

## TAXATION OF ASSET INCOME IN THE PRESENCE OF A WORLD SECURITIES MARKET

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This paper examines a CAPM model of world security prices in which governments recognize their ability to influence international security prices via their tax treatment of foreign and domestic investors. In this model, governments have the incentive to set tax rates such that investors tend to specialize in domestic securities, and to restrict net capital flows between countries. Each country does this to increase the utility of domestic residents, taking as given the tax policies of other governments, but the net outcome is a reduction in world efficiency and likely a reduction in the utility of all investors.

### 1. Introduction

Whenever a country is large enough to be able to affect the international price of a commodity that it trades in, then it will be tempted to set its policy so as to take advantage of this market power, at least so long as it can ignore any threat of retaliation by other countries. This observation forms the basis for a variety of results in the trade literature. For example, when a country can affect the price of its exported goods, then it will find tariffs or direct restrictions on exports attractive.<sup>1</sup> Similarly, if a country is a net demander (supplier) of capital, and faces a nonhorizontal supply (demand) curve, then it may attempt to restrict its net demand (supply).<sup>2</sup>

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<sup>1</sup>The most obvious example of such export restrictions is OPEC.

<sup>2</sup>See, for example, Jones (1967), Gehrels (1971), Feldstein and Hartman (1979), or Hartman (1985a, 1985b), for further discussion. When a country has market power in both the capital market and the commodity market, as in Jones and Gehrels, interaction effects add complications.

The objective of this paper is to explore characteristics of government tax policy and equilibrium resource allocation when countries are not price-takers in the international market for financial securities. Due to risk aversion, the foreign demand for domestic securities should be downward sloping – foreign investors need more attractive terms to induce them to concentrate their portfolios further in any one security.<sup>3</sup> Similarly, the supply curve of foreign securities should be upward sloping. The above observations suggest that each country would face the incentive to reduce both its net supply of domestic securities to foreigners and its new demand for foreign securities. When each country sets its policy accordingly, the net result will be restricted international trade in financial securities.

Since governments have much more market power than any one firm, it is not surprising that at least large countries should have an incentive to restrict international trade in financial securities. However, we show that as long as a country's equity is not perfectly correlated with that of other countries, it will continue to have market power over the price of the equity of its domestic firms even as the number of countries becomes large. Hence, even small countries have the incentive to restrict foreign ownership of domestic equity. In contrast, only large countries have an incentive to restrict domestic ownership of foreign equity, or to restrict net capital flows.

This intervention can take many forms. Direct control on the outflow of capital is obviously one device. To restrict foreign ownership of domestic equity, a dividend withholding tax on dividends sent to foreigners, or a dividend credit available only to domestic residents, can be used.<sup>4</sup> In addition, a corporate tax can be used to restrict the total supply of equity in the domestic firms. One way to restrict inflows of capital is to impose extra fees on multinational entrants to a country. Each of these policies is commonly observed, and each seems to us to be difficult to explain on other grounds.

Our results also provide one possible explanation for two empirical puzzles. The first is why individual portfolios are so highly concentrated in domestic securities. From a direct application of standard results in finance, one would expect investors to hold a fraction of the world portfolio of risky securities.<sup>5</sup> Our model implies that governments have an incentive to induce investors to concentrate their portfolios in domestic equity.

The second puzzle, posed by Feldstein and Horioka (1980), is why net capital flows between countries are so small. Empirically, a country's savings and investment rates are very closely tied, even though these rates differ dramatically across countries. Our model implies that, at least in large

<sup>3</sup>Helpman and Razin (1978, pp. 141–142) noted in this setting the possible gains from government intervention.

<sup>4</sup>See Booth (1987) for estimates of the degree to which the dividend tax credit concentrates ownership of Canadian securities among Canadian investors.

<sup>5</sup>Adler and Dumas (1983) show empirically that, even taking exchange rate risk into account, the mean-variance efficient portfolio for an investor can be approximated by a combination of nominally risk-free domestic bonds and a share of the world portfolio in equity.

countries, governments have an incentive to restrict net capital flows, to limit adverse movements in the interest rate.

Given the many interrelated decisions about the amount of savings, the amount of domestic real investment, and portfolio choice, we find that the government intervention which maximizes the utility of domestic residents involves use of a wide number of tax instruments. In order to characterize simply the optimal government policy when a country is not a price-taker in financial markets, we assume that asset prices satisfy a CAPM equation. Our analysis of optimal policy is related to various aspects of the papers by Stiglitz (1972), Jensen and Long (1972), Ekern and Wilson (1974) and Leland (1974), which examine the optimal investment behavior of a firm which is not a price-taker in the financial market. While the modelling techniques are often related, however, the questions asked are very different.

The organization of the paper is as follows. In section 2 we describe the basic assumptions of our model, and then derive the characteristics of the market equilibrium in the face of arbitrary tax policy in each country. In section 3 we examine the Nash equilibrium for government policy when each government chooses its tax rates to maximize the welfare of its citizens, taking as given the tax policies of other governments. Since many complicated interaction effects can arise in general, we develop in this section a variety of special cases. In section 4 we provide a discussion of the main results, while these results are summarized in section 5.

## 2. Characteristics of the model

### 2.1. Behavior of individual consumers and individual firms

Our economy consists of  $N$  different countries, and operates for two periods. In each country  $n$ , there are  $I_n$  identical individuals and  $M_n$  identical firms. There is only one good in the economy, which is tradable, which can be used in the first period for either consumption or investment, and which is entirely consumed in the second period.<sup>6</sup>

Each firm  $f$  in country  $n$  invests some amount of capital,  $K_{fn}$ , in the first period and produces a stochastic amount of output,  $\theta_n F_n(K_{fn})$ , in the second period. Here,  $F_n$  is a nonstochastic (weakly) concave function, and  $\theta_n$  is a normally distributed random variable with mean  $\bar{\theta}_n$ . The original capital is assumed to depreciate completely. This output, net of depreciation, is subject to a corporate income tax at rate  $\tau_n$ , but the resulting revenue is assumed to be returned to the firm in a lump sum,  $L_{fn}$ , thereby avoiding any distributional effects from the tax.<sup>7</sup> Therefore the firm's owners receive  $R_{fn} \equiv \theta_n F_n - \tau_n(\theta_n F_n - K_{fn}) + L_{fn} = \theta_n F_n$  in the second period.

<sup>6</sup>We therefore assume purchasing power parity. For a related discussion of use of government policy to take advantage of market power with respect to exchange rates, see Gordon (1988).

<sup>7</sup>See section 4 for a discussion of further issues that arise when tax revenue is not returned as a lump sum to each taxpayer.

The firm in the first period 'goes public' and sells shares of ownership of this return to individual investors. Denote the market value of these shares by  $V_{fn}$ , where  $V_{fn}$  implicitly depends on the amount of capital  $K_{fn}$  that the firm promises to acquire. The initial owners of the firm when it goes public then divide the residual  $V_{fn} - K_{fn}$  among themselves. Since all firms in country  $n$  are identical, we let  $V_n = M_n V_{fn}$  denote their aggregate market value,  $K_n = M_n K_{fn}$  denote their aggregate investment, and  $R_n = M_n R_{fn}$  denote their aggregate return.

Before going public, each firm must decide how much capital it will promise to acquire. We assume that in doing so the firm maximizes the value of the residual  $V_{fn} - K_{fn}$  going to its initial owners.

Each individual  $i$  in country  $n$  starts in the first period with wealth  $W_{in}$  and an initial ownership share  $\bar{s}_{in}^m$  in the firms in each country  $m$ . He must then decide how to divide these initial assets between first-period consumption,  $C_{in}^1$ , final ownership shares,  $s_{in}^m$ , and riskless bonds,  $B_{in}$ . Riskless bonds pay a real interest rate  $r$ , and the net supply of bonds in the world economy is zero. The individual decides on this division of his wealth subject to the budget constraint:

$$C_{in}^1 + B_{in} + \sum_m s_{in}^m V_m = W_{in} + \sum_m \bar{s}_{in}^m (V_m - K_m). \quad (1)$$

In the second period, he receives the income from his investments. However, any interest income is subject to tax at rate  $t_n$ ,<sup>8</sup> while any income from firms in country  $m$  is subject to tax at rate  $g_{mn}$ .<sup>9</sup> The resulting tax revenue is assumed to be returned to the individual by a lump-sum transfer,  $T_{in}$ . Therefore, (random) consumption in the second period,  $C_{in}^2$ , must satisfy:

$$\begin{aligned} C_{in}^2 &= (1 + r(1 - t_n))B_{in} + \sum_m s_{in}^m (R_m - g_{mn}(R_m - V_m)) + T_{in} \\ &= (1 + r)B_{in} + \sum_m s_{in}^m R_m. \end{aligned} \quad (2)$$

Individuals choose values for  $C_{in}^1$  and the various  $s_{in}^m$ , allowing  $B_{in}$  to adjust

<sup>8</sup>For simplicity, we assume that real and not nominal interest is taxable. If nominal interest were taxable at different rates in different countries, there must be differences in the after-tax return on different bonds in equilibrium, creating arbitrage possibilities. No such possibilities exist when real interest is taxable. These arbitrage possibilities could also have been avoided by making all exchange rate gains or losses fully taxable. See Gordon (1986) for further discussion.

<sup>9</sup>Existing tax structures do not normally differentiate directly between income from foreign and domestic securities. However, a number of countries impose a dividend withholding tax on dividends from domestic firms paid to foreigners. If  $R_m$  is defined to equal what foreigners receive on equity, then a withholding tax is equivalent to a subsidy on ownership of domestic equity. Similarly, a number of countries have a dividend credit which is available only to domestic residents on equity of domestic firms. The ability of governments to differentiate between income from different foreign countries is assumed to simplify the notation in the following discussion.

according to the budget constraint, so as to maximize the von Neumann–Morgenstern utility function:

$$\begin{aligned} U(C_{in}^1, C_{in}^2) &= -e^{-b_n C_{in}^1} - \rho_n E e^{-b_n C_{in}^2} \\ &= -e^{-b_n C_{in}^1} - \rho_n e^{-b_n (E C_{in}^2 + (b_n/2) \text{var}(C_{in}^2))}. \end{aligned} \quad (3)$$

Here  $b_n$  is the constant absolute risk aversion parameter,  $\rho_n$  is a time preference parameter, and  $E$  is an expectations operator. The second line of eq. (3) follows from the fact that  $C_{in}^2$  is normally distributed. Assuming that the utility function has constant absolute risk aversion is obviously restrictive, but simplifies the following discussion significantly by allowing us to use mean–variance analysis with a *constant* trade-off between mean and variance.<sup>10</sup>

The resulting first-order conditions, after some simplification, can be expressed as

$$e^{-b_n C_{in}^1} = \rho_n (1 + r(1 - t_n)) E e^{-b_n C_{in}^2} \quad (4a)$$

and

$$\bar{R}_m = (1 + \alpha_{mn} r) V_m + b_n \text{cov}(R_m, C_{in}^2), \quad (4b)$$

where,  $\alpha_{mn} = (1 - t_n)/(1 - g_{mn})$  and  $\bar{R}_m = E R_m$ . Eq. (4a) equates the expected marginal utility of consumption in each period, while eq. (4b) determines the portfolio allocation. Eq. (4b) corresponds closely to the standard CAPM equation with taxes, as appears for example in Brennan (1970) or Gordon and Bradford (1980).

## 2.2. Characteristics of the competitive equilibrium in the world economy

The world economy is in equilibrium when each individual is maximizing utility given market prices, so eqs. (4a) and (4b) are satisfied, when each firm has chosen that capital stock which maximizes the value of its residual claim, and when supply equals demand for each security. One useful characteristic of the resulting equilibrium can be derived by aggregating eq. (4b) across individuals for each security. In particular, if we divide eq. (4b) for each individual by  $b_n$  and sum across individuals, we get:

$$\begin{aligned} \bar{R}_m \sum_n (I_n/b_n) &= \left[ \sum_n (I_n/b_n) + r \sum_n (\alpha_{mn} I_n/b_n) \right] V_m \\ &\quad + \text{cov} \left( R_m, \sum_n I_n C_{in}^2 \right). \end{aligned} \quad (5a)$$

<sup>10</sup>The past studies cited above also assume that decision-makers take the market price of risk as given.

This equation can be re-expressed, using eq. (2), as:

$$\bar{R}_m = (1 + \alpha_m r) V_m + B \text{cov}(R_m, R). \quad (5b)$$

Here  $B \equiv 1/(\sum_n (I_n/b_n))$  provides a measure of the degree of risk aversion of the market as a whole,  $R \equiv \sum_n R_n$  measures the return on the market portfolio, and  $\alpha_m \equiv B \sum_n (\alpha_{mn} I_n/b_n)$  is a weighted average of the tax parameters faced by each individual in the economy, weighted by the inverse of each individual's degree of risk aversion,  $b_n$ . This equation is a simple generalization of the standard CAPM market line in a setting with taxes.

Each firm  $f$  in each country  $n$  chooses its capital stock to maximize the value of  $V_{fn} - K_{fn}$ , which implies that it chooses  $K_{fn}$  such that  $\partial V_{fn}/\partial K_{fn} = 1$ . The firm uses eq. (5b) to forecast the impact of changes in its capital stock on its market value. We assume that the firm is small enough that, in doing so, it takes  $\alpha_m$ ,  $r$ ,  $B$ , and the return on the market portfolio,  $R$ , as given. Its optimal capital stock can therefore be characterized implicitly by

$$(1 - \tau_n) F'_n \bar{P} + \tau_n = (1 + \alpha_n r) + B \text{cov}((1 - \tau_n) F'_n \theta_n, R). \quad (6a)$$

This expression can be simplified using eq. (5b) to yield:

$$\frac{F'_n V_n}{F_n} = 1 + \left( \frac{\tau_n}{1 - \tau_n} \right) \left( \frac{\alpha_n r}{1 + \alpha_n r} \right). \quad (6b)$$

The equation characterizing the equilibrium market interest rate can be derived in a similar fashion. Eq. (4a) implies that

$$(1/b_n) \ln [\rho_n (1 + (1 - t_n) r)] = EC_{in}^2 - (b_n/2) \text{var} C_{in}^2 - C_{in}^1. \quad (7a)$$

But if we multiply each of the eqs. (4b) by  $s_{in}^m$  and sum over  $m$ , we find that

$$b_n \text{var} C_{in}^2 = E \sum_m s_{in}^m R_m - \sum_m s_{in}^m (1 + \alpha_{mn} r) V_m. \quad (7b)$$

Substituting eq. (7b) into eq. (7a), summing over all individuals, and using the budget constraints describing  $C_{in}^1$  and  $C_{in}^2$ , we find that

$$\begin{aligned} & \sum_n (I_n/b_n) \ln [\rho_n (1 + (1 - t_n) r)] \\ &= \frac{1}{2} \sum_m [\bar{R}_m + V_m (1 + \alpha_m^* r)] - \sum_n (I_n W_{in} - K_n), \end{aligned} \quad (8)$$

where  $\alpha_m^* = \sum_n s_{in}^m I_n \alpha_{mn}$  represents the simple average of all the  $\alpha_{mn}$  for each

security. In this equation, the first term on the right-hand side simply measures the certainty equivalent amount of consumption in the second period while the second term measures first-period consumption.

### 3. Characteristics of the Nash equilibrium for government tax policies

While we have assumed that no individual and no firm is large enough to have any market power, each government could well be large enough to affect market prices through its tax policy. We assume that each government sets its tax rates so as to maximize the expected utility of its residents, taking into account any effect of its decisions on market prices. When a government considers what will happen to market prices, we assume that it takes as given the tax rates chosen by other governments, that it assumes all individuals and firms will continue to behave competitively, and that market prices will adjust so that all markets continue to clear. Other more complicated games between governments could be imagined, but this description of policy formulation seems to us to be reasonable.

Since taxes distort the allocation of resources, and any tax revenue is simply returned in a lump-sum fashion to whoever paid it, taxes will seem attractive only if they can be used to aid residents at the expense of nonresidents through favorable changes in market prices. If a government assumes that market prices will continue to satisfy eq. (5b), and that the parameters  $\alpha_m$ ,  $B$ ,  $r$ , and  $R$ , will all remain unaffected by any change in its own tax policy, then it follows quickly that the optimal tax rates are all zero. Without any taxes, residents in the country will choose that allocation which maximizes their utility given these assumptions about market prices, and competitive firms will act in the best interests of their shareholders under these assumptions.

However, when the government in some country  $n$  uses its tax policy to change the domestic use of real resources, the various market prices must adjust so that individuals and firms in the *other* countries are just willing to accept the implied change in the resources available to them. Using the model described in section 2, we can calculate the equilibrium market prices for any given use of resources in country  $n$  by aggregating the first-order conditions (4a) and (4b) across all nonresidents, holding fixed the resource use in country  $n$ . Following the same procedure that we used above, when we aggregated eq. (4b) over all nonresidents, we find that

$$\bar{R}_m = (1 + \alpha_{m, -n} r) V_m + B_{-n} \text{cov}(R_m, R - I_n C_{in}^2). \quad (9a)$$

Here,  $\alpha_{m, -n} = [\sum_{p \neq n} (I_p/b_p) \alpha_{mp}] / [\sum_{p \neq n} (I_p/b_p)]$  is a weighted average of the individual tax parameters, as before, but now averaged over all the nonresidents, while  $B_{-n} = 1 / [\sum_{p \neq n} (I_p/b_p)]$  is the aggregate risk aversion parameter

for the nonresidents. Note also that the appropriate market portfolio now equals the portfolio held by nonresidents. Similarly, if we aggregate eq. (4a) over nonresidents, we find that

$$\sum_{p \neq n} (I_p/b_p) \ln [\rho_p(1 + (1 - t_p)r)] - \frac{1}{2} \sum_m \bar{R}_m(1 - I_n s_{in}^m) + (1 + r)I_n B_{in} - \frac{1}{2} \sum_m [1 + \alpha_m^* r - I_n s_{in}^m(1 + \alpha_{mn} r)] V_m + \sum_{p \neq n} I_p C_{ip}^1 = 0. \quad (9b)$$

When a government considers changing domestic real decisions,  $K_n$ ,  $C_{in}^1$ , and the  $s_{in}^m$ , through its choice of tax rates,  $\tau_n$ ,  $t_n$ , and the  $g_{mn}$ , it should therefore use eqs. (9a) and (9b) to forecast how market prices change. In doing so, it should also take into account how foreign firms revise their investment rates in response to changes in market prices, as described by eq. (6b). The resulting implications for government policy are sufficiently complicated, however, that we will focus on a variety of special cases to shed light on what can happen in the general case.

### 3.1. Market interest rates and foreign investment assumed fixed

We begin by assuming that each government takes as given the market interest rate,  $r$ , and the amounts of capital,  $K_m$ , invested in the other countries, but otherwise use eq. (9a) to forecast the effects of its policies on asset values,  $V_m$ .<sup>11</sup> The government in each country  $n$  therefore chooses the tax rates  $t_n$ ,  $g_{mn}$ , and  $\tau_n$ , to maximize the expected utility of its residents,  $E \sum_i U(C_{in}^1, C_{in}^2)$ , taking into account what eq. (9a) implies about asset prices,  $V_m$ . Rather than solving for the optimal tax rates directly, however, it is algebraically more convenient to solve for the optimal values of  $C_{in}^1$ ,  $K_{fn}$ , and the  $s_{in}^m$ , and then infer from these the implied values of the optimal tax rates.<sup>12</sup> An additional advantage of this approach is that it is easy to extend our results to other sets of tax instruments. Essentially, we can use any set of instruments that allows us to control first-period consumption, domestic capital investment, and portfolio decisions in each country.

We first consider the bond market. Since the government takes the market interest rate as given, and so has no market power in the world bond market, it has no incentive to change the decisions residents make about how much to borrow or lend. Therefore, the desired tax rate on interest income,  $t_n$ , is zero.

<sup>11</sup>These assumptions correspond to those used by Stiglitz (1972) and Jensen and Long (1972) in analyzing the behavior of a firm which is not a price-taker in the securities market.

<sup>12</sup>Roughly speaking, the personal income tax  $t_n$  can be used to control the consumption decision, the corporate income tax  $\tau_n$  can be used to control the investment decision, and the dividend taxes  $g_{mn}$  can be used to control the portfolio decision.



To show this, we differentiate expected utility with respect to  $C_{in}^1$ , giving the first-order condition:<sup>13</sup>

$$e^{-b_n C_{in}^1} = \rho_n (1+r) E e^{-b_n C_{in}^2}. \quad (10)$$

Comparing eqs. (4a) and (10), we find that individuals make the socially optimal decisions about  $C_{in}^1$  only if  $t_n = 0$ .

Eq. (9a) shows, however, that equity purchases by residents of country  $n$  will have an effect on asset prices. Since residents do not take these effects into account, the optimal tax treatment of equity income will be more complicated. The first-order condition with respect to the government's implicit choice of  $s_{in}^m$  is:

$$\bar{R}_m = (1+r)V_m + (1+r)I_n \sum_p (s_{in}^p - \bar{s}_{in}^p) (\partial V_p / \partial s_{in}^m) + b_n \text{cov}(R_m, C_{in}^2). \quad (11)$$

Here we find that to the extent that changing  $s_{in}^m$  raises the price of an asset for which the country is a net demander ( $s_{in}^p > \bar{s}_{in}^p$ ), the opportunity cost of buying a share in that asset, as measured by the right-hand side of eq. (11), is increased. (A similar effect holds if the country is a net supplier of an asset.) Since individual portfolio choices are characterized by eq. (4b), the government can induce individuals to make optimal portfolio choices by enacting tax rates on equity income from each asset such that

$$(\alpha_{mn} - 1)rV_m = (1+r)I_n \sum_p (s_{in}^p - \bar{s}_{in}^p) (\partial V_p / \partial s_{in}^m). \quad (12)$$

To see what happens to asset prices when domestic equity purchases change, we can differentiate eq. (9a) with respect to  $s_{in}^m$  and find that

$$\frac{\partial V_p}{\partial s_{in}^m} = \frac{B_{-n} \text{cov}(R_p, R_m)}{(1 + \alpha_{p,-n} r)}. \quad (13)$$

When country  $n$  purchases more of asset  $m$ , leaving less of this asset for nonresidents, the prices of those assets which are substitutes (have returns which covary positively with that on asset  $m$ ) go up, and conversely. Combining this with eq. (12) we have:

*Implication 1.* The government should discourage ownership of any asset which has positive covariance with assets which the country demands on net or negative covariance with assets which the country supplies on net. It should encourage ownership of assets with the reverse characteristics.

<sup>13</sup>Under our assumption of constant absolute risk aversion, any change in savings due to a change in  $C_{in}^1$  is entirely allocated to  $B_{in}$ , so there is no resulting change in any of the  $V_m$ .

In order to shed further light on the characteristics of this Nash equilibrium in government tax policy, we consider a special case in some detail. In particular, assume that each country is identical in all respects except that the random return on each country's technology is independent. Therefore,  $\text{cov}(R_m, R_n) = 0$  for all  $m \neq n$ .<sup>14</sup> Let  $\text{var}(R_m) = \sigma$  for all  $m$ . In addition, assume that initially the equity in each country's firms is entirely owned by domestic residents, so that  $\bar{s}_{in}^m = 0$  for  $m \neq n$ .

Given this symmetry, we can describe a country's tax policy by the tax parameter used on income from the domestic security,  $\alpha_d$ , and the tax parameter used on any income from foreign securities,  $\alpha_f$ . Similarly, we can let  $s_d$  represent the fraction of each firm owned domestically, and  $s_f$  represent the fraction owned by investors in each foreign country. Since all shares must be owned, we know that  $1 - s_d = (N - 1)s_f$ . Other variables do not vary by country or by asset, so we drop subscripts unless they are needed for clarification.

Under these assumptions, the set of eq. (12) describing equilibrium tax policy become:

$$(\alpha_d - 1)rV = -(1 - s_d)\sigma B \left[ \frac{(1 + r)}{(1 + \alpha_f r)} \right] \quad (14a)$$

and

$$(\alpha_f - 1)rV = s_f \sigma B \left[ \frac{(1 + r)}{(1 + \alpha^* r)} \right], \quad (14b)$$

where  $\alpha^* = [(N - 2)\alpha_f + \alpha_d]/(N - 1)$  is a weighted average of the two tax parameters. Let  $G_d < 0$  and  $G_f > 0$  be the right-hand sides of eqs. (14a) and (14b), respectively, and so represent the size of the optimal tax distortion.

Given our assumptions, the individual's first-order condition for holdings of the domestic security becomes  $\bar{R} = (1 + r)V + G_d + b(s_d/I)\sigma$ , implying that

$$s_d = I(\bar{R} - (1 + r)V - G_d)/(b\sigma). \quad (15a)$$

Similarly, the first-order conditions also imply that

$$s_f = I(\bar{R} - (1 + r)V - G_f)/(b\sigma). \quad (15b)$$

In equilibrium,  $s_d + (N - 1)s_f = 1$ . Substituting the above expressions for  $s_d$  and  $s_f$  into this market-clearing condition, we find that the equilibrium asset

<sup>14</sup>This simplifying assumption of independent shocks across countries, while extreme, is not that inconsistent with the data as reported in Adler and Dumas (1983). The results being derived depend almost entirely on the size of the idiosyncratic shocks, and adding common shocks holding constant the size of the idiosyncratic shocks has almost no effect.

prices must satisfy:

$$\bar{R} = (1+r)V + B\sigma + (G_d + (N-1)G_f)/N. \quad (16)$$

It follows easily from eqs. (14a) and (14b) that this last term is positive. Hence:

*Implication 2.* On net the optimal tax policy will raise the required rate of return on equity, taking into account both domestic subsidies to ownership and foreign taxes.

Substituting this condition for the market-clearing price into eqs. (15a) and (15b), we find that

$$s_d = \frac{1}{N} + \frac{N-1}{N} \frac{(G_f - G_d)I}{b\sigma} \quad (15a')$$

and

$$s_f = \frac{1}{N} - \frac{1}{N} \frac{(G_f - G_d)I}{b\sigma}. \quad (15b')$$

Given the symmetry between countries in this example, without taxes investors in each country would own the fraction  $(1/N)$  of each security. Here, we confirm that in equilibrium with optimal taxes, investors will tend to specialize in the domestic security, since  $G_f - G_d > 0$ .

We can then substitute these asset demand equations (15a') and (15b') into eqs. (14a) and (14b) to solve for  $G_f$  and  $G_d$  in terms of the exogenous parameters of the model. While in general the resulting expressions are a bit messy, if we make the simplifying approximation that  $(1+r)/(1+\alpha^*r) \approx (1+r)/(1+\alpha_f r) \approx 1$ ,<sup>15</sup> then it is easy to confirm that  $G_f \approx B\sigma/(N+1)$ , while  $G_d \approx -B\sigma(N-1)/(N+1)$ . Substituting into eqs. (15a') and (15b'), we find that with optimal taxes:

$$s_d \approx \frac{1}{N} \left[ 1 + \frac{(N-1)}{(N+1)} \right] \quad (15c)$$

and

$$s_f \approx \frac{1}{N} \left[ 1 - \frac{1}{(N+1)} \right]. \quad (15d)$$

<sup>15</sup>These approximations will be very good for large  $N$ .

By inspection of (15c) and (15d):

*Implication 3.* With a large number of countries with independent risks, optimal taxation implies that residents' share of domestic firms would be almost twice as large as without government intervention.

As  $N$  gets larger, the optimal value of  $G_d$  increases in absolute value, though the optimal value of  $G_f$  declines towards zero. Each country remains large relative to the market for its own security, due to the fact that each country's security provides a unique source of diversification, although each country becomes small relative to the market for foreign securities as the number of countries increases.

In contrast to this example, if we assume instead that each country's initial ownership share in each technology also equals its desired final ownership share, so that  $\bar{s}_{in}^m = s_{in}^m$  for all  $m$ , then eq. (12) shows that the optimal value of  $\alpha_{mn}$  equals one for all  $m$  – no trade takes place in securities, so there is no gain from changing the price of any security. This setting is the one examined by Ekern and Wilson (1974) and Leland (1974) when investigating the investment behavior of firms. In general, our results show that the government faces an incentive to restrict international trade in securities. But if no trade were to take place anyway, no intervention is needed to restrict trade further. The greater the trade that would take place without intervention, the larger are the optimal tax rates (in absolute value).

Given its use of taxes to distort individual portfolio decisions, the government will also find it desirable to distort the capital investment decisions of domestic firms. While domestic residents are subsidized to own domestic capital, given the amount invested, the capital investment decision should be made taking into account the true cost of capital, ignoring the subsidy. Therefore, to the extent that ownership is subsidized in order to exploit monopoly power in the international market, the government should impose a corporate tax to offset this distortion in the domestic market.

Formally, the first-order condition with respect to  $K_{fn}$  is

$$(1+r) \left[ \bar{s}_{in}^n + \sum_m (s_{in}^m - \bar{s}_{in}^m) \frac{\partial V_m}{\partial K_{fn}} \right] = \frac{s_{in}^n F'_n}{F_n} (\bar{R}_n - b_n \text{cov}(R_n, C_{in}^2)). \quad (15e)$$

Using eq. (9a) to calculate the changes in asset prices, and simplifying using eqs. (4b) and (12), finally gives:

$$\frac{F'_n V_n}{F_n} = \frac{(1+r) I_n \bar{s}_{in}^n}{(1+r) I_n \bar{s}_{in}^n - r(1 - \alpha_{nn})}. \quad (15f)$$

Comparing this equation with eq. (6b), we find that the optimal value of the corporate tax rate is characterized by

$$\frac{1 + \alpha_n r / (1 - \tau_n)}{1 + \alpha_n r} = \frac{(1 + r) I_n \bar{s}_{in}^n}{(1 + r) I_n \bar{s}_{in}^n - r(1 - \alpha_{nn})}. \quad (16a)$$

Since  $\alpha_{nn} < 1$ , we find that  $\tau_n > 0$ . Therefore, capital investment is discouraged not only because  $\alpha_n > 1$  but also because of the supplementary corporate tax. Since  $1 - \alpha_{nn}$  remains positive even as  $N$  grows without bound, we conclude that  $\tau_n$  will also remain positive in the limit.

If  $I_n \bar{s}_{in}^n = 1$ , so that domestic firms are entirely owned domestically, the interpretation of the optimal value of  $\tau_n$  is straightforward, since eqs. (4b) and (15f) together imply that

$$F'_n \bar{\theta}_n = (1 + r) + b_n \text{cov}(F'_n \theta_n, C_{in}^2). \quad (16b)$$

Tax policy has been designed so that the optimal amount of the domestic lottery,  $\theta_n$ , has been sold to foreigners. Any more of this lottery would be absorbed by domestic residents. As eq. (16b) indicates, further investment in domestic capital is worthwhile until domestic residents are just indifferent between the return on this investment and the return from investing the same amount of resources in risk-free bonds. The corporate tax rate would then be set so as to just counterbalance the subsidy to domestic ownership of equity in domestic firms. But if  $I_n \bar{s}_{in}^n < 1$ , domestic investment should be cut back yet further since some of the loss from not maximizing  $V_n - K_n$  is shared with nonresident initial owners. Summarizing this discussion,

*Implication 4.* If firms are initially domestically owned, the corporate tax rate should be set to neutralize the subsidy to domestic ownership of domestic equity in order to induce optimal investment decisions. However, if firms are partially owned by foreigners, investment should be reduced even further.

### 3.2. *Endogenous foreign investment*

So far, each government has been assumed to take as given the amount of capital invested abroad when it decides on its tax policy. However, whenever asset prices change, the above model suggests that the amount of capital investment will change, and governments might be expected to foresee this.<sup>16</sup> If they do, the above results change in a variety of ways.

<sup>16</sup>Since this response will be more gradual than the response of equity prices to policy changes, forecasting its size would be far more difficult, however.

Intuitively, when the government realizes that foreign investment can change, the perceived supply curve of foreign securities becomes more elastic. Previously, when a country purchased more foreign securities from some country  $m$ , the amount left for nonresidents decreased accordingly and its price went up. This increase in price, however, should cause foreign firms to invest more, attenuating the change in the amount of this lottery,  $\theta_m$ , available to nonresidents, and therefore lessening the required change in the per unit price of the lottery. In fact, we show below that this increase in investment can be sufficient to lead the per unit price to fall.

Developing this argument in a general setting results in sufficiently complicated expressions that we instead examine the special case in which the production function has constant returns to scale, so that  $F''_m = 0$ , in each country. Here, the investment responsiveness is maximized since there are no diminishing returns to inhibit this response. One interpretation of our previous analysis is that we assumed that  $F''_m = -\infty$  in all countries, so that each firm's optimal capital stock is unchanged by policy actions.

Now that the amount available of each lottery,  $\theta_m$ , can change, it will prove convenient to let  $S_{in}^m \equiv s_{in}^m F_m$  represent the number of units purchased of the lottery  $\theta_m$  from firms in country  $m$ , and let  $v_m \equiv V_m/F_m$  represent the market price per unit of this lottery. Similarly, we define  $\bar{S}_{in}^m \equiv \bar{s}_{in}^m F_m$ . Using this notation, we assume that the government chooses values for  $C_{in}^1$ ,  $\tau_n$ , and the  $S_{in}^m$  to maximize the utility of the representative resident, given the effects of policy changes on the prices  $v_m$ .

In order to forecast how policy changes will affect  $v_m$ , the government in each country  $n$  can conclude from eq. (6b) that

$$v_m = \frac{1 + \alpha_m r / (1 - \tau_m)}{(1 + \alpha_m r) F'_m}. \quad (17)$$

Since  $F'_m$  is invariant given the constant returns to scale assumption, and since the government assumes  $r$  is given, as are the  $\tau_m$ , for  $m \neq n$ , the only parameter that can affect  $v_m$  is  $\alpha_m$ , which is a weighted average of the  $\alpha_{mp}$  for all values of  $p$  including  $n$ . Note that even  $\alpha_m$  affects  $v_m$  only if  $\tau_m \neq 0$ .

Since changes in  $C_{in}^1$  still have no effect on asset prices, as seen in eq. (17), it immediately follows that the optimal value of  $t_n$  remains zero. However, each government can affect the value of its domestic firms' assets through  $\tau_n$ . As before, the government will wish to restrict the supply of the domestic security to drive up its price, and in this context will do so by imposing a corporate income tax. To see this, differentiate the utility of each resident with respect to  $\tau_n$ , holding  $C_{in}^1$  and the  $S_{in}^m$  fixed, yielding the first-order condition:

$$\bar{s}_{in}^n \left( \frac{\partial V_n}{\partial \tau_n} - \frac{\partial K_n}{\partial \tau_n} \right) - S_{in}^n \frac{\partial v_n}{\partial \tau_n} = 0. \quad (18a)$$

Using the definition of  $v_n$  and eq. (17), this can be re-expressed as:

$$(\bar{S}_{in}^n - S_{in}^n) \frac{\partial v_n}{\partial \tau_n} + \frac{\bar{s}_{in}^n \tau_n \alpha_n r}{(1 - \tau_n)(1 + \alpha_n r)} \frac{\partial K_n}{\partial \tau_n} = 0. \quad (18b)$$

In order to learn how much  $K_n$  will change, we need to use eq. (9a) to solve for how much foreign purchases of domestic equity change in response to the change in the per unit cost of the domestic lottery, so how much extra capital must be invested to satisfy this change in demand. We find that

$$\frac{\partial K_n}{\partial \tau_n} = - \frac{(1 + \alpha_n r)}{F'_n B_{-n} \text{var}(\theta_n)} \frac{\partial v_n}{\partial \tau_n}. \quad (18c)$$

Substituting eq. (18c) into eq. (18b) and simplifying gives:

$$\frac{\tau_n}{1 - \tau_n} = \frac{(\bar{S}_{in}^n - S_{in}^n)(1 + \alpha_n r) F'_n B_{-n} \text{var}(\theta_n)}{\bar{s}_{in}^n \alpha_n r (1 + \alpha_n r)} \quad (19)$$

As long as each country is a net supplier of the equity of its domestic firms, we conclude that each country will choose to impose a positive corporate income tax in order to drive up the price of domestic equity. Even as the number of countries grows without bound, each country will continue to use a corporate tax. This is because in the limit, as  $N$  grows, we find that

$$\frac{\tau_n}{1 - \tau_n} = (\bar{S}_{in}^n - S_{in}^n) F'_n B \text{var}(\theta_n) / (\bar{s}_{in}^n \alpha_n r). \quad (20)$$

The conditions characterizing the optimal values of the  $S_{in}^m$  also change considerably. Due to the change in notation, the first-order conditions become:

$$\bar{\theta}_m = (1 + r)v_m + (1 + r) \sum_p (S_{in}^p - \bar{S}_{in}^p) (\partial v_p / \partial S_{in}^m) + b_n \text{cov}(\theta_m, C_{in}^2). \quad (11a)$$

As before, the second term on the right-hand side describes the effects arising from the market power of the country, which each individual would ignore. In order to calculate how each of the  $v_p$  change, we first need to solve for the changes in the domestic tax rates  $\alpha_{pn}$  needed to lead residents to change  $S_{in}^m$ , holding everything else fixed. Differentiating the individual's first-order conditions (4b), we find that

$$\frac{\partial \alpha_{pn}}{\partial S_{in}^m} = - \frac{b_n}{rv_p} \text{cov}(\theta_p, \theta_m). \quad (21a)$$

Given the definition of  $\alpha_p$ , we know that  $\partial\alpha_p/\partial S_{in}^m = (BI_n/b_n)\partial\alpha_{pn}/\partial S_{in}^m$ . Differentiating eq. (17) with respect to  $\alpha_p$ , and using the above results, gives:

$$\frac{\partial v_p}{\partial S_{in}^m} = - \frac{BI_n \tau_p \text{cov}(\theta_p, \theta_m)}{(1 + \alpha_p r)(1 - \tau_p + \alpha_p r)}. \quad (21b)$$

This equation indicates that purchasing more of a foreign asset, rather than raising its price and the price of substitute assets as before, now causes these prices to fall – the investment response of firms more than offsets the change in the amount purchased. This occurs since a cut in the tax rate domestic residents face on income from foreign equity, inducing them to purchase more foreign equity, makes it profitable according to eq. (17) for foreign firms to invest until asset prices have been reduced. Essentially the supply of foreign securities has become *downward* sloping. As a result, taxes would now be set to induce individuals to buy more foreign securities.

### 3.3. Endogenous interest rate

So far, we have assumed that the market interest rate is unaffected by policy changes, and so have implicitly assumed that aggregate savings is infinitely elastic with respect to the interest rate. This assumption is clearly unrealistic.<sup>17</sup> In contrast, Jones (1967) assumed that the aggregate supply of capital was fixed when analyzing government policy with respect to capital location. In this subsection we point out briefly how optimal tax rates would change when market interest rates are endogenous, but foreign investment rates are again exogenous.

If changes in some policy instrument  $x$  can affect market interest rates, then the first-order conditions with respect to  $x$  must include an extra term  $(\partial U/\partial r)(\partial r/\partial x)$  to reflect the influence of domestic policy on market interest rates. This effect would be ignored by domestic residents. Let us therefore begin by examining  $\partial U/\partial r$ . Carrying out the differentiation, holding all policy instruments ( $C_{in}^1$ ,  $K_n$ , and  $s_{in}^m$ ) constant but allowing the  $V_m$  to respond, we find that

$$\frac{\partial U}{\partial r} = \rho_n b_n \left[ B_{in} + (1+r) \sum_m (\bar{s}_{in}^m - s_{in}^m) \frac{\partial V_m}{\partial r} \right] E e^{b_n C_{in}^1}. \quad (22a)$$

We know from eq. (9a) that  $\partial V_m/\partial r = -\alpha_{m,-n} V_m/(1 + \alpha_{m,-n} r) < 0$ .<sup>18</sup> If we assume that  $\alpha_{m,-n} = 1$ , as would be approximately true if  $N$  were large, then the sign of  $\partial U/\partial r$  equals the sign of  $B_{in} + \sum_m (s_{in}^m - \bar{s}_{in}^m) V_m = W_{in} - C_{in}^1 -$

<sup>17</sup>See, for example, Hartman (1984).

<sup>18</sup>If, in contrast, we assumed that investment rates were endogenous, and production functions were linear, then this derivative would change sign as well as form.



$\sum_m \bar{s}_{in}^m K_m$ . Thus,  $\partial U/\partial r > 0$  if the country is a net supplier of funds to the world securities market, and conversely.

In order to judge how policy changes would affect market interest rates, a government is assumed to use eq. (9b), which characterizes the market clearing interest rate, conditional on domestic policy choices. The main way in which the government can affect  $r$  is presumably through changing the amount of domestic savings, or equivalently through changing first period consumption. Using eq. (9b), we find that  $\partial r/\partial C_{in}^1 = (2+r)I_n/\Omega$ , where  $\Omega$  represents the partial derivative of the left-hand side of eq. (9b) with respect to  $r$ , holding all economic behavior constant, but taking into account the effects of  $r$  on the other prices  $V_m$ . We assume that  $\Omega > 0$ , so that  $\partial r/\partial C_{in}^1 > 0$ . This implies that the interest rate must be higher in order for nonresidents to be willing to consume less in the first period and more in the second period. Therefore, the effect of first-period consumption on market interest rates makes first-period consumption more attractive when the country is a net supplier of funds, and less attractive when the country is a net demander of funds. As a result, tax policy should be used to restrict the absolute size of capital flows.<sup>19</sup>

*Implication 6.* Interest income should be taxed when the country is a net supplier of funds, in order to make lending less attractive. Similarly, interest income should be subsidized to increase the cost of borrowing from abroad if the country is a net demander of funds.<sup>20</sup>

Calculating the effects of either  $K_n$  or  $s_{in}^m$  on market interest rates leads to sufficiently complicated expressions that we omit them from the paper. However, these expressions suggest that an increase in investment, holding own savings constant, would require a rise in interest rates. Similarly, if  $a_{in}^m$  is increased, nonresidents must be content holding more bonds and less equity which should require a rise in the interest rate. Therefore, if the country is a net demander (supplier) of capital, investments in both real capital and in equity are less (more) attractive due to their effects on market interest rates. Therefore, everything else equal corporate tax rates and tax rates on equity income should be higher (lower) if the country is a net demander (supplier) of capital.

However, as the number of countries gets large, eq. (9b) indicates that each country has less and less effect on market interest rates. Therefore, these additional complications disappear in the limit as the number of countries grows.

<sup>19</sup>See Jones (1967), Hartman (1985b), and Feldstein and Hartman (1979) for similar results.

<sup>20</sup>There could also be an incentive to use government budget deficits (surpluses) to reduce the country's net supply (demand) of capital. In the above model, however, government fiscal policy would have no real effects.

#### 4. Discussion

In deriving these results, we have assumed that any taxes collected are returned lump sum to each taxpayer, so that no redistribution results. If we had allowed for redistributive taxes, two further uses of policy would have appeared. The first use arises when foreigners own some share of the rights to the true profits  $V_n - K_n$ . A country can seize this share by imposing a cash-flow tax on the firm, and returning the resulting revenue not to the firm but to the domestic residents in a lump sum.<sup>21</sup> This incentive raises obvious time consistency and precommitment issues which we attempted to circumvent by not allowing for such a tax.

Another use of redistributive taxes would be to redesign the distribution of returns on marketed securities whenever doing so is advantageous. For example, if  $\alpha_{m,-n} < 1$  for any security, so that market prices reflect heavier tax treatment of interest income than income from equity of country  $m$ , then country  $n$  has the incentive to issue a new type of equity which is simply a portfolio of equity from country  $m$  and bonds.<sup>22</sup> By doing so it converts interest income into equity income, making it more attractive to foreign investors for tax purposes. For domestic equity, the relative importance of the risk-free component of the return can be increased through imposing a cash-flow tax on domestic firms.

Given these two incentives, many types of redistributive taxes would appear attractive to the extent that they can serve one of the above purposes. For example, we found that a withholding tax on dividends paid to foreigners, with the revenue retained domestically, would be used to supplement the taxes previously considered whenever  $\alpha_{n,-n} < 1$ , and the desired tax rate would be larger when  $I_n \bar{s}_{in}^n < 1$ .

In deriving these results, we have also used a somewhat specialized model. In particular, we have assumed that individuals have constant absolute risk aversion, that all security returns are distributed normally, that there are only two periods, and that there is only one physical commodity. Together, these assumptions allow us to use a standard variant of the CAPM model of securities prices. Each of these assumptions clearly simplifies the algebra, but we see no reason that these simplifications should change any of the qualitative conclusions from the model. For example, weakening the assumption of constant absolute risk aversion will imply that policy changes could in principle affect the market risk-aversion parameter  $B$ . However, we suspect that the magnitude of this effect would be small. Allowing for more than one good introduces incentives on governments to take advantage of any market

<sup>21</sup>Mintz (1986) has also pointed out this incentive. As many papers have shown, e.g. Boadway and Bruce (1984), such a tax has no effect on investment decisions, but raises as revenue a fraction of the true profits of the firm.

<sup>22</sup>If  $\alpha_{m,-n} > 1$ , then the chosen portfolio would consist of equity from country  $m$  and debt.

power to affect relative goods prices, raising further complications of a similar sort to those already analyzed.<sup>23</sup>

In the results, we found that taxes will be used to reduce the extent of future *trade* in securities. But no trade need occur if ownership patterns are initially fully diversified. However, even if there is full diversification initially, in a more realistic setting the set of firms would not be static – some existing firms would disappear and some new firms would be created each period. If these new firms are owned primarily by domestic investors when they go public, and if they have a return pattern which is not within the span of existing securities, then we again have a setting where securities will be traded in the future creating an incentive for governments to restrict the amount of this trade.

Of course, our explanation for the lack of international diversification is only one of several possibilities. One simple alternative is that purchase of foreign securities involves greater transactions costs than purchase of domestic securities. This story was developed initially by Black (1974), and explored further by Stulz (1981).<sup>24</sup> However, it is difficult to understand why these costs should be that large. Transactions costs may seem large simply because these markets in foreign securities are so thin, making the explanation for thin trade circular.

Another obvious explanation is tax evasion. Direct foreign investment by individuals cannot easily be monitored by the tax authorities, and capital controls are therefore often imposed, restricting the amount of international diversification. However, foreign real investments by corporate subsidiaries and financial investments handled by domestic financial intermediaries are normally permitted, since they can be monitored more easily by tax authorities. Capital controls used to prevent tax evasion would therefore likely change the form but not the amount of international diversification.

A third, and perhaps important explanation, would be fear of expropriation of foreign investments by the local government. If the probability of expropriation depends on the amount of foreign investment, then not only is there a reduction in the equilibrium amount of foreign investment under competition, but in addition, each new investor in a foreign country imposes a negative externality on previous investors by raising the probability of expropriation. Therefore, each government has the incentive to internalize this externality by further discouraging foreign investments. However, each government would also face the incentive to promise credibly that it will not expropriate foreign investments, so expropriation should occur only to the

<sup>23</sup>For a related argument concerning the incentives a country faces when it can influence real exchange rates, in a model without uncertainty, see Gordon (1988).

<sup>24</sup>In Black's paper, there was an extra transactions *savings* on short sales of foreign securities, leading to peculiar patterns of ownership. In Stulz, short sales of foreign securities also involved extra transactions costs, leading to more conventional results.

degree that these promises cannot be made binding, and even then reputation effects may inhibit expropriation.

Yet another explanation for lack of international diversification is that governments choose various restrictive measures, including tax policy, so as to manipulate exchange rate movements. Formally speaking, this sort of intervention can be analyzed using the same sort of techniques we have used in this paper.

A number of other explanations are certainly possible, including informational asymmetries between investors in different countries, government incentives created by the strategic interactions between firms from different countries, etc. The point of this paper has simply been to explore the implications of one possible story.

## 5. Conclusions

This paper has shown that whenever a country is not a price-taker in the international securities market, then it has an incentive to design its tax policy so as to restrict international trade in these securities. For example, as a number of writers have argued, if a country can affect the prevailing market interest rate through its net demand or supply of funds, then it has an incentive to restrict the size of this net demand or supply. In fact, Summers (1985) has argued that governments do indeed use their fiscal policies to restrict their net demand or supply of funds, or equivalently to restrict the difference between their savings rate and their investment rate. This use of market power may therefore provide one explanation for the observation by Feldstein and Horioka (1980) that among the OECD countries, the difference between a country's savings rate and investment rate tends to be small.<sup>25</sup> We show, however, that this incentive to restrict the net flow of funds is smaller for smaller countries. Indeed, the evidence reported in both Summers (1988) and Obstfeld (1985) is that the savings and investment rates for smaller countries are much less closely tied than are those for larger countries.

In addition, we show that each country faces the incentive to restrict the amount of equity in its domestic firms owned by foreigners and the amount of equity in foreign firms owned by domestic residents. It can do so both by imposing a corporate tax on its domestic firms, to restrict the total supply of their equity, and by imposing a set of taxes on the income its residents receive from equity, to induce them to concentrate their portfolios in domestic equity.<sup>26</sup> This use of market power may therefore also help explain

<sup>25</sup>The model does not provide support, however, for the inference by Feldstein and Horioka that extra domestic savings leads to essentially the same amount of extra domestic investment. Given our assumption of constant absolute risk aversion, at the margin any extra savings in a country, holding its tax policy constant, is used to buy risk-free bonds, and so results in a drop in the world interest rate and an equivalent expansion in investment in all countries.

<sup>26</sup>This last result can change if the amount of capital investment by firms is sufficiently elastic with respect to the market value of its equity.

the very limited degree of international diversification that is observed empirically.

More surprisingly, we show that even small countries have the incentive to restrict the supply of domestic equity available to foreigners, both by reducing the total supply of domestic equity through a corporate income tax and also by reducing the fraction of this total supply available to foreigners by inducing domestic residents to concentrate their portfolios in domestic equity. These results on the design of tax policy in a small open economy are in sharp contrast with those in Gordon (1986), who examined optimal tax policies in a similar model but without uncertainty. Without uncertainty, small countries are price-takers and should not distort corporate investment decisions or individual portfolio decisions even when other sources of tax revenue impose efficiency costs.

As in models of tariff policy, we find that each country, acting in isolation, faces an incentive to distort the allocation of resources (and of risk-bearing) in order to take advantage of its market power. The net result may well be a loss in utility in all countries – if all countries are identical (except for the risk characteristics of domestic production), this is certainly the case. Just as binding agreements to avoid using tariffs (such as GATT) should raise the efficiency of the allocation of resources, binding agreements on tax policy should also be attractive. Unlike the case of tariffs, however, governments normally wish to tax savings and investment independently of attempts to exploit market power in international securities markets. Therefore, formulating an agreement which prevents governments from taking advantage of their market power in the financial securities markets and yet which leaves them adequate flexibility in the design of domestic tax policy may be very difficult.

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