Multinational Firms Mitigate Tax Competition

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by

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Abstract

An increase in the taxation of foreign affiliates reduces domestic investment, as has recently been empirically shown in Becker and Riedel (2012). This paper investigates the implication of this finding for tax competition. It is shown that an increase in the number of multinational firms (in contrast to purely national firms) may actually mitigate tax competition – counter to the popular opinion that multinational firms undermine the national capacity to levy source-based taxes.

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1 Introduction

What happens to a firm's domestic activity if foreign activity is increased? Several recent studies empirically show that an increase in foreign activity (e.g., investment, employment, sales) is associated with an increase in domestic activity.[1] In Becker & Riedel (2012) we provide further evidence for the complementarity of domestic and foreign investment by showing that an increase in foreign taxes is associated with a decrease in domestic investment. In this paper, we explore the implications of this finding for tax competition. If foreign taxes decrease domestic investment instead of increasing it, a central assumption of the classical tax competition literature (starting with Zodrow & Mieszkowski, 1986) is put into question, and the welfare properties of tax competition may fundamentally change.

We build a two-country model with purely national and multinational firms which only differ in the location of their production facilities (purely national firms produce in one country only, multinationals in two countries).[2] If the share of multinational firms is reduced to zero, the model becomes similar to the standard tax competition framework. We demonstrate that an increase in the share of multinational firms may mitigate tax competition in the sense that equilibrium taxes are higher.

2 The model

Consider a world with two countries, $i = a, b$. In each of the two countries, there is a representative household receiving utility from consumption of a homogeneous private good, C_i, and a publicly provided good, G_i. The household's utility function is given by

$$U^i = U\left(C_i, G_i\right) \tag{1}$$

The household is endowed with a fixed amount of savings, denoted by $\bar{k}$, which is invested in the world capital market at an interest rate of r. Moreover, it owns all firms headquartered in the country where it resides. Thus, the household's income is given by firm profits, P, and interest income. Its budget constraint reads

$$C_i = P_i + r\bar{k} \tag{2}$$

In each country, there is a large number of firms normalized to unity. A fraction $\lambda \in [0, 1]$ of firms is multinational, i.e. produces in both countries, the complement $1-\lambda$ is purely national, i.e. produces in one country only. Production needs two inputs, $j = 1, 2$, which both are produced with capital denoted by K for multinational firms and k for national firms. Producing in both countries means that one input good is produced in country a, the other in country b. We assume that one unit of capital can be transformed into one unit of input good. Both types of firms are assumed to produce the same homogeneous output good the price of which is normalized to unity.

To start with, consider the national firms. Output in i is given by $f^i(.)$ and inputs by k_i^1. A national firm's after-tax profits π in country i are given by

$$\pi_i = f^i\left(k_i^1, k_i^2\right) - \left(r + t_i\right)\left(k_i^1 + k_i^2\right) \tag{3}$$

[1] These studies include Desai, Foley & Hines (2005, 2009), Barba Navaretti, Castellani & Disdier (2010) and Simpson (2012).

[2] This assumption allows focussing on one specific aspect of multinationals: the geographically dispersed production structure, although – of course – national and multinational firms differ in many other aspects.

where t_i denotes the source-based unit tax on capital. The firm chooses both capital stocks in order to maximize its profits. The first order conditions are $f_j^i\left(k_i^1, k_i^2\right) = r + t_i$ for $j = 1, 2$ where $f_j^i\left(k_i^1, k_i^2\right) \equiv \partial f\left(k_i^1, k_i^2\right)/\partial k_i^j$.

Now, turn to the multinational firms. With the production function denoted by $F^i\left(K_i^1, K_{-i}^2\right)$ and inputs by K_i^j, after-tax profits Π are given by

$$\Pi_i = F^i\left(K_i^1, K_{-i}^2\right) - (r + t_i) K_i^1 + (r + t_{-i}) K_{-i}^2 \tag{4}$$

The firm chooses K_i^1 and K_{-i}^2 in order to maximize its profits. The profit maximizing stocks of capital are implied by the two first order conditions, $F_1^i\left(K_i^1, K_{-i}^2\right) = r + t_i$ and $F_2^i\left(K_i^1, K_{-i}^2\right) = r + t_{-i}$. Note that, in this model, firms cannot shift profits for tax saving purposes (see the corresponding discussion in Becker & Riedel, 2012).

Governments in both countries are assumed to be benevolent, i.e. to maximize their resident household's utility. They do so by optimally setting the source-based unit tax on capital use, t_i, which is their only tax instrument. The government's budget constraint is given by

$$G_i = \lambda t_i\left(K_i^1 + K_i^2\right) + (1-\lambda) t_i\left(k_i^1 + k_i^2\right) \tag{5}$$

The interest rate is determined on the world capital market. Capital demand is given by the two capital stocks of each firm, national and multinational, in each country, a and b. Capital supply is given by the two savings endowments of the households in each country. In equilibrium, supply has to meet demand:

$$\lambda\left(K_a^1 + K_b^2 + K_b^1 + K_a^2\right) + (1-\lambda)\left(k_a^1 + k_a^2 + k_b^1 + k_b^2\right) = 2\bar{k} \tag{6}$$

where $K_i^j = K_i^j(r, t_i)$ and $k_i^j = k_i^j(r, t_i)$. Differentiating the above equation over r, t_i and t_{-i} yields $\frac{dr}{dt_i} = \frac{dr}{dt_{-i}} = -\frac{1}{2}$.

Optimal tax policy and tax competition

The benevolent government in country i maximizes its resident's utility by optimally choosing t_i, i.e. it solves $\max_{t_i} U^i(C_i, G_i)$ subject to $C_i = \lambda\Pi_i + (1-\lambda)\pi_i + r\bar{k}$ and G_i given in (5). The first order condition is given by

$$\begin{aligned}\frac{dW^i}{dt_i} &= \left(U_G^i - U_C^i\right)\left[\lambda K_i^1 + (1-\lambda)\left(k_i^1 + k_i^2\right)\right] + U_G^i\lambda K_i^2 + \frac{\partial W^i}{\partial r}\frac{dr}{dt_i} \\ &\quad + U_G^i t_i\left[\lambda\left(\frac{dK_i^1}{dt_i} + \frac{dK_i^2}{dt_i}\right) + (1-\lambda)\left(\frac{dk_i^1}{dt_i} + \frac{dk_i^2}{dt_i}\right)\right] = 0\end{aligned} \tag{7}$$

with $\frac{\partial W^i}{\partial r} = -U_C^i\left[\lambda\left(K_i^1 + K_{-i}^2\right) + (1-\lambda)\left(k_i^1 + k_i^2\right) - \bar{k}\right]$ which equals zero under the symmetry assumption. Assume that the above equation holds in both countries, a and b, in a symmetric equilibrium.

The central question of this paper is whether multinational firms make tax competition more or less intense. For this purpose, we consider a variation of the parameter λ. As the Appendix shows, differentiation of $\frac{dW^i}{dt_i} = 0$ and $\frac{dW^{-i}}{dt_{-i}} = 0$ with respect to t_i, t_{-i}, r and λ yields that $\frac{dt_i}{d\lambda}$ has the same sign as $d\left(\frac{dW^i}{dt_i}\right)/d\lambda$ which is given by $\partial\left(\frac{dW^i}{dt_i}\right)/\partial\lambda = U_C^i K_i^2 + U_G^i t_i\left[\frac{dK_i^1}{dt_i} + \frac{dK_i^2}{dt_i} - \frac{dk_i^1}{dt_i} - \frac{dk_i^2}{dt_i}\right]$. Using (A1) to (A4) from the Appendix and assumptions of equal technology and symmetry, the above expression can be rewritten as

$$\frac{\partial}{\partial\lambda}\frac{dW^i}{dt_i} = U^i_C K^2_i + U^i_G t_i \left[\frac{F^i_{12}}{2Z_i} + \frac{f^i_{12}}{2z}\right] \tag{8}$$

where $Z_i =$ and $z_i =$. We can thus state

Proposition 1 *Increasing the share of multinational firms i) unambiguously increases equilibrium tax rates if the two inputs are complements, i.e. if $f^i_{12}, F^i_{12} \geq 0$, ii) decreases equilibrium tax rates if the two inputs are strong substitutes, $f^i_{12}, F^i_{12} < 0$, such that the right hand side of (8) becomes negative.*[3]

Is the tax competition equilibrium described by (7) efficient? To answer this question, we consider a coordinated increase in taxes in both countries, such that $dt_i = dt_{-i} = dt$. The welfare effect in country i is given by $dW = \frac{dW^i}{dt_i}dt_i + \frac{dW^i}{dt_{-ii}}dt_{-i}$. Starting from the uncoordinated tax competition equilibrium in which $\frac{dW^i}{dt_i} = 0$ the welfare effect is given by

$$\frac{dW^i}{dt} = \frac{dW^i}{dt_{-i}} = -U^i_C \lambda K^2_{-i} + U^i_G t_i \left[\lambda\left(\frac{dK^1_i}{dt_{-i}} + \frac{dK^2_i}{dt_{-i}}\right) + (1-\lambda)\left(\frac{dk^1_i}{dt_{-i}} + \frac{dk^2_i}{dt_{-i}}\right)\right] \tag{9}$$

Note firstly that, if $\lambda = 0$, the externality is purely fiscal and unambiguously positive. This implies that tax rates are inefficiently low in the tax competition equilibrium. An increase in the share of multinational firms reduces the externality if $\frac{\partial}{\partial\lambda}\frac{dW^i}{dt_{-i}} < 0$ with $\frac{\partial}{\partial\lambda}\frac{dW^i}{dt_{-i}} = -U^i_C K^2_{-i} + U^i_G t_i \left[\frac{dK^1_i}{dt_{-i}} + \frac{dK^2_i}{dt_{-i}} - \frac{dk^1_i}{dt_{-i}} - \frac{dk^2_i}{dt_{-i}}\right]$. Again, this expression can be simplified using the symmetry assumption to $\frac{\partial}{\partial\lambda}\frac{dW^i}{dt_{-i}} = -U^i_C K^2_{-i} - U^i_G t_i \left[\frac{F^i_{12}}{2Z_i} + \frac{f^i_{12}}{2z}\right]$. Thus, if an increase in λ increases the equilibrium tax rates, it reduces the externality. Thus, $\frac{\partial}{\partial\lambda}\frac{dW^i}{dt_{-i}} = \frac{\partial}{\partial\lambda}\frac{dW^i}{dt_i}$, see equation (8). We can now state

Corollary 2 *Starting from $\lambda = 0$, an increase in the share of multinational firms, λ, (i) improves efficiency if the two inputs are complements, i.e. if $f^i_{12}, F^i_{12} \geq 0$, and ii) deteriorates efficiency if the two inputs are strong substitutes, $f^i_{12}, F^i_{12} < 0$, such that $-U^i_C K^2_{-i} - U^i_G t_i \left[\frac{F^i_{12}}{2Z_i} + \frac{f^i_{12}}{2z}\right] > 0$.*

In Becker & Riedel (2012), we found empirically that $\frac{dK^j_i}{dt_{-i}} < 0$. Thus, in the framework of this model, an increase in the share of multinational firms unambiguously mitigates tax competition. Moreover, if λ approaches unity, tax competition would imply overtaxation. There is something like an 'optimal' level of multinational firm share that renders tax competition efficient.

3 Conclusion

In this paper, we started from the empirical finding that taxes on foreign affiliates reduce domestic investment and asked for the implications for tax competition. We considered a model with purely national and multinational firms and showed that an increase in the share of multinational firms may mitigate tax competition and increase equilibrium tax rates. For the purpose of clarity, we

[3]If $F^i_{12}, f^i_{12} = 0$, the right hand side of (8) is unambiguously positive due to the so-called foreign firm ownership effect, see Huizinga & Nielsen (1997). The existence of multinational firms imply that foreigners own capital in a given jurisdiction. Then, part of the tax burden may be exported which increases the incentive to increase source-based taxes.

abstracted from profit shifting and other aspects of international investment (see Becker, Fuest & Riedel, forthcoming, for an extensive discussion). An implication of the above derived results is that the role of multinational firms for the future of national tax policies may have be revised. Instead of undermining the national capacity of levying source-based taxes, complementarities of headquarters and affiliate production may actually reduce the pressure from international tax competition.

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Appendix

Comparative statics w.r.t. k_i^j and K_i^j

This appendix provides some comparative statics. Differentiating $f_1^i\left(k_i^1, k_i^2\right) = r + t_i$ and $f_2^i\left(k_i^1, k_i^2\right) = r + t_i$ over k_i, t_i and r gives $dk_i^1 = \frac{f_{22}^i - f_{12}^i}{z_i} dr + \frac{f_{22}^i - f_{12}^i}{z_i} dt_i$ and $dk_i^2 = \frac{f_{11}^i - f_{21}^i}{z_i} dr + \frac{f_{11}^i - f_{21}^i}{z_i} dt_i$ where $z_i = f_{11}^i f_{22}^i - f_{12}^i f_{21}^i > 0$, which is required for stability.

Differentiating $F_1^i\left(K_i^1, K_{-i}^2\right) = r + t_i$ and $F_2^i\left(K_i^1, K_{-i}^2\right) = r + t_{-i}$ over K_i, K_{-i}, t_i, t_{-i} and r gives $dK_i^1 = \frac{F_{22}^i - F_{12}^i}{Z_i} dr^i + \frac{F_{22}^i}{Z_i} dt_i - \frac{F_{12}^i}{Z_i} dt_{-i}$ and $dK_{-i}^2 = \frac{F_{11}^i - F_{21}^i}{Z_i} dr - \frac{F_{21}^i}{Z_i} dt_i + \frac{F_{11}^i}{Z_i} dt_{-i}$ where $Z_i = F_{11}^i F_{22}^i - F_{12}^i F_{21}^i > 0$, which is required for stability.

With $\frac{dr}{dt_i} = \frac{dr}{dt_{-i}} = -\frac{1}{2}$, we can then rewrite the above equations as tax effects accounting for interest rate changes:

$$\frac{dk_i^1}{dt_i} = \frac{f_{22}^i - f_{12}^i}{2z_i} \quad \text{and} \quad \frac{dk_i^1}{dt_{-i}} = -\frac{f_{22}^i - f_{12}^i}{2z_i} \tag{A1}$$

$$\frac{dk_i^2}{dt_i} = \frac{f_{11}^i - f_{21}^i}{2z_i} \quad \text{and} \quad \frac{dk_i^2}{dt_{-i}} = -\frac{f_{11}^i - f_{21}^i}{2z_i} \tag{A2}$$

as well as

$$\frac{dK_i^1}{dt_i} = \frac{F_{22}^i + F_{12}^i}{2Z_i} \quad \text{and} \quad \frac{dK_i^1}{dt_{-i}} = -\frac{F_{22}^i + F_{12}^i}{2Z_i} \tag{A3}$$

$$\frac{dK_{-i}^2}{dt_i} = -\frac{F_{11}^i - F_{21}^i}{2Z_i} \quad \text{and} \quad \frac{dK_{-i}^2}{dt_{-i}} = \frac{F_{11}^i - F_{21}^i}{2Z_i} \tag{A4}$$

Comparative statics w.r.t. τ_i

Assume that $\frac{dW^i}{dt_i} = 0$ and $\frac{dW^{-i}}{dt_{-i}} = 0$ describe a symmetric Nash equilibrium. Consider the effect of a small increase in λ on equilibrium tax rates which can be derived by differentiating $\frac{dW^i}{dt_i} = 0$ and $\frac{dW^{-i}}{dt_{-i}} = 0$ with respect to t_i, t_{-i}, r and λ. Due to symmetry, we can simplify the problem using $dt_i = dt_{-i}$, $d\left(\frac{dW^i}{dt_i}\right)/dt_i = d\left(\frac{dW^{-i}}{dt_{-i}}\right)/dt_{-i}$ and $d\left(\frac{dW^i}{dt_i}\right)/dt_{-i} = d\left(\frac{dW^{-i}}{dt_{-i}}\right)/dt_i$. Differentiation then yields

$$\frac{dt_i}{d\lambda} = -\frac{\frac{d\left(\frac{dW^i}{dt_i}\right)}{d\lambda}}{\frac{d\left(\frac{dW^i}{dt_i}\right)}{dt_i} + \frac{d\left(\frac{dW^i}{dt_i}\right)}{dt_{-i}}} \tag{A5}$$

with $\frac{d\left(\frac{dW^i}{dt_i}\right)}{dt_i} + \frac{d\left(\frac{dW^i}{dt_i}\right)}{dt_{-i}} < 0$ which is straightforward to show.

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