreed that the elasticity of the tax base is 0.4; then it does not matter whether one thinks the policy-maker would waste 5% of any additional revenue or 30%: coordination will in either case benefit the representative citizen.

4. Coordination with a partially immobile tax base

The results of the previous section are predicated on the assumption that each country's entire tax base is internationally mobile. This is hardly plausible; nor, almost by the same token, is it reasonable to conceive of international coordination removing all domestic discretion in tax policy. The question then arises as to how robust the conclusions above are to the existence of some immobility in the tax base. It is to this question that we turn, briefly, in this section.

To incorporate some immobility in the tax base, we now extend the model by supposing that a commodity tax, levied on a destination basis and at a specific rate t, can be imposed on X. There is now also assumed to be, in the background, a second (and untaxed) private good Y. The producer prices of X and Y are, for simplicity, assumed constant and normalised to unity. Thus the consumer price of X is $Q = 1 + t$, and the citizen's indirect utility $H(Q, G, M)$, where $M(\rho, T)$ denotes lump-sum income (obtained by substituting $K(\rho + T)$ into the right of (2.3)).

As in the previous section, we first characterise the non-cooperative equilibrium and then perturb it for a coordinated increase in T. The analytics parallel those above, so most details are omitted. [20]

4.1. The non-cooperative equilibrium

It is again helpful to conceive of the policy-maker's problem comprising two steps. At the first, she takes T as given and chooses G and t to maximise C subject to the revenue constraint $C = TK + tX - G$ and the constraint that the representative citizen achieve utility of at least U. At the second, she chooses T and U to maximise $V[C(\rho, T, U), U]$, where $C(\rho, T, U)$ denotes the maximised value from the first step. This optimisation leads to two key conditions. The first is that

$$\frac{H_G}{H_M} = \frac{(1 - tX_G)X}{X + tX_Q} = \frac{(1 - tX_G)K}{K + TK' - tX_M K} \tag{4.1}$$

[20] They are available on request from the authors.

and the second that

$$\frac{V_U}{V_C} = \frac{1 - tX_G}{H_G}. \tag{4.2}$$

These indicate that the broad qualitative features of the non-cooperative equilibrium are just as in Section 3. Eq. (4.1), parallels (3.6), showing that the allocation of those resources left for the use of the citizen will be constrained efficient: the only implication of introducing an additional instrument is that the policy-maker will equate across the two the marginal social cost of raising \$1 more revenue. Eq. (4.2) differs from the implication of (3.8)–(3.9), illustrated in Fig. 1, only in that the cost to the policy-maker of raising G is modified to reflect the impact tX_G on indirect tax revenues.

4.2. The effects of coordination

Proceeding once more as in Section 3, and denoting by $X^U(Q,G,U)$ the compensated demand for good X, one arrives at:

Proposition 3. With a partially immobile tax base, a coordinated increase in the tax on mobile capital:

(a) unambiguously increases the policy maker's welfare;

(b) increases the welfare of the representative citizen if and only if

$$\frac{tX_Q^U}{X}\left(\frac{V_U\bar{K}}{V_C}\right)\left\{V_{CC} - V_{UC}\left(\frac{V_C}{V_U}\right)\right\} + V_C(C_{UT} - C_{U\rho}) > 0. \tag{4.3}$$

The first term in (4.3) is exactly analogous to the corresponding term in (3.13) of Proposition 1, capturing the income effect of coordination. Except when there are no substitution effects in the citizen's consumption (in which case it vanishes), it is positive – coordination is on this account beneficial – if and only if U is normal in the policy-maker's preferences. The strength of this effect increases with (the absolute value of) tX_Q^U/X, which (as will be seen in some detail below) is closely related to the marginal deadweight loss from taxation, and thus plays a role similar to that of $1 - (U_G/U_X)$ in (3.13): the greater the marginal deadweight loss from taxation, the greater the potential efficiency gain from the movement towards lump-sum taxation implied by coordination.

At least conceptually, the interpretation of the second term in (4.3) is straightforward. If $C_{UT} - C_{U\rho} < 0$, the increase in T and corresponding decease in ρ implied by coordination increases $-C_U$, the marginal price of the citizen's welfare faced by the policy-maker. The opportunity locus in Fig. 1 then becomes steeper, a relative price effect that tends to reduce U; coordination is then, on this account, detrimental. It is not easy, however, to proceed beyond this generality. The

complexity of the policy-maker's problem is such that we have been unable to find a direct interpretation of the sign of $C_{UT} - C_{U\rho}$ in terms of the underlying structure of preferences. [21] When the tax base is partially immobile, there seems to be no general condition for signing the relative price effect of coordination as transparent as the normality condition derived for the simpler circumstances of Section 3.

There is, however, a crude but appealing alternative way of expressing the condition for coordination to benefit the representative consumer, analogous to Proposition 2:

Proposition 4. Starting from the non − cooperative equilibrium, a small multilateral increase in the tax on mobile capital increases the welfare of the representative citizen if and only if

$$-\frac{tX_Q^U}{X}\left(=-\frac{TK'}{K}\right)>\frac{\mathrm{d}C}{\mathrm{d}R}. \tag{4.4}$$

Proof. See Appendix B.

The necessary and sufficient condition for coordination to be desirable is thus that the compensated elasticity of the commodity tax base, which is equated, in the non-cooperative equilibrium, to the elasticity of the capital tax base, exceed the policy-maker's marginal propensity to waste.

5. A unifying condition

The similarity of the rules in Propositions 2 and 4 is striking, and suggests an encompassing intuition that can be more directly related to existing empirical knowledge than can the conditions (3.13) and (4.3). To see this, note first that both $-tX_Q^U$ and $-TK'$ can be interpreted, in their respective contexts, as the additional deadweight loss from a small tax increase. In the former case, the deadweight loss is that from commodity taxation, measured as in Kay (1980). In the latter case, it is that from the tax on mobile capital, measured as the 'triangle' under the marginal product schedule. [22] By the same token, both $-tX_Q^U/(X+tX_Q^U)$ and $-TK'/(K+TK')$ can be interpreted as deadweight loss per dollar of revenue, at

[21] Edwards and Keen (1994) show that if rents can be taxed at 100 percent and the citizen's preferences are of the form $H(Q,G,M)=h[\gamma(Q)+M,G]$, with $\gamma(\cdot)$ decreasing, convex and having non-negative third derivative, then the relative price effect of coordination is detrimental to the citizen iff the composite private good $\gamma(Q)+M$ is normal. The structure of the relative price effect is, in this very special case, thus very much as in Proposition 1 for the wholly mobile base.

[22] That is, as $F[K(\rho)]-F[K(\rho+T)]-\rho\{K(\rho)-K(\rho+T)\}$.

the margin: as measures, that is, of the marginal excess burden of taxation (*MEB*).[23] From the equality in (4.4), the non-cooperative equilibrium in the partially immobile case has the feature (again reflecting its constrained efficiency) that the *MEB* of commodity taxation is equated to that of capital taxation. There is thus no ambiguity in referring simply to the *MEB*, so that Propositions 2 and 4 can be re-expressed in the common form:

Proposition 5. Irrespective of whether the tax base is fully or partially mobile, a small multilateral increase in the tax on mobile capital from the non-cooperative equilibrium increases the welfare of the representative citizen if and only if

$$\frac{MEB}{1+MEB} > \frac{\mathrm{d}C}{\mathrm{d}R}. \tag{4.5}$$

Proposition 5 has an easy intuitive explanation. Coordination, as already emphasised, is equivalent to a lump-sum transfer from the citizen to the policy-maker. Suppose coordination results in \$1 being transferred in this way. Then while the direct consequence to the citizen is a loss of \$1, he also gains in so far as the part of this that is not wasted, $1-(\mathrm{d}C/\mathrm{d}R)$, enables the policy-maker to reduce the revenue raised from distorting taxes. This gain is worth $\$(1+MEB)(1-\mathrm{d}C/\mathrm{d}R)$, so that, on balance, the citizen benefits if this exceeds \$1; a condition that reduces to (4.5).

What ultimately matters is thus not so much some notion of the elasticity of the tax base, but rather the marginal excess burden of taxation. The larger is the *MEB*, the greater is the potential efficiency gain from the element of lump-sum taxation implied by coordination, and hence the more likely it is that coordination will prove beneficial.

Though we have not shown that it applies in circumstances more general than those considered in this paper, it is interesting to confront Proposition 5 with empirical estimates of the deadweight loss from taxation. These vary widely, from about 7 cents per dollar to about 30 cents (see, for example, Browning (1987), Fullerton (1991) and Hausman (1981)). Taking the higher of these estimates, coordination will be desirable so long as a gift to the policy-maker of \$1 of lump-sum revenue would not increase socially unproductive public expenditure by more than 23 cents. Taking the lower, it will be desirable so long as unproductive expenditure would not increase by more than about $6\frac{1}{2}$ cents. Such calculations clearly leave much room for disagreement as to the wisdom of coordination. There remains considerable uncertainty as to the magnitude of the *MEB*, and – a general

[23] As Fullerton (1991) emphasises, precise definitions of the *MEB* vary quite widely. That adopted here for the commodity tax case – in which the consumer is hypothetically compensated for the tax increase in evaluating its revenue effect – follows, for example, Browning (1987).

limitation of the analytical framework used here – it is far easier to talk of 'waste' in the abstract than it is to measure it in practice. The important point for present purposes, however, is that discussion of the case for coordination has acquired a clear structure and, at least to some degree, empirical content.

6. Summary and conclusions

This paper has not set out to provide an unambiguous resolution of the conflict between the two extreme views of international tax competition and coordination discussed at the outset. By analysing tax competition and coordination in a framework that nests both views, the objective has rather been to identify relatively well-defined conditions upon which, in particular circumstances, the balance of truth between them turns.

It emerges that, when policy-makers are neither wholly benevolent nor wholly unconcerned with the welfare of citizens, the question of whether international tax coordination tends to increase or reduce the well-being of the citizenry – of whether, that is, it is predominantly a desirable response to the inefficiency of non-cooperative behaviour or an undesirable measure of tax 'cartelisation' – hinges on the balance between two effects. The first of these is an 'income effect' that tends to make coordination beneficial. For the impact effect of a multilateral tax increase is akin to a lump-sum transfer from the representative citizen to the local policy-maker. While this in itself makes the citizen worse off, the policy-maker, now being better off, will generally want to spend part of this additional revenue on raising the citizen's welfare above its initial level. This is achieved by adjusting other tax and spending instruments: increasing expenditure on the local public good or cutting other taxes. The effect is a powerful one, in the sense that the existence of a benefit to the representative citizen through this route does not depend on the relative weight attached to the citizen's welfare in the policy-maker's preferences, but merely on an apparently weak normality assumption. The second effect of coordination is on the 'relative price' that the policy-maker perceives between tax revenues diverted to her own uses on the one hand and the welfare of the citizen on the other. The income effect will typically lead the policy-maker to over-compensate the citizen for the impact effect of coordination, and these policy adjustments will generally affect the marginal cost to her of buying welfare for the citizen. In the most general of the circumstances examined here, the direction of the price effect is ambiguous. But there is some presumption (from special cases) that coordination is on this account damaging to the citizen. Intuitively, the notional compensation would generally be expected to involve, in part, increasing the provision of the local public good; but that in turn will tend to reduce the citizen's valuation of the public good, which means that spending \$1 less on it and \$1 more on herself becomes more attractive to the policy-maker.

It has also been seen that, at least in the simple models considered here the

central issue can be reduced to the comparison between two numbers for which commentators might reasonably be asked to produce their best guesses. The first is the marginal excess burden of taxation (deadweight loss per dollar of revenue, at the margin); the second is the amount by which unproductive public expenditure would increase if the policy-maker were given an additional dollar of lump-sum revenue. Some degree of tax coordination is desirable if and only if the former [24] exceeds the latter (the efficiency gain then being sufficient to outweigh the policy-maker's tendency to waste).

This last conclusion, like the others, can be turned to the policy concerns raised in the introduction only with considerable caution. The framework used here has many limitations. In the specific context of capital income taxation, asymmetries between countries, not least in size, are liable to have a powerful effect on strategic incentives in tax-setting and, hence, on the effects of various forms of coordination; [25] and practical proposals generally involve only a subset of countries (not, as here, the entire world), in which case effects arising from trade in capital may prove important. At a more general level, the concept of 'waste' employed here is dangerously vague. But it does seem, nevertheless, that there are useful lessons to be learned by synthesising the two perspectives on policy-making rather than, as has often been the case, regarding them as mutually exclusive.

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Appendix A. Proof of Proposition 1

It is convenient to begin with part (b). Perturbing (3.11) and using (3.12) gives

$$dU = \left(\frac{\Omega_\rho - \Omega_T}{\Omega_U} \right) dT. \tag{A.1}$$

Since $\Omega_U < 0$ by the second-order condition for the second step of the policy-maker's problem, the sign of the effect of a coordinated increase in T on U

[24] Expressed in 'inclusive' form.

[25] See, for example, Bucovetsky (1991) and Kanbur and Keen (1993).

is thus given by the sign of $\Omega_T - \Omega_\rho$, evaluated at the symmetric non-cooperative equilibrium. To investigate this, note first, from (3.11), that

$$\Omega_\rho = V_{CC}C_\rho C_U + V_C C_{U\rho} + V_{UC}C_\rho, \tag{A.2}$$

$$\Omega_T = V_{CC}C_T C_U + V_C C_{UT} + V_{UC}C_T. \tag{A.3}$$

From the first-order conditions (3.5) and (3.8) for the policy-maker's problem in the absence of coordination, evaluating (A.2) and (A.3) at the non-cooperative equilibrium gives

$$\Omega_T - \Omega_\rho = V_C(C_{UT} - C_{U\rho}) + C_\rho\left(V_{CC}\left(\frac{V_U}{V_C}\right) - V_{UC}\right). \tag{A.4}$$

The next step is to evaluate the derivatives of $C(\rho, T, \mathrm{U})$ in (A.4). Differentiating with respect to ρ in (3.4) gives, using (2.2), (3.1) and (3.6),

$$C_\rho = TK' - (K + TK')\left(\frac{K - \bar{K}}{K}\right) \tag{A.5}$$

and hence

$$C_{U\rho}(\rho, T, U) = 0. \tag{A.6}$$

Differentiating (3.9) and using (2.2), at the non-cooperative equilibrium

$$C_{UT}(\rho, T, U) = G_{UX}\bar{K} \tag{A.7}$$

$$C_{UT}(\rho, T, U) = \frac{\bar{K}}{U_G^2}\left\{U_{GG}\left(\frac{U_X}{U_G}\right) - U_{GX}\right\}, \tag{A.8}$$

the second equality following from differentiation of (3.2). Substituting from (A.6) and (A.8) into (A.4), noting from (A.5) and (3.6) that (at the symmetric non-cooperative equilibrium) $C_\rho = \bar{K}((U_X/U_G) - 1)$, one finds

$$\Omega_T - \Omega_\rho = V_C\bar{K}\left(\frac{1}{U_G}\right)^2\left(\frac{U_X}{U_G}\right)\left\{U_{GG} - U_{GX}\left(\frac{U_G}{U_X}\right)\right\}$$
$$+\left(\frac{U_X}{U_G} - 1\right)\bar{K}\left(\frac{V_U}{V_C}\right)\left\{V_{CC} - V_{UC}\left(\frac{V_C}{V_U}\right)\right\}. \tag{A.9}$$

The result follows from (A.9) on noting from (3.8) and (3.9) that $(1/U_G)^2 = (V_U/V_C)^2$ and dividing by $V_U U_X \bar{K}/V_C U_G$.

For part (a), perturbing $V[C(\rho, T, U), U]$ and using the first-order conditions (3.5) and (3.8) gives $\mathrm{d}V = -V_C C_\rho \mathrm{d}T$. From (A.5), $C_\rho = TK' < 0$ at the non-cooperative equilibrium, and the conclusion follows.

Appendix B. Proof of Proposition 4

Note first that the equality in (4.4) follows, on using the Slutsky equation, from the second equality in (4.1). To establish the inequality, perturbing $U = H(Q, G, M)$, using Roy's identity, recalling that $d\rho = -dT$ and noting that at the non-cooperative equilibrium $M_T = -\bar{K}$ and $M_\rho = 0$, one finds

$$dU = -XH_M dt + H_G dG - \bar{K}H_M dT \tag{B.1}$$

where, from the revenue constraint,

$$dG = \frac{1}{1 - tX_G}\left\{(1 - tX_M)\bar{K}dT + (X + tX_Q)dt - dC\right\}. \tag{B.2}$$

Substituting (B.2) into (B.1) and using (4.1) to evaluate at the non-cooperative equilibrium gives, on simplifying,

$$dU = -\left(\frac{H_G}{1 - tX_G}\right)\left\{\frac{t(X_M X + X_Q)}{X} + \frac{dC}{dR}\right\}dR \tag{B.3}$$

where $dR = \bar{K}dT$ is the lump-sum increase in tax revenue consequent upon coordination. Using the Slutsky equation in (B.3) gives (4.4).

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