

TAX COMPETITION WITH PARASITIC TAX HAVENS

Joel Slemrod

University of Michigan

John D. Wilson*

Michigan State University

ABSTRACT

We develop a tax competition framework in which some jurisdictions, called tax havens, are parasitic on the revenues of other countries, and these countries use resources in an attempt to limit the transfer of tax revenues to the havens. Recognizing that taxes on wage income are also evaded, we solve for the equilibrium tax rates on mobile capital and immobile labor, and we demonstrate that the full or partial elimination of tax havens would improve welfare in non-haven countries. We also demonstrate that the smaller countries choose to become tax havens, and we show that the abolition of a sufficiently small number of the relatively large havens leaves all countries better off, including the remaining havens.

* We are grateful for comments on an earlier draft provided by Clemens Fuest, Andreas Haufler, and Charles McLure; by participants in seminars at the University of Copenhagen, the University of Michigan, the University of Mannheim, and the University of North Carolina; and by participants in the Spring 2006 Meeting of the Midwest International Economics Group (Michigan State University), the 2006 Conference of the Canadian Public Economics Group (Concordia University, Montreal), the 2006 CESifo Public Economics Area Conference, and the 2006 Congress of the International Institute of Public Finance (Cyprus).

1. Introduction

According to the OECD (1998), a tax haven is a jurisdiction that imposes no or only nominal taxes and offers itself as a place to be used by non-residents to escape tax in their country of residence. A tax haven can offer this service because it has laws or administrative practices that prevent the effective exchange of information on taxpayers benefiting from the low-tax jurisdiction.¹ Although a previous literature has modeled tax havens as a benign phenomenon that helps high-tax countries reduce the negative impact of their own suboptimal domestic tax policies, there is considerable concern that the havens are “parasitic” on the tax revenues of the non-haven countries, inducing them to expend real resources in defending their revenue base and in the process reducing the welfare of their residents. This paper develops an equilibrium model of tax havens and tax competition that provides a rigorous framework within which to address why countries are, and should be, concerned about the detrimental effects of havens on their citizen’s welfare.

Policy actions by OECD countries certainly reflect this concern. Before an OECD report issued in 1998, action against tax havens was predominantly unilateral, as exemplified by the introduction in 1962 of the U.S. Subpart F provisions that addressed so-called passive income earned in tax haven countries and not distributed to the United States.² Subsequently many other OECD countries enacted domestic tax rules designed to lessen the attractiveness of tax evasion and avoidance through tax havens.

¹ The OECD report distinguished tax havens from cases in which countries that raise significant revenues from the income tax but have preferential tax regimes for certain kinds of income, generally restricted to non-residents; see footnote 4. This paper is about the kind of tax haven covered by the OECD’s definition.

² This history is recounted in Eden and Kudrle (2005).

The 1998 OECD report concluded that “governments cannot stand back while their tax bases are eroded through the actions of countries which offer taxpayers ways to exploit tax havens [and preferential regimes] to reduce the tax that would otherwise be payable to them.” (p. 37). It offers a long list of recommendations concerning domestic legislation, tax treaties, and international cooperation. In the last category is a recommendation to produce a list of tax-haven countries that would enable non-haven countries to coordinate their responses to the problems created by the havens and to “encourage these jurisdictions to reexamine their policies.” (p. 57) In 2000, the OECD followed up by publishing the names of 35 countries called “non-cooperating tax havens,” which were given one year to enact fundamental reform of their tax systems and broaden the exchange of information with tax authorities or face economic sanctions. By 2005, almost all of the blacklisted tax havens had signed the OECD’s Memorandum of Understanding agreeing to transparency and exchange of information.³

Notably, the 35 designated tax havens are invariably small. Their average population is 284,000, and is 116,000 if one excludes the only two designated countries (Liberia and Panama) whose population exceeds one million. Although the 35 tax havens represent over 15 percent of the world’s countries, their total population comprises just 0.150 percent of the world’s population (0.058 percent excluding Liberia and Panama). Of the 35 designated tax havens, 27 are island nations.⁴

³ Public U.S. support for the OECD initiative flagged after 2000, as exemplified by statements by the Secretary of the Treasury suggesting that the U.S. government was no longer committed to fighting the tax havens. In addition, some other OECD countries such as Ireland, Luxembourg, and Switzerland, have haven-like aspects of their own tax systems, and several other member countries provide privileges to certain tax havens through double tax treaties and other preferential tax regimes. (Eden and Kudrle 2005, p. 123).

⁴ Some countries that levy low corporate tax rates do so in part to attract real investment, knowing that once multinational companies have made such an investment, it is in their interest to use transfer pricing and other strategies to shift taxable income into the low-tax host country and away from other high-tax

In sharp contrast to the longstanding concern among policy makers about the deleterious effects of havens, recent normative economic theory has focused on a potentially beneficial role for tax havens. The starting point is the well-known result that, under certain conditions, a small, open economy should levy no distorting tax on mobile factors such as capital.⁵ Countries do, however, levy distorting taxes on mobile capital, and much of the recent theoretical literature conceives of tax havens as a device to save these countries from themselves, by providing them with a way to move toward the non-distorting tax regime they should, but for some reason cannot, explicitly enact.⁶ For example, in Hong and Smart (2005), citizens of high-tax countries can benefit from haven-related tax planning because it allows them to tax domestic entrepreneurs (in a lump-sum way) without driving away mobile multinational capital. The presence of the haven reduces the (distorting) effective marginal tax rate for any given statutory tax rate.

jurisdictions in which they operate. For example, the analysis of havens in Hines (2005) covers a different set of countries than the OECD list, including some countries, most notably Ireland and Switzerland, that have the kind of dual motivation discussed in this footnote.

⁵ The intuition behind this result is straightforward. All taxes levied in this economy will ultimately be borne by the immobile factors. Given that, it is better to levy taxes directly on the immobile factors; attempting to tax the mobile factors will not change the incidence but will, unlike taxes levied directly on the immobile factors, drive away the mobile capital, thus reducing the productivity and therefore the pre-tax return to the immobile factors. See Gordon (1986) and Bucovetsky and Wilson (1991) for demonstrations that small open economies should not levy distorting source-based taxes.

⁶ A separate literature examines the issue of whether countries would benefit from international agreements that potentially lessen tax competition by restricting the degree to which countries can provide preferential tax treatment to relatively mobile factors. The results are mixed. See Janeba and Peters (1999), Keen (2001), Janeba and Smart (2003) Wilson (2005), and Bucovetsky and Haufler (2008). Most recently, Marceau, Mongrain, and Wilson (2006) demonstrate that rules against preferential treatment enable small countries to compete away mobile capital from larger countries, but that non-preferential regimes are still preferable. A separate literature models information sharing between governments as a strategic variable in tax competition; see, for example, Bacchetta and Espinosa (1995).

Peralta, Wauthy, and van Ypersele (2006) assume that countries cannot directly discriminate the rate of profit taxation of mobile and immobile firms, but a government may optimally decide not to enforce the arm's length principle of transfer pricing in order to host a multinational firm while setting high profit taxes on domestic firms. Similarly, Becker and Fuest (2005) demonstrate that if immobile and mobile firms must be taxed at the same rate, then the government may wish to alter other aspects of the tax code to reduce the effective taxation of the mobile firms, including the use of a pure profits tax and the degree to which capital costs are tax deductible.

The idea that countries should welcome tax havens as a way to overcome their inability to explicitly differentiate the effective tax rate on mobile and immobile capital must be reconciled with the fact that governments of non-haven countries often expend considerable resources to limit the effect of haven transactions on their own tax revenue.⁷ It suggests that these countries do not view havens as a way to overcome exogenous, perhaps politically-motivated, constraints on their tax policy.

This paper develops a model of tax competition in the presence of parasitic tax havens that explains and justifies existing initiatives to limit haven activities. In the model tax havens lead to a wasteful expenditure of resources, both by firms in their participation in havens and by governments in their attempts to enforce their tax codes. In addition, tax havens worsen tax competition problems by causing countries to reduce their tax rates further below levels that are efficient from the viewpoint of all countries combined. Either full or partial elimination of havens is found to be welfare-improving. Indeed, initiatives to limit some, but not all, havens can be designed to raise welfare both in the non-haven countries and in the remaining havens. To demonstrate this last possibility, we model the decision to become a haven and, in so doing, demonstrate that small countries have a greater incentive to become havens.

Our model is designed to capture the role in the world economy of the small, mostly island economies that act as tax havens. For this reason we do not develop a model of symmetric, identical countries, but rather a model in which some countries act as havens and other countries do not—the former are parasitic on the revenues of the latter, in a way we make explicit. Second, we model the real resources that are used up

⁷ One path of reconciliation might be that a country would want to spend resources to limit which companies can take advantage of tax havens (to, presumably, the more mobile ones).

as companies shift taxable income to tax havens and home country governments attempt to limit this shifting. To address this issue, we model tax havens as juridical entrepreneurs that sell protection from national taxation, resulting in what Palan (2002) calls the “commercialization of state sovereignty.” The equilibrium price for this service depends on the demand for such protection, which in turn depends on the tax system, including the resources devoted to tax enforcement by the non-haven countries, and on the technology available to the parasitic havens. Our analysis allows this “price” to take the form of cash or various “in-kind benefits” provided to the tax haven. The activities undertaken by havens facilitate what may be viewed as forms of legal tax avoidance or illegal tax evasion. We do not prejudge their legality and recognize that the dividing line between legal and illegal activities is often blurry. For brevity, however, the term “avoidance” is sometimes used in this paper to cover both types of haven activities.

In addition to examining restrictions on the number of havens, we explicitly model the decentralized use of enforcement activities. The notion that tax enforcement policy is a separate instrument of tax policy that can play a role in tax competition has been recognized in the work of Cremer and Gahvari (1997, 2000). An important insight from this work is that each country has an incentive to enforce its tax base suboptimally, because the resulting reduction in the effective tax rate causes more of the mobile tax base to locate within its borders. Whereas this result may also hold in the current model, we explicitly examine the mix of statutory rates and enforcement levels used to finance a given public good level. Our conclusion is that countries would be better off if they agreed to increase their tax rates and lower enforcement. Doing so would raise the demand for the services provided by tax havens, which would raise the effective price of

these services and thereby discourage their use. Countries fail to take into account this “cost externality” when choosing how vigorously to enforce their tax codes.

The plan of this paper is as follows. We develop the model in the next section, and then devote Section 3 to deriving the equilibrium tax policies for each country. Section 4 demonstrates that eliminating tax havens raises public good levels and improves welfare. The partial elimination of havens is addressed in Section 5, and Section 6 analyzes inefficiencies in tax enforcement activities. In Section 7, the model is extended to include the endogenous determination of the number of tax havens. Section 8 concludes.

2. The Model

We extend a standard model of tax competition to include tax havens.⁸ The economy contains a large number of countries, each containing a fixed number of identical residents, L_i for country i . Each resident possesses one unit of labor and k^* units of capital. The utility function is denoted $u(x, g)$, where x is private consumption and g is consumption of a publicly-provided private good, both of which are normal goods. For brevity, we refer to the latter good as the “public good.”

The capital employed by country i is K_i , with $K_i - k^*L_i$ representing imports of capital. Competitive firms use a constant-returns technology to transform these inputs into a single output. This output is sold to consumers in the form of the private consumption good, and to the government for use as the sole input in the production of the public good. Taxes on immobile labor and mobile capital are used to finance the public good. Although countries differ in size, we will specify a constant-returns

⁸ See Wilson (1999) for a review of the tax competition literature.

technology for collecting and evading taxes that yields equilibrium tax policies that are independent of country size.

The taxation of capital takes the form of a territorial tax on “taxable business income,” defined below. In particular, each government taxes only the capital income earned within its borders.⁹ This assumption is standard in the tax competition literature, and reflects the difficulties that home countries face in effectively taxing foreign-source income.

In standard models that feature perfect competition and constant returns to scale in production, the number of competitive firms is typically indeterminate and irrelevant. For the present case, however, we wish to model tax avoidance at the firm level. Consequently, we assume that investors create firms using one unit of capital per firm, and then these firms hire labor and decide whether to shift income to tax havens.¹⁰ Each firm has access to the same production technology and therefore employs the same labor and produces the same output. Firms differ, however, in the cost of participating in tax havens, as described by a parameter, θ . This parameter can be interpreted as the legal and accounting fees needed to research the relevant tax laws, research the available tax havens, and implement the chosen income-shifting strategy.

To obtain the “concealment services” that havens provide, firms must also incur a variable cost. In particular, we posit a unit price of concealment services, p , which in equilibrium is a function of the worldwide purchases of these services, C . In other words,

⁹ This assumption allows us to sidestep the question of whether havens can benefit capital-exporting countries by reducing the tax collected by host countries, letting the home country collect more revenue for any given excess burden. See Hines and Rice (1994) for an elaboration of this argument.

¹⁰ By limiting the income-shifting opportunities to tax havens, the model does not address the possibility that the non-haven countries might compete for capital by not only lowering their tax rates, but also by offering the types of avoidance services provided by havens. In this case, restrictions on tax havens may increase the attractiveness of low-tax, but non-haven, alternatives, including the kind of preferential regimes discussed in footnote 5.

there is a well-defined inverse supply function for concealment services, $p = p(C)$, which is assumed to be upward-sloping. An interpretation is that there are many “competitive” havens, each of which prices its services at marginal cost.¹¹ As previously noted, havens may be paid in cash or in indirect forms of compensation, such as investments made at favorable terms that facilitate economic growth.

For now, we treat the number of jurisdictions that are tax havens as exogenously fixed. If a country is not a tax haven, then it is often simply referred to as “a country.” For the present analysis, we assume only that the total size of havens is sufficiently small to imply that any net imports or exports of capital between havens and countries are unimportant *relative to the aggregate size of the non-haven countries*. This assumption is consistent with our previous observations that havens tend to be very small jurisdictions. It allows us to follow standard tax competition models by treating the capital employed per worker as fixed for the system of non-haven countries as a whole. Note that the investment flows associated with haven activities may still be important to havens even while they are unimportant to non-haven countries. In Section 7 we extend the model by endogenizing the choice of a jurisdiction to become a haven and shows that only the smaller countries choose to become havens.

The timing of events is as follows. First, each country’s government chooses its tax rates and expenditures on tax enforcement. Next, firms are formed, with capital moving across countries to ensure that a firm’s expected income, calculated net of taxes,

¹¹ Note that this specification may be interpreted more generally by assuming that the production of concealment services requires the use of not just a tax haven, but also the aid of “accountant services” located in a firm’s country of residence. More formally, one could posit a production process whereby accountant and haven services serve as intermediate inputs in the production of concealment services. If there were constant costs in the provision of accountant services (to abstract from issues related to country size, which do not seem important in this context), then all countries would face the same world supply curve for concealment services.

labor expenditures, and expenditures on the concealment of taxable income, are the same everywhere. This expected income is denoted r , which may be interpreted as the expected after-tax return on capital. The realized return is random because investors do not yet know the value of θ . However, when making their investment decisions, investors correctly anticipate wages in each country and the opportunities for concealing income. In the next stage, θ is revealed, output is produced and sold, taxes are paid, and the public good is provided.

Output produced in a country may then be written $Kf(L/K)$, where the production function f relates a firm's output per unit of capital to the labor-capital ratio that it employs, and country subscripts are dropped where doing so would cause no confusion. The income earned by a firm's investors before taxes are paid (or avoided) is given by the before-tax return on capital, $R = f(L/K) - W(L/K)(L/K)$, where $W(L/K)$ is the country's equilibrium wage, which is declining in the labor-capital ratio. Note that R is an increasing function of L/K . Inverting this function yields the capital demand function, $k(R)$, expressed per unit of labor. With R and W both related to L/K , we can also define a factor-price frontier, $W(R)$, which satisfies the requirement that equilibrium profits (output minus labor and capital costs) equal zero.

Capital income is taxed at the statutory rate t , but a firm can lower the tax base, and therefore the average effective tax rate, by first incurring the "set-up cost," θR , which we take to be a fixed fraction of firm size as measured by income, R .¹² For each dollar of income, $s(c, b)$ can be shielded from taxes by making use of c units of concealment services at the cost pc , where b represents the government's enforcement

¹² Making the set-up cost proportional to revenue R simplifies the algebra, because the subsequent purchases of concealment services are also proportional to R ; however, our results are not sensitive to this particular specification.

expenditures per unit of capital.¹³ This function is increasing and strictly concave in c , and declining and convex in b , with $s(0, b) = 0$ and $I > s(c, b) > 0$ for all positive c . In particular, some taxes are paid even when $b = 0$, although the amount may be small (costless “moral suasion”).¹⁴ Finally, we assume that $\partial^2 s / \partial c \partial b < 0$, implying that an increase in b reduces the marginal productivity of c in income-shifting activities, thereby reducing a firm’s optimal purchases of concealment services. Unless specifically indicated, we will consider only interior solutions for both taxpayers and the government, i.e., where b and c are positive.

For a firm that takes advantage of this income-shifting opportunity, after-tax profits are

$$\tilde{r} = R[I - (pc + \theta) - t(I - s)], \quad (1)$$

where the tilde distinguishes this return from its expected value, r , calculated prior to the realization of θ . For ease of notation only, we assume that the costs of participating in tax havens are not deductible from taxable income. Also without loss of generality, we assume that the income shifted to a tax haven is not taxed at all by the haven.

The firm chooses s to maximize \tilde{r} , yielding the first-order condition,

$$t \frac{\partial s}{\partial c} = p. \quad (2)$$

¹³ Equivalently, we could specify a cost function $c(s, b)$. Whereas firms are assumed to directly choose c in the current paper, a previous draft assumed that they chose s , given a nonlinear price function, $p(s)$, designed by tax havens to induce firms to choose s efficiently. The two specifications are effectively equivalent.

¹⁴ This specification avoids discontinuities at $b = 0$, where $s(c, b)$ goes to zero as c goes to zero for $b > 0$, but $s(c, b) = I$ for $b = 0$ and $c > 0$. We assume that $s(c, b)$ is twice continuously differentiable.

As an example, suppose that $s = c^\gamma$, $\gamma < 1$, for a given b and a value of c in some neighborhood of zero. In this case, (2) implies that dc/dt is increasing in t , with $dc/dt = 0$ at $t = 0$. Alternatively, let $s = \int_0^c \frac{1}{\psi + x} dx$, $\psi > 0$, again for a given b and small values of c . For small values of t , we then have a corner solution, where $c = 0$. But for any given t , no matter how small, we may choose ψ sufficiently small to ensure that the chosen c is positive, in which case (2) implies that $dc/dt = 1/p$.¹⁵ This last example suggests that the marginal deadweight loss from an increase in t can be substantial even at low values of t , measured in terms of the resources “wasted” on tax avoidance. As we next see, however, few firms will choose to evade taxes at small values of t .

The benefit that a firm receives from participating in a haven, calculated per dollar of income and not counting the setup cost θ , is the tax saving

$$\Theta = ts - pc. \tag{3}$$

This benefit determines the number of firms that participate in a haven. In particular, all firms with $\theta < \Theta$ choose to participate, whereas those with $\theta > \Theta$ do not. Letting $G(\theta)$ denote the continuous distribution function for θ , the number of firms participating in a tax haven, summed over all countries, is $G(\Theta)k * \sum_{i \in N} L_i$, where N is the set of countries.

With each of these firms purchasing cR units of concealment services, aggregate purchases are $C = cR G(\Theta)k * \sum_{i \in N} L_i$.

Letting $\alpha = G(\Theta)$ denote the share of firms that shift income to havens, we may rearrange (1) and take its expected value to obtain the pre-tax return, R , as the sum of the

¹⁵ We cannot choose $\psi = 0$, because then the integral defining c does not exist.

expected after-tax return, r , the effective tax rate, T , and the social costs associated with capital income tax shifting, D^K :

$$R = r + T + D^K, \quad (4)$$

where

$$T = tR(1 - \alpha s) - b. \quad (5)$$

and

$$D^K = R(\alpha(pc + E(\theta/\theta < \Theta))) + b, \quad (6)$$

where $E(\theta/\theta < \Theta)$ is the expected value of θ , conditional on participation in a tax haven.

The social cost of capital taxation per unit of capital, D^K , consists of government expenditures on enforcement, b , plus the expected costs incurred by a firm to evade taxes.

Using (3)-(6), together with the optimizing behavior of taxpayers, we may define the functions, $T = T(R, t, b, p)$ and $D^K = D^K(R, t, b, p)$. The costs included in D^K are social costs not only from the given country's viewpoint, but also from the viewpoint of all countries combined, because they represent expenditures on real resources.

For future use it will be helpful to invert the function T to obtain $t = t(R, T, b, p)$. By substituting this function into $D^K(R, t, b, p)$ and using the determination of R given by (4), we may redefine the function D^K as $D^K(r, T, b, p)$. The derivative, $D_T^K(r, T, b, p)$, is positive, because a rise in the effective rate T requires an increase in the statutory rate, which induces more firms to participate in havens, and existing participants to increase their concealment purchases. In addition, the higher statutory rate raises the before-tax return, R , which further increases $D^K(r, T, b, p)$, because more income is subject to

avoidance. Note finally that a welfare-maximizing country will choose an enforcement level b to minimize $D^K(r, T, b, p)$. In other words, it will choose the combination of t and b that minimizes this deadweight loss, subject to the constraint that t and b yield the chosen effective rate T . In the case of an interior solution, we may use the first-order condition, $D_b^K(r, T, b, p) = 0$, to define a relation between the optimal value of b and T , given the r and p faced by the country.

To introduce labor taxation into the model, it is essential that we recognize the administrative and compliance costs involved in taxing labor. If this tax could be costlessly collected, then governments would clearly prefer taxes on labor to taxes on capital, which distort investment and, in a small economy open to capital but not labor movement, have similar incidence. Even if we introduced a labor-leisure distortion into the model, the labor tax would still be preferred; as shown by Gordon (1986) and Bucovetsky and Wilson (1991), a small open economy should not tax capital income at source if a tax on (immobile) labor income is available, regardless of the labor supply elasticity. If, for political reasons, government officials must tax wage and capital income at the same statutory rate, then they would have an incentive to allow tax havens to exist, thereby lowering the effective tax on capital towards zero.¹⁶

However, these arguments ignore the administrative costs involved in taxing wage income, including those associated with costly tax evasion and avoidance activities. Standard models predict that employers and employees also face incentives to engage in these activities (see Slemrod and Yitzhaki, 2002, for a review).

¹⁶ This is the logic underlying the “tax-havens-are-good” literature discussed in Section 1.

We simplify the specification of evasion and avoidance activities in the labor market by assuming that each worker's expenditures on these activities depends only on the effective tax rate on a unit of labor, producing a deadweight loss function that is increasing at an increasing rate in the effective tax on labor: $D^L = D^L(\Gamma)$, where $\partial D^L / \partial \Gamma > 0$ and $\partial^2 D^L / \partial \Gamma^2 > 0$ at $\Gamma > 0$.¹⁷ To ensure some use of wage taxation in equilibrium, we assume that $\partial D^L / \partial \Gamma = 0$ at $\Gamma = 0$. The interpretation here is that a small tax rate on wage income (effective and statutory) creates no first-order incentive to evade taxes. Because our main focus is capital taxation, we do not explicitly model tax enforcement for the wage tax, but its costs may be viewed as included in the definitions of D^L and Γ . In the same way that D^K and T raise R above r , D^L and Γ lower a resident's net income:

$$x = rk^* + W(R) - \Gamma - D^L(\Gamma). \quad (7)$$

The government budget constraint requires that the cost of the public good be equal to tax revenue net of enforcement expenditures. Assuming constant returns to scale in the provision of the public good, this cost may be written gL , and the budget constraint may then be expressed, in per capita terms, as follows:

$$g = Tk(R) + \Gamma. \quad (8)$$

¹⁷ Earlier versions of our paper, available upon request, show that the main insights of the current paper hold if this deadweight loss also depends positively on wage income. In addition, the desirability of restricting tax havens extends to cases where the avoidance and evasion of wage taxes depends on the statutory tax rate on capital income. Gordon and MacKie-Mason (1995) emphasize this linkage. In their model, if capital income is not taxed, then taxpayers have the incentive to recharacterize and report wage income as capital income for tax purposes. Raising the capital tax rate, t , reduces this incentive, lowering the deadweight loss from wage taxation. This observation reinforces our finding that the optimal capital tax is positive.

3. Equilibrium Tax Policies

This section demonstrates that countries choose to tax capital, despite its mobility. The optimization problem for a government consists of maximizing the utility of its residents, $u(x, g)$, subject to the government budget constraint [eq. (8)], a resident's budget constraint [eq. (7)], and the equation determining how taxation raises the gross return on capital above the net return [eq. (4)], which we rewrite as follows:

$$R = r + T + D^K(r, T, b, p), \quad (9)$$

Consider now the optimal choice of the taxes on wage and capital income. Replacing x and g in $u(x, g)$ with the expressions given by (7) and (8), and using (9), yields an unconstrained optimization problem with T , b , and Γ as the control variables. The first-order condition for T is derived by differentiating (7) and (8) with respect to T to obtain the marginal rate of transformation between x and g , $(dx/dT)/(dg/dT)$, and then equating this quantity to the marginal rate of substitution between x and g , yielding:

$$\frac{u_g}{u_x} = \frac{1 + D_T^K}{1 - \frac{T}{R} \varepsilon (1 + D_T^K)} \equiv MC^T, \quad (10)$$

where $\varepsilon = -k'(R/k) > 0$, denoting the capital demand elasticity (measured positively), and use is made of the factor-price derivative, $W'(R) = -k$.

Recall that in the standard tax competition model (i.e., where tax evasion and avoidance are absent), the marginal cost of g , MC^T , exceeds the marginal resource cost (normalized to equal one) because each country treats as a cost the outflow of capital resulting from a rise in its tax rate on capital. This outflow represents a positive

externality for other countries, in the form of capital inflows, suggesting that public good provision is inefficiently low (more on this below).

When tax havens exist, the standard tax competition story is incomplete because it ignores several relevant factors. First, increasing T through a higher statutory rate on capital income, t , makes concealment services more valuable to firms. As a result, they respond by increasing their purchases of concealment services: c and s rise. In addition, more firms participate in tax havens, so α rises. These responses cause the required return R to rise more than it would in the absence of tax havens, and the result is a greater outflow of capital, shown in (10) by the marginal loss term, D_T^K , multiplying the capital demand elasticity, ε . The more elastic response of capital to changes in the effective tax rate increases the marginal cost of raising funds in this way. But in addition to this increased elasticity, there is the burden arising directly from the additional resources that go into tax haven activities when the tax rate is raised. Since labor is the immobile factor, it bears this burden in the form of a greater fall in the wage, reflected by the presence of D_T^K in the numerator of the expression for MC^T in (10). For both reasons—the direct burden of additional expenditures on havens, and the increased in the capital elasticity—tax havens tend to raise the marginal cost of public good provision.

As stressed in Mayshar (1991) and Slemrod and Yitzhaki (2002), in an optimal tax system the marginal efficiency cost of funds should not depend on how these funds are obtained at the margin. Thus, the marginal cost of the public good under labor-tax finance at the margin, MC^L , must equal the marginal cost under capital-tax finance, that is $MC^L = MC^T$. Differentiating (7) and (8) with respect to T gives the marginal rate of transformation between x and g , which is MC^T :

$$MC^F = 1 + D_T^L \quad (11)$$

Equating MC^F with MC^T then gives

$$\frac{1 + D_T^K}{1 - \frac{T}{R} \varepsilon (1 + D_T^K)} = 1 + D_T^L > 1. \quad (12)$$

Equation (12) immediately tells us that the capital tax must be positive. If it equaled zero, then the marginal deadweight loss of capital taxation would be zero, in line with the well-known observation that small taxes have zero deadweight losses.¹⁸ Thus, MC^T would equal zero, whereas the positive labor tax would produce a positive MC^F .

The only way to equate these two marginal costs is for both taxes to be positive:

Proposition 1. *Countries tax both labor and capital.*

One final optimality condition is the requirement that the enforcement level minimize deadweight loss: $D_b^K(r, T, b, p) = 0$, for $b > 0$, given the tax variables, as previously explained. To shorten the exposition, we also assume that the equilibrium b is positive, unless stated otherwise.

Figure 1 depicts the equilibrium mix of taxes as the intersection of the two marginal cost curves, MC^T and MC^F (ignore the other line for now), holding fixed g and p and assuming b is always optimally set. We also hold R fixed at its equilibrium level, where $k(R) = k^*$, by adjusting the net return r as the capital tax changes. The horizontal

¹⁸ With $t = 0$ initially, there are no incentives to evade capital income taxes, so no firms participate in tax havens. Thus, $\alpha = c = 0$ in the expression for D^K given by (6), implying that a marginal increase in t has no effect on D^K .

axis measures the share of the given level of public expenditures that is financed with the capital tax, and the optimal mix of taxes is located at the intersection of these two marginal cost curves. Under our assumptions about deadweight losses, MC^T necessarily rises as wage taxation is substituted for capital taxation. We also know that MC^T starts at one and initially rises as the capital tax is increased above one. For simplicity, we limit the analysis to cases where the two curves cross once, which must be the case if taxes are not too high.¹⁹ The height of this intersection determines the marginal cost function, $MC(g, p)$. At positive values of g , $MC(g, p)$ exceeds one, but it falls to one as g goes to zero, since D_T^L and D_T^K go to zero. With this observation as a justification, we assume that $MC(g, p)$ rises with g over the relevant range of taxes.

4. The Undesirability of Tax Havens

We now demonstrate that in our model tax havens are undesirable for non-haven countries. The argument proceeds by eliminating tax havens and showing that, for two reasons, welfare increases. First, each country's residents directly benefit from the productive use of resources that were previously used for income shifting and tax enforcement activities. Second, the marginal cost of the public good declines, inducing countries to increase their public good levels. We shall show that competition for capital implies that the equilibrium public good level remains below the level that is optimal from the combined viewpoint of all countries, and so eliminating tax havens moves the public good level closer to this optimum, increasing welfare. Thus, the following proposition obtains:

¹⁹ Without additional assumptions, we do not have a general proof that MC^T always slopes up. But $D^L(I)$ can be specified to make the slope of MC^T as steep as desired, ensuring a single crossing.

Proposition 2. *The elimination of all tax havens raises the equilibrium level of the public good and increases country welfare.*

Proof. Eliminating havens does not alter factor prices R and $W(R)$ (which are determined by the equilibrium condition, $k(R) = k^*$). For a given g , however, the resulting efficiency gains raise private consumption, x .

But g does change. If it remained at its initial value, then the rise in x would increase the marginal benefit of g , given by u_g/u_x , since g is a normal good. But for a given value of T , the absence of havens would eliminate the marginal deadweight loss term, D_T^K , on the right side of (10), causing MC^T to fall (recall that R does not change). Then, as shown in Figure 1, the decline in MC^T would move its intersection down the MC^T curve, thereby reducing the common value of this marginal cost. With the marginal benefit now greater than the marginal cost of public good provision, equilibrium would be restored through an increase in every country's g , as shown in Fig. 2.

To conclude the proof, we show that this increase in g in every country raises each country's welfare. Set g at its new equilibrium level, where

$$\frac{u_g}{u_x} = \frac{1}{1 - \frac{T}{R}\varepsilon} = 1 + D_T^L > 1, \quad (13)$$

given that both t and τ are optimized. When all countries raise g by increasing these two taxes, no country's capital stock changes, and so the wage rate also remains fixed. Thus, there is no loss in revenue from capital outflows and no change in the deadweight loss from wage taxation; that is, the term $T\varepsilon/R$ drops out of (13), lowering the marginal cost expression given by the middle term to one. Countries therefore provide g at the level

where increasing g by a unit in every country, financed with their chosen increases in t and τ , would provide a marginal benefit, u_g/u_x , that exceeded the marginal cost. It follows that the positive impact of the elimination of tax havens on each country's g raises welfare. Q.E.D

Proposition 2 may appear to run counter to arguments in favor of tax havens, which are based on a presumption that havens *lower* the effective tax rate on mobile capital, thereby reducing the investment distortions associated with a tax system that constrains income from immobile and mobile factors to be taxed at similar, or identical, statutory rates. Note, though, that this argument is not relevant here, because we have endogenized the relative values of these statutory rates by allowing them to be optimally set in an unconstrained way. A lower effective tax on capital can be achieved simply by reducing the statutory rate, and doing so is preferable to allowing tax havens to flourish, because tax havens raise the cost of collecting any given level of taxes on capital income.

Note, though, that even if we simply impose the requirement that capital and wage income be taxed at the same statutory rate, it might still be the case that eliminating tax havens is beneficial. Given our assumption that taxes on wage income induce evasion and avoidance, the optimal tax system involves some taxation of capital income, and so governments will engage in costly enforcement activities to collect this tax. Eliminating havens reduces or eliminates these enforcement costs, but the resulting effective tax rate on capital is presumably too high when capital and wage income must face the same statutory tax rate. These two considerations work in opposite directions, so in the political-constraint scenario we cannot say for sure whether tax havens are good or bad. However, the next section demonstrates that it is always desirable to eliminate *some*

havens, and this result extends to the case in which all income is taxed at the same statutory rate.

5. Partial Elimination of Tax Havens

Partial elimination of tax havens raises some issues that complete elimination does not. In particular, if some, but not all, tax havens are eliminated, then countries are affected by the reduction in the supply of concealment services, because the equilibrium price of these services will increase (see Section 7). The question thus becomes whether country residents are better off when p increases, but not all the way to infinity. This section answers that question in the affirmative.

To establish this result, we need to place restrictions on the form of the income-shifting function, $s(c, b)$. In particular, assume that this function can be written as $s(c/(\gamma + b))$, where $s(0) = 0$, $s'(\cdot) > 0$, and γ is a positive parameter. For small values of this parameter, it is then approximately true that equal percentage changes in concealment services (c) and enforcement expenditures (b) leave unaffected the optimal amount of income shifting. To shorten notation, define $B = \gamma + b$, in which case we may describe $s(c/B)$ as homogeneous of degree zero in c and “adjusted enforcement,” B . Then the first-order condition (2) of a firm’s optimal choice of c becomes:

$$ts' \left(\frac{c}{B} \right) = pB \quad (14)$$

Referring to $s(c/B)$ as the “homogeneous income-shifting function,” we prove the following lemma in the Appendix:

Lemma 1. *For the homogeneous income-shifting function, if $b > 0$ in equilibrium, then a rise in the unit price of concealment services, holding fixed the after-tax return, r , raises a country's welfare.*

By (14), the increase in p enables countries to reduce their enforcement expenditures, b , without causing the amount of concealment services to rise. Since b is financed out of the government budget, countries are then able to increase public good provision or reduce the wage tax.

The behavioral response of countries to a higher p creates externalities through their impact on the after-tax return, r . The proof of Proposition 3 in the Appendix shows that the increase in p increases the equilibrium public good level by shifting down the marginal cost of funds curve, and shifting up the marginal benefit curve. In Figure 2, the new equilibrium public good level is denoted g^{**} . Countries respond to the rise in p by increasing public good provision and their taxation of labor and capital, which drives down r . In the standard tax competition story, welfare rises in every country because no country experiences a capital outflow when their taxes all rise by identical amounts. Instead, r falls enough to keep the before-tax return R unchanged, thereby eliminating incentives for capital to exit any country.

But when tax havens are present, the reduction in r may increase the costs associated with these havens. In particular, the unit tax tR falls as r declines, requiring a higher t to offset the revenue loss. But this higher statutory rate increases incentives to shift income through the use of tax havens. As a result, it appears possible for welfare to fall as each country's public good level rises above the equilibrium value. In other

words, we cannot rule out the possibility that the equilibrium level of public good provision is inefficiently high.

The public good must be underprovided when the number of havens is sufficiently small, because the higher t no longer has much effect on tax haven activities, relative to the fiscal externalities that lead to public good underprovision. Thus, we can say that a large enough elimination of havens must improve welfare (assuming that b remains positive, as required for Lemma 1). In addition, our previous examples suggest that the fiscal externalities leading to public good underprovision will in many cases outweigh the new “avoidance externality” identified above, provided the capital tax is not too high. In particular, recall our examples where $dc/dt = 0$ at $t = 0$. In this case, small taxes create no first-order demand for concealment services, and therefore no first-order participation in tax havens. As a result, the efficiency losses from the fiscal externalities dominate those from capital tax avoidance if t is not too high.

Thus, underprovision of public good remains a relevant problem in economies with both tax competition and tax havens, and reducing the number of tax havens is beneficial because it increases public good provision. Using Lemma 1, we may then state:

Proposition 3. *Assume the homogeneous income-shifting function, and consider an equilibrium where $b > 0$. By increasing the concealment price p , a reduction in the number of havens causes all countries to increase their public good provision. Provided tax competition leads to underprovision of the public good, this reduction in havens must raise welfare.*

As the number of havens is reduced, raising p , it becomes increasingly likely that a corner solution will be reached, where governments realize it is not optimal to pay for enforcement activities because the private costs associated with tax avoidance have become sufficiently high. In this case, our proof of Proposition 3 is no longer valid.²⁰ However, the possibility that havens could be limited this much is perhaps farfetched. We return to the issue of haven reduction in Section 7.

6. Enforcement Expenditures

Instead of attempting to control the number of tax havens, countries could instead coordinate their enforcement activities. If public goods are underprovided, then mandating stricter enforcement might improve welfare in part by leading to additional public good provision. However, such mandates would also affect the mix of taxes and enforcement used to finance the chosen public good level. We next argue that the equilibrium mix (i.e., without coordination) of tax rates and enforcement is inefficient when the supply curve for concealment services is upward-sloping (i.e., when $p'(C) > 0$). In this case, a higher tax rate on capital or a lower enforcement level will increase the equilibrium price of concealment services by increasing the demand for these services. We have already seen that this higher price raises welfare in all countries. One country's policy change causes only a small change in p , but this price change impacts a large number of countries, making its welfare effect non-negligible. This "cost externality" is not found in standard tax competition models. Here, it implies that countries finance

²⁰ The proof builds on Lemma 1 by showing that an increase in p enables b to be reduced so that additional tax revenue is generated, without any changes in incentives to evade taxes, and a reduction in the marginal deadweight loss from the financing of an additional unit of g . For income-shifting functions that do not satisfy our homogeneity assumption, we would need to rule out the possibility that Proposition 3 is reversed by asymmetries in the incentive effects associated with marginal changes in p and b .

their chosen public good supply with an inefficiently high level of enforcement, because they do not take into account that a lower level will, by raising p , benefit all countries.

The next proposition provides an exact sense in which enforcement is inefficiently high. The assumption that $p'(C) > 0$ ensures that an increase in the demand for concealment services raises p , whereas the other three assumptions were previously shown to imply that welfare rises with p .

Proposition 4. *Assume that: (1) the avoidance technology implies a homogeneous income-shifting function; (2) $b > 0$ in the initial equilibrium; (3) tax competition leads to underprovision of the public good; and (4) the supply curve for concealment services is upward-sloping. Then countries acting independently enforce their capital tax collections too stringently. In particular, if each country reduces the enforcement level b by the same amount, while adjusting its capital tax t to keep its cost of capital unchanged, given the equilibrium r and p , then p will rise and all countries will be better off.*

Proof. Suppose first that that a single country raises the statutory rate t but then lowers enforcement b enough to keep $T + D^k$ unchanged, thereby leaving the before-tax return, R , unaffected. In this case, there will be no capital inflow or outflow and therefore none of the resulting externalities. However, both the rise in t and fall in b induce firms to demand more concealment services, driving up the price. If we implement this policy change in every country, p will rise and, as we have seen, all countries will benefit from the higher price, through both its negative impact on the social costs of tax avoidance (Lemma 1), and its positive impact on public good supplies. Q.E.D.

The policy perturbation described in this proposition does not necessarily keep public good supplies fixed, because the proposition encompasses the case where increasing the tax rate on capital reduces the evasion and avoidance of wage taxes. But we can then adjust the wage tax to keep g fixed, giving us a welfare-improving perturbation that finances the equilibrium level of g with less enforcement. In this sense, the financing of the equilibrium public good level is too “enforcement-intensive”.

This proposition qualifies results in previous literature saying that governments compete for capital by reducing their enforcement activities (e.g., Cremer and Gahvari 1997, 2000), and it arises from cost externalities not found in the standard tax competition model. If the supply curve for concealment services were completely elastic ($p'(C) = 0$), then these externalities would disappear, and so capital taxes would be collected using the level of enforcement that is socially optimal for the system of countries as a whole. But our analysis of haven formation in the next section suggests that an upward-sloping supply curve is the norm.

7. Country Size and Tax Havens

We now model the formation of tax havens, in a way that generates an upward-sloping relation between the number of havens and the concealment price, and explains why relatively small countries are more likely to become tax havens.²¹ The basic idea is that the costs incurred in becoming a haven grow with country size, whereas the benefit remains largely unchanged because a country’s productivity in supplying concealment

²¹ We abstract from the fact that there may be heterogeneous characteristics of countries that make them intrinsically more or less attractive as havens. Dharmapala and Hines (2006) argue that one such characteristic is governance: well-governed small countries are, *ceteris paribus*, more likely to be tax havens.

services is unrelated to its size. In other words, what enables a jurisdiction to provide concealment services (i.e., facilitate income shifting) is that it is *a* jurisdiction, not that it is a *large* jurisdiction.

Consider the conditions for a symmetric equilibrium, under which all (non-haven) countries choose the same policies. We continue to assume that each country is small enough to have no significant impact on the after-tax return r and concealment price p . Thus, each country optimizes, conditional on these prices, and their optimal policies imply a before-tax return, $R(p, r)$. In equilibrium, p and r must then equate demand with supply in the capital market:

$$k(R(p, r)) = k^*. \quad (15)$$

Given p , (15) determines a market-clearing r , denoted $r(p)$. Using this function, we may then define a single country's per-capita demand for concealment services as a function of p alone, $d(p)$. Letting $c_i(p)$ denote haven i 's total supply of concealment services, the market-clearing condition for p is:

$$\sum_{i \in N} L_i d(p) = \sum_{i \in H} c_i(p), \quad (16)$$

where N is the set of (non-haven) countries and H is the set of havens.

We shall argue that, under some assumptions, the per-capita benefit of becoming a haven falls with country size. To see this, rank countries by population size so that size L_i rises with i , and assume for simplicity that all residents are identical. Consider first the non-haven countries, which are free to choose any desired tax system. Given the assumptions of constant returns to scale in private and public production, along with

constant returns both in tax evasion and avoidance activities as well as in tax enforcement (as previously specified, for example), the optimal tax system does not depend on the size of the country. Thus, the maximum value of a resident's utility is independent of country i 's population level, L_i . Using the function, $r(p)$, we may define this utility as a function of p alone: $v^n(p)$.

Turning to havens, define $v^i(p, pc)$ as the utility for a resident of a haven i , given a price p for concealment services and a value pc of the services provided by the haven. Suppose first that no concealment services are provided, implying that utility is $v^i(p, 0)$. The difference $v^n(p) - v^i(p, 0)$ may be interpreted as the cost of becoming a haven. In our model, the simplest way to view this cost is that it is the utility reduction associated with the requirement that havens lower their statutory tax rates on capital to inefficiently low levels, which in the prior analysis we have taken to be zero. Other costs might include inefficiencies in the financial system that result from concealment activities, such as the need to reduce the transparency of financial transactions. Once again, we may assume that these (per-capita) costs do not depend on country size, given our constant-returns assumptions: $v^i(p, 0)$ is independent of i . More generally, let us extend this independence property by assuming that $v^i(p, pc)$ takes the form $v(p, pc/L_i)$, reflecting the idea that residents care about per-capita benefits from the provision of concealment services, not total benefits.²²

A haven's choice of concealment services c will depend on the variable costs incurred by providing these services. These costs could be modeled by specifying a cost function for providing these services, and then equating marginal revenue with marginal

²² This function could easily be generalized by assuming that there is some rivalry in the benefits from providing concealment services, but not complete rivalry.

cost. For example, the haven banking system could be viewed as being involved in the production of concealment services, with the chosen level of these services then determined by solving a standard profit-maximization problem. If there are decreasing returns to scale, the resulting profits will rise less than proportionally with haven size, giving an advantage to small havens over large havens.

An alternative view of tax havens is that the incremental resources involved in concealing more income are minor, suggesting that decreasing returns is not at work and raising questions about what factors limit the provision of concealment services. Our view is that if a haven conceals too much revenue, those countries that are losing tax revenue will undertake activities to shut the haven down, acting individually or collectively. To illustrate this mechanism, suppose that $\pi(c)$ denotes the probability that a haven is shut down next period, given the concealment services it provides now. Let $V(p, pc/L_i)$ and $V^n(p)$ denote the expected present discounted values of the utility of a resident of a haven and non-haven, respectively, and assume that there is a cost Z of shutting down the haven and transitioning to a non-haven country. We may then write,

$$V(p, pc_t / L_i) = v(p, pc_t / L_i) + \frac{(1 - \pi(c_t))V(p, pc_{t+1} / L_i) + \pi(c_t)[V^n(p) - Z]}{1 + \rho}. \quad (17)$$

where the subscript t denotes time, and ρ is a discount rate. An interior solution can then be assured by making $\pi(c_t)$ sufficiently convex. This solution is obtained by differentiating $V(p, pc_t/L_i)$ with respect to c_t and setting the derivative equal to zero.

With this setup, it is clear that the maximized value of resident utility is declining with haven size, because the benefits from providing a particular level of concealment services must be spread over a larger population, whereas the probability of losing haven

status, $\pi(c)$, is based not on the size of the country, but rather on the concealment-service level. Letting $V^i(p)$ denote this maximized value for country i , we may therefore conclude that there is a country i^* such that $V^i(p) < (>) V^{i^*}(p)$ for all $i > (<) i^*$, with country i^* indifferent about becoming a haven.²³

Thus, we have found that only the smaller countries choose to become havens. As a result, the world supply curve, $p(C)$, is upward-sloping not only because a higher price induces existing havens to provide more concealment services, but also because it induces marginally larger countries to become havens. In our previous model with a fixed number of havens, only the first source of additional concealment services is present. In the case of a variable number of havens, we may assume that some countries choose to become havens in equilibrium, because reducing the number of havens towards zero drives up the equilibrium price p to the point where $V^i(p) > V^{i^*}(p)$ for some values of i .

We close by relating this model of haven formation to our previous results. Proposition 1—that countries will tax both labor and capital—clearly extends to the case of endogenous havens, because it concerns the tax policies chosen by (non-haven) countries. Next consider Proposition 2, that the elimination of some havens raises the level of public goods and welfare in non-haven countries. With an endogenous number of havens, the complete elimination of havens will improve welfare in all countries that are not initially havens, as well as in the larger havens, which are close to being indifferent about their haven status. However, the countries that were small havens may be worse off, because they had relatively high benefits from their haven status.

²³ To insure exact indifference, we are assuming a continuum of haven sizes as an approximation of a discrete number of such sizes.

Proposition 3 considers an exogenous reduction in the number of tax havens (but not complete elimination), with the resulting reduction in the supply of concealment services raising the equilibrium price of these services. For the endogenous-haven case, Proposition 3 tells us that a sufficiently small reduction in havens will make everyone better off and nobody worse off, provided the larger havens are eliminated first. The largest haven did not benefit at the margin from haven activities, so it will be better off when these activities are eliminated and it takes advantage of the welfare gains associated with the higher p charged by the remaining havens. But these remaining havens also benefit from this higher price. Thus, everyone is better off. This result provides a possible explanation for why international agreements might successfully restrict the number of havens by some small amount, whereas large restrictions are not politically feasible.

Finally, Proposition 4—that a coordinated reduction in enforcement combined with an increase in tax rates could make all countries better off—clearly extends to the endogenous-haven case. If enforcement is reduced and the statutory rate increased, then the higher p not only benefits non-haven countries, but it is also clearly to the advantage of havens. Thus, everyone in the world economy should desire less enforcement and higher statutory rates.

8. Conclusion

Unless territorial capital income taxes are dominated by other taxes, it is optimal for countries to devote resources to defend this revenue base. Tax haven jurisdictions make this more difficult by, in return for some compensation, facilitating tax avoidance in the form of income shifting. Incentives to participate in tax havens rise with capital

income tax rates, and governments react to these incentives not only with enforcement policies, but also by relying more on other revenue sources (taxes on wage income in our model) and reducing their overall levels of public expenditures.

Our analysis justifies concerns about the prevalence of tax havens. In an explicit equilibrium model where jurisdictions independently choose their optimal policies, the elimination of havens makes all non-haven countries better off. When the model is extended to incorporate the decision of a country to become a haven, however, smaller havens may be worse off if forced to give up their haven status. Whereas the elimination of a sufficiently small number of havens will leave all countries better off, the analysis points to the potential difficulties involved in eliminating large numbers of havens, including small ones.

The model presented here points the way to two potentially valuable research directions. One would integrate the key aspect of “havens-are-good” models—sub-optimizing governments—with the key aspects of the model presented here. Another promising research direction would address the dual motivation of some “bricks-and-mortar” low-tax countries that levy low tax rates in part to attract real investment, knowing that the low statutory rate lowers the effective tax rate on investment because it facilitates multinationals companies’ income shifting.

Appendix

Proof of Lemma 1. Applying the envelope theorem, we know that the impact of a rise in p on a country's welfare does not depend on how the common values of b and t change, since they are initially optimized. In particular, we may compute the welfare change by holding t fixed as p rises, and adjusting b in any way we find convenient; the welfare effect will be the same regardless of how we choose to change b . Since (14) tells us that s and c/B stay fixed if pB (and t) does not change, let us therefore reduce b enough to keep pB fixed as p rises, so that:

$$\frac{dB}{dp} = -\frac{B}{p}. \quad (\text{A.1})$$

The constancy of pB and c/B also implies no change in pc , and along with the constancy of s , we can conclude that the number of firms participating in havens stays fixed. It follows that the only reason that the effective rate T changes is that enforcement expenditures decline (see (5)). The resulting fall in T creates a surplus in the government budget, which can then be used to reduce the wage tax. But with r^e and R unchanged (the change in b alone does not affect R), there is then a rise in private income, $x = r^e k^* + w(R)(1 - \Gamma - D^L)$, increasing country welfare. Q.E.D.

Proof of Proposition 3. We need to show that the increasing p raises welfare. Consider first the policy response described in the proof of Lemma 1, where b is reduced as p rises so that pB stays constant. We know from the proof of Lemma 1 that T rises, only because

b falls. As a preliminary step, hold g fixed by taking the revenue generated from the reduced enforcement expenditures and essentially throwing it away: the lower b in the expression for T given by (5) is replaced with $b + w$, where waste w is sufficient to keep T unchanged. Despite this waste, we next show that the marginal cost of public good provision is lower than before and, therefore, countries have an incentive to increase their public good levels, holding w fixed. Eliminating the waste w enables taxes to be reduced, further lowering the marginal cost of public good provision at the initial g . Moreover, the lower taxes increase private consumption, x , which increases the marginal benefit of g , $MB = u_x/u_g$ (assuming g is a normal good). As shown in Figure 2, the optimal level of public good provision rises to g^{**} . Under our assumptions, this greater provision improves welfare.

Consider first the impact of the changes in p and b on the capital-tax-financed marginal cost of the public good, MC^T in (10). By (14), the constancy of pB implies no change in c/B and, consequently, no change in income-shifting, $s(c/B)$, no change in its derivative, and no change in concealment expenditures, pc . Again using (14), we can also conclude that the marginal impact of t on c/B and hence s will be unaffected by these changes in p and B . Although the lower B implies that c will fall less in response to the tax-induced fall in c/B , the change in pc will remain the same, given the higher p . Given these results, neither the number of firms participating in havens, nor the marginal impact of t on these firms, will change. Collecting all of these results, we find that there is no change in the marginal cost of the public good if it is financed at the margin with a rise in the statutory rate t .

On the other hand, the higher p means that a unit rise in b will increase the right side of (14) more than before, leading to a greater fall in c/B and therefore greater fall in s . We may therefore conclude that the marginal cost of the public good is lower than before the price change, if it is financed with increased enforcement at the margin, holding fixed the statutory tax rates. Let MC^b denote this marginal cost. Of course, there is no change when the financing comes from the wage tax. Thus, we have

$$MC^b < MC^T = MC^r. \tag{A.2}$$

The important implication of this result is that the marginal cost of the public good has not risen (assuming optimal financing), although the fall in b has generated additional revenue (denoted w per unit of capital above). As explained above, this surplus in the government budget can be used to lower the tax rates, which further reduces the marginal cost of public good provision at the initial g , while raising the marginal benefit. The resulting rise in the equilibrium g increases welfare. As explained above, the higher g further increases welfare. Q.E.D.

References

- Bacchetta, Philippe and María Paz Espinosa. 1995. "Information Sharing and Tax Competition among Governments." *Journal of International Economics*, 39: 103-121.
- Becker, Johannes and Clemens Fuest. 2005. "Optimal Tax Policy when Firms are Internationally Mobile." CESifo Working Paper 1592, November.
- Bucovetsky, Sam and Andreas Haufler. 2008. "Tax Competition with Endogenous Mobility of Firms: Should Tax Loopholes for Multinationals be Closed?" *Journal of International Economics* 74(1): 188-201.
- Bucovetsky, Sam and John D. Wilson. 1991. "Tax Competition with Two Tax Instruments." *Regional Science and Urban Economics* 21: 333-50.
- Cremer, Helmuth and Fahrouz Gahvari. 1997. "Tax Competition and Tax Evasion." *Nordic Journal of Political Economy* 24: 89-104.
- Cremer, Helmuth and Fahrouz Gahvari. 2000. "Tax Evasion, Fiscal Competition, and Economic Integration." *European Economic Review* 44: 1633-57.
- Dharmapala, Dhammika and James Hines. 2006. "Which Countries Become Tax Havens?" Mimeo. University of Michigan.
- Eden, Lorraine and Robert T. Kudrle. 2005. "Tax Havens: Renegade States in the International Tax Regime?" *Law & Policy* 27(1): 100-127.

- Elitzur, Ramy and Jack Mintz. 1996. "Transfer Pricing Rules and Corporate Tax Competition." *Journal of Public Economics* 60(3): 410-22.
- Gordon, Roger H. 1986. "Taxation of Investment and Saving in the World Economy." *American Economic Review* 76: 1086-1102.
- Gordon, Roger H. and Jeffrey K. MacKie-Mason. 1995. "Why Is There Corporate Taxation in a Small Open Economy? The Role of Transfer Pricing and Income Shifting." In M. Feldstein, J.R. Hines, Jr. and R.G. Hubbard (eds.), *The Effects of Taxation on Multinational Corporations*. Chicago: University of Chicago Press.
- Haufler, Andreas and Guttorm Schjelderup. 2000. "Corporate Tax Systems and Cross Country Profit Shifting." *Oxford Economic Papers* 2: 306-25.
- Hines, James. R. 2005. "Do Tax Havens Flourish?" In J. Poterba (ed.), *Tax Policy and the Economy*. Vol. 19. National Bureau of Economic Research and MIT Press.
- Hines, James R. and Eric Rice. 1994. "Fiscal Paradise: Foreign Tax Havens and American Business." *Quarterly Journal of Economics* 109: 149-82.
- Hong, Qing and Michael Smart. 2005. "In Praise of Tax Havens: International Tax Planning and Foreign Direct Investment." Mimeo, University of Toronto, May 25.
- Janeba, Eckhard and Wolfgang Peters. 1999. "Tax Evasion, Tax Competition, and the Gains from Nondiscrimination: The Case of Interest Taxation in Europe." *The Economic Journal* 109: 93-101.

- Janeba, Eckhard and Michael Smart. 2003. "Is Targeted Tax Competition Less Harmful than its Remedies?" *International Tax and Public Finance* 10: 259-80.
- Keen, Michael. 2001. "Preferential Regimes Can Make Tax Competition Less Harmful." *National Tax Journal* 54: 757-762.
- Marceau, Nicolas, Steve Mongrain, and John D. Wilson. 2006. "On the Efficiency of Tax Havens," Mimeo, Michigan State University.
- Mayshar, Joram. 1991. "Taxation with Costly Administration." *Scandinavian Journal of Economics* 93(1): 75-88.
- Palan, Ronen. 2002. "Tax Havens and the Commercialization of State Sovereignty." *International Organization*, 56(1): 151-176.
- Peralta, Susana, Xavier Wauthy, and Tanguy van Ypersele. 2006. "Should Countries Control International Profit Shifting?" *Journal of International Economics*, 68(10): 24-37.
- Slemrod, Joel and Shlomo Yitzhaki. 2002. "Tax Avoidance, Evasion, and Administration." In A. Auerbach and M. Feldstein (eds.), *Handbook of Public Economics*, Vol. 3, Elsevier Science B.V.
- Wilson, John D. 1999. "Theories of Tax Competition." *National Tax Journal* 52(2): 269-304.
- Wilson, John D. 2005. "Tax Competition with and without Preferential Treatment of a Highly-Mobile Tax Base." In J. Alm, J. Martinez-Vazquez, and M. Rider (eds.), *The Challenges of Tax Reform in a Global Economy*, Springer.

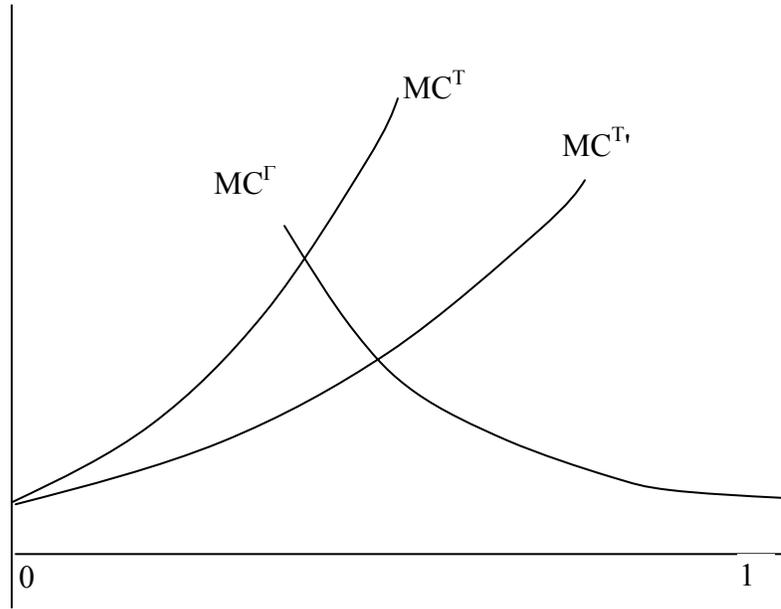


Figure 1

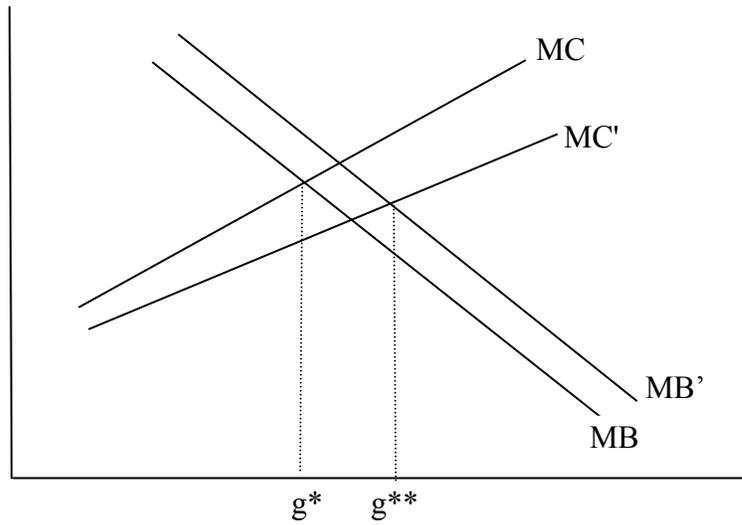


Figure 2