Market Access and Tax Competition\textsuperscript{z}

Gianmarco I.P. Ottaviano\textsuperscript{y}  Tanguy van Ypersele\textsuperscript{z}

28 March 2002
Preliminary draft

Abstract

With international externalities, different country sizes, imperfect competition, and trade costs, tax competition for mobile firms is efficiency-enhancing with respect to the free market outcome. Nonetheless, while the latter entails too many firms in the larger country, the former has too many firms in the smaller one. Under both scenarios the resulting inefficiencies in international specialization and trade flows vanish when trade costs are low enough. Otherwise, only international tax coordination can implement the efficient spatial distribution of firms.

Keywords: tax competition, trade, capital mobility, monopolistic competition.


\textsuperscript{x}We are indebted with seminar participants at LACEA 2001 in Montevideo and University of Bologna for helpful comments.

\textsuperscript{y}Università Commerciale “L. Bocconi” Milano and CEPR. Corresponding author: Università Commerciale “L. Bocconi”, Istituto di Economia Politica, via Gobbi 5, 20136 Milano, Italy. E-mail: gianmarco.ottaviano@uni-bocconi.it.

\textsuperscript{z}The University of Namur, CREW, CORE-UCL and CEPR. 8 rempart de la Vierge, 5000 Namur, Belgium, e-mail: tanguy@fundp.ac.be
1 Introduction

Economic integration as we know it dismantles barriers to goods and factors mobility while allowing governments to function independently in most policy areas. In particular, a presumption in favor of this independence seems to be reflected in the founding principles of regional trade agreements in Europe as well as North and South America. All this raises the natural issue whether such independence is indeed a good thing or not.

The present paper investigates that issue from a specific point of view, namely, from the perspective of tax competition for mobile capital. More precisely, it aims at answering three related questions. First, does tax competition distort the international allocation of capital, thus yielding an inefficient international specialization in production? Second, does tax competition distort the pattern of international trade, thus yielding inefficient shipments of goods across countries? Third, if such inefficiencies exist, are they related to the extent of trade integration?

These questions have been explored in various directions. First of all, the presence of international externalities can make tax competition wasteful. This is the case, for example, when a rise in one country's tax rate increases capital supply in other regions due to tax arbitrage by capital owners. As a national government neglects this positive effect on other countries' capital supply, tax rates and public good provisions are inefficiently low. Two caveats are in order. On the one hand, such inefficiency is mitigated even if not removed when countries are able to influence the international remuneration of capital. On the other, though tax competition is globally inefficient, it can nonetheless benefit some countries. For example, when countries are not utility-takers and differ in size, tax rates are higher in larger countries and smaller countries can be better off with than without tax competition ('importance of being small'). Thus, the inefficiency costs of tax competition are unevenly borne by regions with different sizes (Bucovetsky, 1991; Wilson, 1991).

Secondarily, tax competition can be even efficiency-enhancing when firms are imperfectly competitive. Janeba (1998) studies a model in which two countries compete for two duopolists that serve a third market through ex-
ports. When firms are exogenously assigned to different countries, government engage in wasteful export subsidies. On the contrary, when firms are mobile, tax competition drives the tax rates to zero. This result rests on equal-sized countries facing an infinitely elastic supply of capital. In terms of the questions raised above, the assumption of equal sized countries is particularly disturbing in that it rules out international specialization. Moreover, since Janéba (1998) does not consider trade costs, his contribution does not provide any insight on the interaction between trade integration and tax competition.

Imperfect competition together with trade barriers can also reverse the ‘importance of being small’. Haufler and Wooton (1999) consider two countries competing for a monopolist. They show that, even if the larger country ends up imposing higher taxes, it nonetheless wins the competition since trade costs give it a location advantage due to better market access (‘importance of being big’). In other words, what is crucial for size to give an advantage in terms of tax competition is the fact that, with imperfectly competitive firms and trade costs, the larger country faces a lower elasticity of capital supply. This insight is developed in models in which, given two initially identical countries, trade integration causes mobile factors to agglomerate in one country only. Ludema and Wooton (2000) as well as Kind, Midelfart-Knarvik and Schjelderup (2000) show that agglomeration economies generate a locational rent that can be taxed away by the local government without inducing relocation. That is, by fostering agglomeration, trade integration leads to a decrease in the intensity of tax competition. In terms of the questions we raised above, all these models lack a detailed welfare analysis, which makes them silent about the desirability of tax competition. A partial exception is represented by Baldwin and Krugman (2000) who show that international tax coordination via full harmonization or via the introduction of a minimum capital tax generally harms at least one country.

To sum up, the existing literature identifies the basic requirements that a model must satisfy in order to tackle the questions raised above. Such requirements are international externalities, asymmetric sizes, imperfect competition, and trade costs. To the best of our knowledge there exists no model fulfilling all those requirements while providing at the same time a full- fledged global welfare analysis. This is the gap we want to fill in by this paper.

In addition, Anderson and Forslid (1999) show that tax competition per se may act as an agglomeration force.
The paper is organized in six additional sections. The first develops a general equilibrium model in which two countries compete for monopolistically competitive firms à la Ottaviano, Tabuchi and Thisse (2002). Countries have asymmetric sizes and trade is costly so that the larger country provides a better overall market access. Following Persson and Tabellini (1992) taxes exist only to redistribute income, so as to abstract from the efficiency of public goods provision. The second section characterizes the free market outcome showing that it yields a ‘home market effect’: the larger country hosts a more than proportionate share of firms (Helpman and Krugman, 1985). In the third section, this outcome is shown to be inefficient because, unless trade costs are low enough, too many firms are located in the larger country. The fourth section characterizes the tax competitive outcome in which the location of firms is less concentrated than the free market one. Moreover, the fifth section shows that, unless firms are all clustered in one country, tax competition is efficiency-enhancing with respect to the free market. Nonetheless it overshoots in the opposite direction with too many firms located in the smaller country. Under both free market and tax competition the inefficiencies in international specialization and trade flows vanish when trade costs are low enough. Otherwise only international tax coordination can implement the efficient spatial distribution of firms. The sixth section concludes.

2 The model

The economy consists of two countries, H and F, which are endowed with two factors, capital K and labor L. Labor is geographically immobile, its total stock equals L, and it is distributed so that a $\frac{3}{4}$ workers reside and work in country H with $0 < \frac{3}{4} < 1$. Capital is perfectly mobile, its total stock equals K, and it is distributed so that $\frac{3}{4}$ units are owned by country H workers while $\frac{1}{4}$ units are used in country H production with $0 < \frac{1}{4} < 1$. Hence, $(\frac{3}{4} - \frac{1}{4})K > 0 \ (0 < 0)$ measures capital inflows to (outflows from) country H from (to) country F. Finally, we assume that country H is ‘larger’ than country F, that is, $\frac{3}{4} > 1 = 2$.

A. Consumers

Following Ottaviano, Tabuchi, and Thisse (2002), preferences are identical across individuals and captured by a quasi-linear utility function, which
is symmetric as well as quadratic in a continuum of horizontally differentiated varieties \( i \in [0; N] \) and linear in a homogenous good \( O \). The associated indirect utility function is:

\[
V(y; p(i); i = 2 \in [0; N]) = \frac{a^2 N^2}{2b^\#_2} \sum_{i=0}^{N} a \frac{b + cN}{2} \frac{Z^N}{p(i)} + b + cN \frac{Z^N}{0} \frac{p(i)^2}{2} \ (1)
\]

with \( a, b > 0 \) and \( c \geq 0 \). In (1), \( p(i) \) is the price of variety \( i \), \( y \) the consumer’s income, \( q_0 \) her initial endowment of the homogenous good and \( p_0 \) its price. The presence of the term \( \frac{1}{0} [p(i)]^2 \) reflects the consumer’s love for variety, while \( c \) is a direct measure of the substitutability between varieties (\( c = 0 \) means no substitutability). Finally, the initial endowment \( q_0 \) in the homogenous good is assumed large enough for the consumption of the numéraire to be strictly positive at the market equilibrium and optimal solutions.

Applying Roy’s identity to (1) yields the following demand for variety \( i \):

\[
q(i) = a + (b + cN) p_i + c \sum_{j=0}^{N} \frac{p(j)}{p(i)} \ (2)
\]

which shows that the quantity demanded of a variety is a decreasing function of its own price and an increasing function of other varieties prices.

In the sequel, we focus on country \( H \) keeping in mind that things pertaining to country \( F \) can be derived by symmetry. Accordingly, we can use (2) and the assumption of symmetry between varieties to write the individual demands by a consumer in \( H \) for two representative varieties produced in \( H \) and \( F \) respectively:

\[
q_{iH} = a + (b + cN) p_{iH} + cP_H \ (3)
\]

\[
q_{iF} = a + (b + cN) p_{iF} + cP_F \ (4)
\]

where \( p_{iH} (p_{iF}) \) is the price set in \( H (F) \) by a .rm located in \( H \) and

\[
P_H = n_H p_{iH} + n_F p_{iF} \]

\[
P_F = n_H p_{iF} + n_F p_{iF}
\]

Most naturally, \( P_H = N \) and \( P_F = N \) can be interpreted as the price indices prevailing in countries \( H \) and \( F \). Therefore, in a certain market the demand
for a typical variety increases (decreases) if the local price index increases (decreases).

B. Firms

The differentiated varieties and the homogeneous good are supplied by two different sectors, modern and traditional. The modern sector supplies varieties under increasing returns to scale and monopolistic competition. Specifically, the production of any variety requires a fixed amount $k$ of capital $K$. Horizontal differentiation then implies that, in equilibrium, a one-to-one correspondence between varieties and firms so that from now on, we will use the two terms interchangeably. The traditional sector produces a homogeneous good under constant returns to scale and perfect competition. It uses labor $L$ as the only input with one unit of $L$ required to produce one unit of output. This good is freely traded and is chosen as the numéraire ($p_o = 1$).

On the contrary, the varieties of the modern sector are traded at a cost of $\omega$ units of the numéraire per unit shipped between the two countries. Firms are assumed to take advantage of positive trade costs to segment markets, that is, each firm sets a price specific to the market in which its product is sold. This is consistent with empirical evidence that shows that firms succeed to price discriminate between spatially separated markets even within an integrated economic area (Head and Mayer, 2000).

Using (3) and (4), a representative firm in $H$ maximizes profits:

$$\pi_H = p_{HH} \left[ a \frac{\beta}{\beta + cN} (1 - \sigma) + \frac{cP_H}{1 - \sigma} \right] L_{HH} +$$

$$\left( p_{HF} \frac{\omega}{\omega + cN} + \frac{cP_F}{1 - \sigma} \right) L_{HF} -$$

$$\frac{1}{2} k L_{HH}$$

(5)

where $r_H$ is return to capital prevailing in $H$. In so doing, the firm takes the price indices as given: since there is a continuum of firms, each one is negligible in the sense that its action has no impact on the market. At the same time, the market as a whole has a non-negligible impact on each firm’s choice in that each firm must account for the distribution of all firms’ prices through an aggregate statistics (the price index) in order to find its equilibrium price. As a consequence, our market solution is given by a Nash equilibrium with a continuum of players in which prices are interdependent.

Solving the first order conditions for profit maximization with respect to prices yields:

$$p_{HH} = \frac{12a + \omega cN (1 - \sigma)}{2b + cN} \frac{1}{2}$$

(6)
Subtracting $\xi$ from (8) and (9), we see that .rms' prices net of trade costs are positive regardless of the .rms' distribution if and only if

$$\xi < \xi_{\text{trade}} \cdot \frac{2aA}{2bA + cN}$$

The same condition must hold for consumers in F (H) to buy from .rms in H (F), i.e. for the demand (4) evaluated at the prices (8) and (9) to be positive for all $\theta$. From now on, condition (10) is assumed to hold. Hence, we consider a setting in which there is a priori intra-industry trade whatever the distribution of .rms.

Notice that equilibrium prices depend on trade costs, on the total number of active .rms as well as on their distribution between the two countries. In particular, (10) implies that an increase in the number of .rms in the economy leads to lower prices for the same spatial distribution ($\theta; 1_i, \theta$) because there is more competition in each local market. For similar reasons, for given $N$, the prices charged by both local and foreign .rms in H (F) fall when $\theta$ increases (decreases) because local competition gets .erceser. Provided that (10) holds, equilibrium prices also rise when substitutability between varieties falls (lower $c$). Furthermore, home sales rise while foreign sales fall with $\xi$ because of the higher protection enjoyed by domestic .rms.

Finally, it is readily veri...ed that

$$\rho_{HF} - \rho_{HH} = \frac{b + c\theta N}{2b + cN} < \xi$$

which shows that only a fraction of the trade cost is passed on to distant consumers. In particular, freight absorption by .rms located in H is a decreasing function of their relative number. The reason is that as $\theta$ falls, the market in country F becomes more crowded pushing down local prices. As a result, the elasticity of demand for .rms located in H rises on foreign sales while falling on domestic ones. The result is that they .nd it convenient to reduce their operating margins on foreign sales while increasing them on domestic sales (Brander and Krugman, 1983).
3 Free market location

Capital market clearing implies that the number \( n_H \) of firms belonging to the modern sector and located in country \( H \) is equal to:

\[
  n_H = \alpha K = \bar{A}
\]

so that the number of firms in \( F \) is

\[
  n_F = (1 - \alpha) K = \bar{A}
\]

Hence, in each country the number of active firms is determined by the stock of capital that is used locally so that any change in the geographical distribution of firms originates from a corresponding change in the geographical employment of capital. Moreover, (12) and (13) imply that the total number of firms (varieties) in the economy is fixed by endowments and technology and equal to \( N = K = \bar{A} \).

Firms’ entry and exit are free so that profits are zero in equilibrium. Given (12) and (13), the corresponding equilibrium returns to capital are determined by a bidding process among firms which ends when no firm can earn a strictly positive profit at the equilibrium market prices. Substituting (6) and (8) into (5), imposing the zero profit and solving the resulting equation in \( r_H \) yields a quadratic function of \( \alpha \):

\[
  r_H(\alpha) = \frac{\bar{A} + cK}{4(2\bar{A} + cK)^2\bar{A}} [2a\bar{A} + \frac{1}{2} cK (1 - \alpha)]^2 L
\]

The calculation for \( r_F \) also yields a quadratic function of \( \alpha \):

\[
  r_F(\alpha) = \frac{\bar{A} + cK}{4(2\bar{A} + cK)^2\bar{A}} [2a\bar{A} + \frac{1}{2} cK (1 - \alpha)]^2 L
\]

When a firm moves from one country to the other, competition increases in the former and decreases in the latter. Depending on the relative importance of the home and the foreign markets in profits, one effect dominates the other. Standard, but cumbersome, investigations reveal that \( r_H(\alpha) \) is convex and decreasing in \( \alpha \). In other words, the equilibrium return to capital falls
with the local number of ...rms. This effect gets weaker and weaker as the number of local ...rms increases because the larger their number, the weaker the marginal impact of a new entrant on the intensity of local competition. In particular, an increase in \( \alpha \) increases competition in the home market and decreases it on the foreign one. As to home ...rms, since it is the home market that is the most lucrative, it is not surprising that the increase in domestic competition dominates the decrease in foreign competition.

One can also show that \( r_F(\alpha) \) is convex in \( \alpha \) and has a minimum when \( \alpha = 2(a(2\beta \gamma - 1) + \frac{3}{4}b) = cK \beta \). This means that, when \( \frac{3}{4}b \) is large enough, \( r_F(\alpha) \) is rst decreasing and then increasing in \( \alpha \). Intuitively, when \( \alpha \) is small, an increase in \( \alpha \) means an important increase in competition in the foreign market and a small decrease in competition in the local market. When \( \frac{3}{4}b \) is large enough, the H market is important for foreign ...rms. Therefore, the rst effect dominates the second for small values of \( \alpha \): When \( \alpha \) gets larger, the second effect dominates the rst as in the case of the home country.

We are now ready to determine the equilibrium location of ...rms as the outcome of the international allocation of capital. Since it is capital ow that determines the location of ...rms, an equilibrium arises when no capital owner can earn strictly higher returns by changing the country serviced by her capital endowment. This happens for \( 0 < \alpha < 1 \) whenever capital returns are equalized in the two countries:

\[
r_H(\alpha) = r_F(\alpha)
\]

and for \( \alpha = 1 \) \( \alpha = 0 \) whenever \( r_H(1), r_F(1), r_F(0), r_H(0) \). In these latter cases the modern sector is clustered in one country only, with the other country completely specialized in the production of the traditional good.

Plugging (14) as well as the corresponding expression for country F in (16) and solving for \( \alpha \), we obtain the equilibrium location of ...rms:

\[
\alpha^M = \frac{1}{2} + \frac{4a(2\beta \gamma - 1)}{4a(2\beta \gamma - 1) + cK}
\]

Given \( \frac{3}{4}b > 1 \) \( \frac{3}{2} \) and the trade condition (10) that implies \( 2a(2\beta \gamma - 1) + cK > 0 \), \( \alpha^M \) is always larger than \( 1 \) \( \frac{3}{2} \). It is also less than \( 1 \) \( \frac{3}{2} \) as \( \beta \) is larger than

\[
\varepsilon_{\text{cluster}} = \frac{4a(2\beta \gamma - 1)}{2b(2\beta \gamma - 1) + cK}
\]

\( \frac{3}{2} \) Since \( r_H(\alpha) \) is decreasing while \( r_F(\alpha) \) is increasing in \( \alpha \), if they cross, they do so only once.
when \( \chi \) falls short of this threshold the modern sector is clustered inside
country \( H \) and country \( F \) is completely specialized in the production of the
traditional good. Therefore, the incomplete specialization of \( F \) is compatible
with international trade flows only if \( \chi_{\text{trade}} > \chi_{\text{cluster}} \) i.e.

\[
\frac{3}{4} < \frac{1}{2} + \frac{cK}{4(bA + cK)}
\]

which shows that the modern sector is more likely to cluster the larger country
\( H \) (larger \( \frac{3}{4} \), the lower the substitutability of varieties (lower \( c \)), the higher
the degree of returns to scale (larger \( A \)). When (19) is violated trade always
leads to complete specialization of \( F \) in the production of the traditional
good. For example, this is always the case with asymmetric countries (\( \frac{3}{4} > 1 = 2 \)) when \( \chi \) are monopolists (\( c = 0 \)).

**Proposition 1** When trade barriers are zero, the equilibrium location of
\( \chi \)s and capital is indeterminate.

When trade barriers are positive, two alternative scenarios arise:
(1) if \( 0 < \chi < \chi_{\text{cluster}} \), all \( \chi \)s agglomerate in the larger country (\( \omega^M = 1 \));
(2) if \( \chi_{\text{cluster}} < \chi < \chi_{\text{trade}} \), while some \( \chi \)s are located also in the smaller
country, the larger country hosts a more than proportionate share of them
(‘home-market effect’: \( 1 = 2 < \frac{3}{4} < \omega^M \)).

We can evaluate capital returns for positive trade costs. When \( 0 < \chi < \chi_{\text{cluster}} \), all \( \chi \)s are clustered in country \( H \). Setting \( \omega^M = 1 \) in (14) yields:

\[
r^M_M = \frac{L(bA + cK)}{(2bA + cK)^2}[a^{2\frac{3}{4}} + (a \chi b)^2(1 - \frac{3}{4})]
\]

where the equilibrium capital return \( r^M_M \) is a decreasing function of trans-
portation costs and an increasing function of the relative size of country \( H \).

When \( \chi_{\text{cluster}} < \chi < \chi_{\text{trade}} \), the equilibrium return to capital can be found
by substituting (17) into (14):

\[
r^M_M = \frac{L(bA + cK)[16A^2(2a \chi b)^{2\frac{3}{4}} + (2bA + cK)^2]}{16A^2(2bA + cK)^2}
\]

Expression (20) is a concave function of \( \frac{3}{4} \) with a maximum at \( \frac{3}{4} = 1 = 2 \).
The more asymmetric the endowment of the two countries, the lower the
remuneration of capital because spatial competition is tougher. By (17), a
symmetric endowment implies $^oM = 1 \Rightarrow 2$. Then, (11) shows that freight absorption equals $p_{HF} = p_{HH} \Rightarrow 2$, which is well known to be what a monopolist would deliver when facing a linear demand. In other words, when countries have identical sizes spatial competition is the weakest.

Moreover, (20) is a convex function of $\zeta$. It has a minimum for some $\zeta \in [0, \zeta_{\text{trade}}]$. The reason is that, when ..rms are not monopolist ($c > 0$) high trade costs relax competition so that operating pro..ts tend to rise. Thus, for $c > 0$, reducing trade costs from an already low level increases capital return because the positive effect of less freight to be absorbed dominates the negative effect of tougher competition. The opposite is true starting from a high $\zeta$.

4 Efficient location

In principle the model has two potential sources of ine..ciency. On the one hand, when pricing above marginal cost, ..rms do not take into account the social loss in terms of consumer surplus. On the other, when choosing location, they do not consider the impact of their decisions on the intensity of spatial competition. Notice, however, that the total number of ..rms $N$ is efficient since, as a consequence of (12) and (13), that number is determined by the total endowment of $K$ and the technology parameter $\bar{A}$.

To abstract from market power distortions that will be present with tax competition, in the present welfare analysis we take monopolistic pricing as given. In other words, we consider the choice of a second-best planner who is able to assign any number of modern ..rms to a speci..c region but is unable to use lump-sum transfers from workers to ..rms to implement marginal cost pricing. In this case, the planner chooses $^o$ in order to maximize the sum of all consumers’ indirect utilities, wherever they reside, evaluated at market prices (6)-(9):

$$W(\zeta) = S_H(\zeta) \frac{3}{4} L + S_F(\zeta) (1 - i) \frac{3}{4} L + r_H(\zeta) i K + r_F(\zeta) (1 - i) \zeta K + \text{constant}$$

Where $S_H(\zeta)$ and $S_F(\zeta)$ are individual consumer surpluses in the two countries associated with the equilibrium prices (6) and (9). Speci..cally, by (1) we have:

$$S_H(\zeta) = \frac{a^2 K}{2bA} i \frac{aK}{A} \left[ \zeta p_{HH} + (1 - i) \zeta p_{HF} \right]$$
This expression can be shown to be quadratic in $\theta$. In particular, differentiating it twice with respect to $\theta$ reveals that $S_H(\theta)$ is concave. Furthermore, (10) implies that $S_H(\theta)$ is always increasing in $\theta$ over the interval $[0; 1]$. Hence, as more ...ms enter in $H$, the surplus of residents rises because local prices fall. However, this effect gets weaker and weaker as the number of local ...ms increases. A symmetric expression holds for consumer surplus in the foreign country.

Solving the ...rst order condition yields the second-best spatial distribution of modern ...ms:

$$\frac{\theta_S - \theta_M}{\theta_S - \theta_H} = \frac{\theta(2a_i \theta - b)(2b\theta + cK)(2\theta - 1)}{\theta(b\theta + 3cK)}$$

(23)

where the ratio on the right hand side is positive by (10). Moreover, it can be easily checked that $\theta_S > \frac{\theta}{2}$. Thus, we have $\frac{\theta}{2} < \theta_S < \theta_M$ which implies that the market outcome leads to too much concentration with respect to the second-best allocation. Equation (23) also shows that the discrepancy between $\theta_M$ and $\theta_S$ grow as $\theta$ falls: economic integration widens the gap between market and efficient outcomes.

When trade costs are low enough, also the planner would like to have all ...ms in the larger region. This is indeed the case whenever $\theta$ falls below the following threshold:

$$\theta_S^{cluster} = \frac{8a(3b\theta + cK)(2\theta - 1)}{12b\theta^2 (2\theta - 1) + cK (4b(2\theta + 1) + 3cK)}$$

(24)

which is smaller than $\theta_S^{cluster}$, implying that there is an interval of trade costs $(\theta_S^{cluster} < \theta < \theta_S^{cluster})$ such that all ...ms cluster in $H$ at the market outcome while they should not from a second-best perspective.

These results can be summarized as follows:

**Proposition 2** When trade barriers are zero, the optimal location of ...ms and capital is indeterminate.

When trade barriers are positive, two alternative scenarios arise:

1. **Proposition 2** When trade barriers are zero, the optimal location of ...ms and capital is indeterminate.

When trade barriers are positive, two alternative scenarios arise:
(i) if $0 < \delta < \xi^S_{\text{cluster}}$ it is optimal to have all ..rms agglomerated in the larger country ($^{\text{oM}}_M = 1$).

(ii) if $\xi^S_{\text{cluster}} < \delta < \xi_{\text{trade}}$, while some ..rms are located also in the smaller country, it is optimal for the larger country to host a more than proportionate share of them ('home-market effect: $1 = 2 < \frac{3\delta}{\xi^S_M}$).

Moreover:

**Proposition 3** The efficiency properties of the market outcome differ depending on the level of trade costs. In particular:

(i) if $0 < \delta < \xi^S_{\text{cluster}}$ the market outcome and the optimum coincide;

(ii) if $\xi^S_{\text{cluster}} < \delta < \xi_{\text{cluster}}$ the market outcome yields complete clustering of ..rms in the larger country while the optimum has some ..rms also in the smaller country;

(iii) if $\xi_{\text{cluster}} < \delta < \xi_{\text{trade}}$, while both the market outcome and the optimum yield a more than proportionate presence of ..rms in the larger country, the share of ..rms in the larger country is smaller at the optimum than at the market outcome.

In particular, when $\xi_{\text{cluster}} < \delta < \xi_{\text{trade}}$, the welfare loss evaluates to:

$$W^{oS} - W^{oM} = \frac{(2\gamma_i - 1)^2(2a - \xi b)(bA + cK)L}{8c(8bA + 3cK)}$$

which increases as the level of trade costs falls. In other words, as long as ..rms are not completely clustered, economic integration increases the welfare loss due to the inefficient spatial distribution of ..rms at the market outcome.

## 5 Tax competition

In this section we investigate the effects of tax competition on the location of ..rms. In so doing we adopt a simple tax competition game. In particular, we assume that (i) country choices are made by two national planners (governments); (ii) each national planner maximizes the welfare of its own citizens; (iii) source-based per-unit taxes on labor and capital are the only available policy tools; (iv) each government faces an exogenously determined budget requirement (v) taxation is not discriminatory (i.e., tax rates are the same
for domestic and foreign capital). Assumption (iv) enables us to abstract from the issue of public good provision (Kehoe, 1989). The game between the two governments takes place in two stages. In the rst, governments simultaneously choose their countries' welfare maximizing tax rates. In the second, rms and consumers make their choices taking the chosen tax rates as given. The equilibrium concept adopted will be subgame-perfect Nash with two players in the rst stage and a continuum of players in the second.

A. Second-stage game: rms and consumers

Let us solve the game backwards and call \( t_i \) and \( t^*_i \), respectively, the per unit capital and labor tax rates in country \( i \) (\( i = H, F \)). In the second stage, rms and consumers make their decisions taking scalar choices as given. In country H, equilibrium prices are again given by (6) and (9) and the equilibrium return to capital by (14). Analogous expressions hold for F. What changes is the equilibrium location of rms because now an equilibrium arises when no capital owner can earn strictly higher after-tax returns by changing the country serviced by her capital endowment. This happens for \( 0 < \delta < 1 \) whenever after-tax capital returns are equalized in the two countries:

\[
\text{r}_H(\delta) \cdot t_H = \text{r}_F(\delta) \cdot t_F
\]

and for \( \delta = 1 \) [\( \delta = 0 \)] whenever \( \text{r}_H(1) \cdot t_H \), \( \text{r}_F(1) \cdot t_F \), \( \text{r}_H(0) \cdot t_H \) ].

To deal with these three alternative cases, we start solving the game assuming that the interior constraints on the equilibrium \( \delta \) are satisfied. Then we establish under which conditions such constraints are indeed satisfied by the solutions. Finally we characterize the equilibrium outcome when those conditions are not met.

4Taxation of capital income takes place under the 'source principle': income is taxed where generated, that is, where .rms are located ** as it is the case for the corporate tax which is the focus of the present paper**. Alternatively taxation could take place under the 'residence principle': income is taxed where capital owners reside. **Adding such a tax instrument wouldn't affect the result of our paper. We will show below that the source based capital tax is used as a strategic device to influence the international allocation of capital. As, in our set-up, taxation under the residence principle does not affect the location of .rms, allowing for it wouldn't change the need for the source based capital tax in the international competition for .rms. Nevertheless, the residence based principle raises questions of implementation that are beyond the scope of this paper. It requires national .scal authorities to coordinate on information transmission in order to tax their residents on capital incomes generated abroad.**
Assuming an interior outcome \((0 < \beta < 1)\), the solution of (26) in terms of \(\beta\) yields its equilibrium value as a function of the tax difference:

\[
\beta(t_H; t_F) \sim \beta \left( \frac{2}{L} \right) \frac{\hat{A}^2 (2b\hat{A} + c\hat{K})}{cL(b\hat{A} + c\hat{K})} \tag{27}
\]

which shows that a higher tax rate in one country discourages firms location:

\[
\beta(t_H; t_F) = \beta \left( \frac{2}{L} \right) \frac{\hat{A}^2 (2b\hat{A} + c\hat{K})}{cL(b\hat{A} + c\hat{K})} < 0 \tag{28}
\]

where the lower index on \(\beta\)'s denotes the partial derivative with respect to the corresponding argument, e.g. \(\beta(t_H; t_F) = \beta \left( \frac{2}{L} \right) \frac{\hat{A}^2 (2b\hat{A} + c\hat{K})}{cL(b\hat{A} + c\hat{K})} \). Expression (28) also points out that the discouraging location effect of a higher tax rate gets stronger as trade costs fall, that is, trade integration makes capital more responsive to tax differences.

To proceed it is useful to define \(\gamma(t_H; t_F)\) as the common after-tax return that accrues to all units of capital in equilibrium. That implies \(\gamma(t_H; t_F) = r_H(\beta) - t_H = r_F(\beta) - t_F\). Substituting (27) into (14) gives then:

\[
\gamma(t_H; t_F) \sim \frac{1}{2} \frac{\hat{A}^2 (2b\hat{A} + c\hat{K})}{L^2 (b\hat{A} + c\hat{K})} \tag{29}
\]

which shows that a higher average tax rate and a lower tax wedge both reduce after-tax return on capital. Specifically, the marginal effect on capital return of an increase in \(t_H\) is:

\[
\gamma(t_H; t_F) = \beta \left( \frac{2}{L} \right) \frac{\hat{A}^2 (2b\hat{A} + c\hat{K})}{cL(b\hat{A} + c\hat{K})} \tag{30}
\]

Accordingly, when \(t_H\) is larger but not much larger than \(t_F\), an increase in \(t_H\) reduces the after-tax remuneration of capital. To understand this result consider a situation in which tax rates are initially the same \((t_H = t_F)\) and countries decide to increase the tax rates simultaneously by the same amount \((dt_H = dt_F)\). In this case, there is no scope for international tax arbitrage by capital owners. Consequently, since the gross return on capital \(r^M\) is independent from tax rates, the net return falls by the whole amount of the common tax increase: \(\gamma(t_H; t_F) + \gamma(t_H; t_F) = 0\) since we start with \(t_H = t_F\). Assume now a different situation, in which again the tax rate is initially the same in both countries \((t_H = t_F)\) but taxation is increased
unilaterally by \( H (dt_H > 0, dt_F = 0) \). When country \( H \) acts, capital owners are now able to shift their investments to country \( F \) where tax rates are lower. As a result, the return to capital falls less than before: \( \frac{1}{2} t_H (t_H; t_F) = 1 \leq 2 \) since we start with \( t_H = t_F \). It falls even less if initially \( t_H > t_F \) as in this case there is an extra gain for capital owners from arbitraging out of country \( H \).

From (30), one expects \( \frac{1}{2} t_H \) to be positive when \( t_H \) is large. Indeed, for most parameter values, when the tax differential is large enough for \( \frac{1}{2} t_H \) to be positive, no firms are left in the home country i.e. \( \delta = 0 \). The only case where \( \frac{1}{2} t_H \) and \( \delta \) are both positive arises when \( \eta \) is sufficiently large. In that case, as described in the interpretation of (30), the relocation of capital induced by a higher \( t_H \) increases the foreign gross remuneration of capital and therefore increases \( \frac{1}{2} \). For this to be true, however, \( \delta \) has to be small.

B. First-stage game: governments

Turning to the first stage, governments simultaneously choose their tax rates anticipating the impact of their choices on the second-stage decisions of firms and consumers. In each country \( i \), taxation on capital and labor is chosen as to raise a given amount of revenues, \( G_i \). Without loss of generality we shall assume that \( G_i = 0 \). Since we assume that capital taxes are levied according to the source principle, all capital invested in a certain country is subject to the same tax rate. Thus, the governments’ budget constraints are given by:

\[
0 = t_H \delta K + t_L \delta L \quad \text{and} \quad 0 = t_F (1 - \delta) K + t_L (1 - \delta) L \quad (31)
\]

Notice that, since the amount of public revenues is exogenously given, the policy problem faced by the government is one-dimensional: the choice of the tax rate on capital automatically determines the tax rate on labor required to satisfy the budget constraint. Moreover, as labor is immobile and in inelastic supply, the tax on labor is essentially lump-sum.\(^5\)

Using (31) to substitute the labor tax, welfare in country \( H \) equals:

\[
W_H = S_H (\delta) \delta L + \delta L + \delta r_H (\delta) K_i (\delta) \delta K \quad (32)
\]

where the dependence of \( \delta \) and \( \frac{1}{2} \) on capital tax rates has been left implicit to simplify notation. Moreover, \( S_H (\delta) \) is individual consumer surplus defined

\(^5\)Our results would not change if we introduced a public good and a preliminary stage of the game in which governments decide on the level of its provision. The public good would be provided efficiently because of the lump-sum nature of labor taxation.
by (22), $\bar{\lambda}$ is labor income, $r^H(\bar{\theta})K$ is the gross income from the modern sector and $(\bar{\theta} i \quad 3/4)K$ is the net contribution from abroad. Notice that, as long as $\bar{\theta} > \frac{3}{4}$ the country is importing capital which means that there is a positive net contribution from abroad and part of the tax burden is borne by foreign residents.

Given $t_i$, the first order condition (best reply) of government $i$ requires then $dW_i dt_i = 0$ where:

$$
\begin{align*}
\frac{dW_i}{dt_i} &= \frac{dW_i}{d\theta} t_i + \frac{dW_i}{d\bar{\theta}} \bar{\theta}_t + tK \theta_t i (\theta i \quad 3/4)K \bar{\theta}_t \\
&= \frac{dS_H(\bar{\theta})}{d\theta} \bar{\lambda} + \frac{dS_H(\bar{\theta})}{d\bar{\theta}} + tK \theta_t i (\theta i \quad 3/4)K \bar{\theta}_t
\end{align*}
$$

in which $\theta_t < 0$ and $\bar{\theta}_t$ are given by (28) and (30) respectively and

$$
\begin{align*}
\frac{dS_H(\bar{\theta})}{d\bar{\theta}} &= \frac{i (bA + cK) f 4A(2a + b\bar{\lambda})(bA + cK) i \bar{\lambda}^2K^2(2\bar{\theta} - 1)}{8\bar{\lambda}^4(2bA + cK)^2}
\end{align*}
$$

The right hand side of condition (33) reveals the traditional capital movement and terms of trade effects of capital taxation. The welfare of the country is affected by capital taxation because it induces an international capital movement and because it influences the terms at which capital is internationally traded. The terms of trade effect appears in most of the corporate tax competition literature. As shown in the interpretation of (30), the effect of capital taxation on $\bar{\theta}$ is unambiguously negative except in extreme case where $\bar{\theta}$ is close to zero and $3/4$ is large. Therefore, except in these extreme cases, a capital importing country is willing to tax capital in order to decrease the amount spent at importing capital. The opposite is true for the capital exporting country.

The first effect is richer than in the traditional models. The capital movement affects the welfare of the country in three different ways. First, a loss of capital influences negatively the surplus of domestic consumers that have to increase their reliance on imports and thus to face additional trade costs. Second, it decreases competition on the domestic market and therefore increases the operating profits of the local firms. Third, capital movement creates an international externality because it social value $r^H(\bar{\theta})$ differs from its social cost $\bar{\theta}$ by the level of the capital tax. This corresponds to the traditional Wilson (1991) and Bucovetsky (1991) capital movement effect and has the opposite sign of the tax rate. The two first effects are particular to our
economic geography model and are signed in the following way: an increase in tax decreases the domestic consumer surplus and increases the domestic operating pro.ts.

Symmetric expressions hold for government F. In particular, its best reply has to satisfy $dW_F = dt_F = 0$ where:

$$
\begin{align*}
\frac{dW_F}{dt_F} &= \frac{dS_F(°)}{d°} (1_i \quad \frac{\partial S_F(°)}{\partial °} (1_i \quad °) \frac{dW_F}{d°} i \quad t^F K \quad ° t_F i \quad (\frac{\partial S_F(°)}{\partial °} (1_i \quad °) K)^{\frac{1}{2}} \\
\frac{dS_F}{d°} &= \frac{i (b\dot{A} + cK) f 4(A(2a_i + bK) (b\dot{A} + cK) + \xi c^2 K^2 (2° i \quad 1)] K}{8A^2 (2b\dot{A} + cK)^2} \\
\frac{1}{2} (t_H ; t_F) &= \frac{2(t_f i \quad t_H) \dot{A}^2}{\xi^2 L(b\dot{A} + cK)} i \quad \frac{1}{2} \quad \text{and} \quad ° t_F (t_H ; t_F) = i \quad ° t_H (t_H ; t_F)
\end{align*}
$$

As to second order conditions, it can be verified that both $W_H$ and $W_F$ are concave functions of $t_H$ and $t_F$ respectively.

C. Tax rates and firms location

Solving (33) and (34) for $t_H$ and $t_F$ gives the subgame-perfect Nash equilibrium tax rates. We have to distinguish between two scenarios depending on whether $\xi$ is larger or smaller than $\xi_{cluster}$. In the former case, the equilibrium tax rates are:

$$
\begin{align*}
t_H &= i \quad ° (E_0(0_i \quad \xi) i \quad E_1(0_i \quad \xi)(2\frac{\partial \xi}{\partial °} (1)^2 i \quad E_2(0_i \quad \xi)(2\frac{\partial \xi}{\partial °} (1) \] (35)
\end{align*}
$$

and:

$$
\begin{align*}
t_F &= i \quad ° (E_0(0_i \quad \xi) i \quad E_1(0_i \quad \xi)(2\frac{\partial \xi}{\partial °} (1)^2 + E_2(0_i \quad \xi)(2\frac{\partial \xi}{\partial °} (1) \] (36)
\end{align*}
$$

where $E_i$ and $E_0$, $i = 0; 1; 2$, are positive bundling parameters that do not include either $\frac{\partial \xi}{\partial °}$ or $\xi$. In particular, $E_0 > \xi$ when (10) holds. Under the same condition, it can be shown that (35) and (36) are always negative for positive $\xi$, being convex functions of trade costs. Therefore, tax competition leads to subsidies to capital funded through taxes on labor. Moreover, (35) and (36) are monotonous functions of $\frac{\partial \xi}{\partial °}$ However, while the former is increasing, the latter is decreasing in $\frac{\partial \xi}{\partial °}$. Notice that, when countries are equal-sized, the equilibrium tax rates are zero. Indeed, imposing $\frac{\partial \xi}{\partial °} = 1=2$ into (35) and (36) leads to $t_H = t_F = 0$. 

18
All this is reflected by the tax differential:

$$t_H - t_F = \frac{L(2^{3/4} \frac{1}{2})(bA + cK)}{2A^2(12bA + 5cK)} > 0 \quad (37)$$

which shows that the equilibrium tax wedge is concave and increasing in the level of trade costs for every $\xi < \xi_{\text{trade}}$ so that trade integration induces a convergence of international tax rates. Indeed, when integration is complete ($\xi = 0$) tax rates are identical ($t_H = t_F = 0$). Furthermore, the equilibrium tax wedge is also increasing in relative size $\frac{1}{2}$: were countries of equal size, there would be no tax wedge ($t_H = t_F = 0$) as in Janeba (1998) and in Ludema and Wooton (2000).

Substituting (37) into (27), we obtain the equilibrium location of rms under tax competition:

$$\theta_T = \theta_M - \frac{(2^{3/4} \frac{1}{2})(2bA + cK)}{\xi cK (12bA + 5cK)} \quad (38)$$

Condition (10) ensures that $\frac{3}{4} < \theta_T < \theta_M$ so that tax competition induces the larger country to subsidize less, thus reducing its share of rms with respect to the free market outcome. This is the more so the larger $\xi$ because of the smaller responsiveness of rms location to tax differentials, which is reminiscent of Haufemer and Wooton (1999).

In addition, the threshold value for $\xi$ below which rms are all concentrated in the larger country $H$ is now lower than $\xi_{\text{cluster}}$, the exact value being:

$$\xi_{\text{cluster}}^T = \frac{8A(2^{3/4} \frac{1}{2})(3bA + cK)}{12bA(2^{3/4} \frac{1}{2}) + cK} + \left(7i - \frac{1}{2}c^2K^2\right)$$

These results can be summarized in the following proposition:

**Proposition 4** Assume capital-income tax competition and $\xi_{\text{cluster}}^T < \xi < \xi_{\text{trade}}$. Then, in equilibrium:

(i) if countries are equal-sized ($\frac{1}{2} = 1$), governments do not intervene ($t_H = t_F = 0$) and the location of rms is the free-market one ($\theta_T = \theta_M$);

(ii) if countries are different sized ($\frac{1}{2} > 1$), both government subsidize capital income but subsidies are higher in the smaller country ($t_F < t_H < 0$). Moreover, the larger country hosts a more than proportionate share of rms but such share is smaller than at the market outcome ($\frac{3}{4} < \theta_T < \theta_M$).
D. Taxing a cluster

The above results differ from the existing literature on clusters in that they characterize the tax competitive outcome when agglomeration is not complete, which is the case for \( \tau_{\text{cluster}} < \tau < \tau_{\text{trade}} \). To make our analysis fully comparable with previous research, it is nonetheless useful to characterize the equilibrium of the model when all firms end up clustering in one country. As discussed above, this happens when trade costs are low enough \( \tau < \tau_{\text{cluster}} \) and all firms are located in country \( H \). Indeed, in that case we have just shown that there exists no equilibrium of the tax game such that capital is invested in both countries.

When \( \tau < \tau_{\text{cluster}} \), we have \( \tau = 1 \) implying net capital return \( r \left( t_H; t_F \right) = r_H(1) \) for \( H \). Consequently, \( \tau_{\text{H}} = \tau_{\text{F}} = \frac{1}{2} \) and \( \frac{1}{2} \) are both equal to 1, which imply

\[
\frac{dW_H}{dt_H} = (1 - \frac{1}{2})K > 0 \quad \text{and} \quad \frac{dW_F}{dt_F} = 0
\]

Conditions (39) show that the government in \( H \) sets its tax rate at the highest level compatible with government \( F \) being unable to attract the location of firms. This means that in equilibrium the government in \( H \) chooses a tax rate such that rent equalization just takes place at \( \tau = 1 \) for given \( t_F \):

\[
t_H \quad t_F = \frac{\tau L(bA + cK)f - (2 \tau q - 1) \left[ 2bA(2 \tau q - 1) + cK \right]}{4A^2(2bA + cK)}
\]

Thus, the tax wedge is positive for \( \tau < \tau_{\text{cluster}} \) and falls as \( \tau \) decreases.

Moreover, the equilibrium tax rates have also to be such that at \( \tau = 1 \) government \( F \) has no incentive to decrease \( t_F \) (which would attract some capital to \( F \)) and the government \( H \) has not incentive to raise \( t_H \) (which would repel some capital from \( H \)):

\[
\frac{dW_H}{dt_H} \bigg|_{\tau = 1} < 0 \quad \text{and} \quad \frac{dW_F}{dt_F} \bigg|_{\tau = 1} > 0
\]

These two conditions identify a segment along the line (40) which is upward sloping in the \( (t_H; t_F) \)-plane. Since the second-order conditions of the \( \tau \)-first-stage tax game are satisfied, it must be that \( \frac{dW_H}{dt_H} \bigg|_{\tau = 1} < 0 \) when \( t_H \) is large enough and \( \frac{dW_F}{dt_F} \bigg|_{\tau = 1} > 0 \) when \( t_F \) is small enough. This means that along (40), there exist \( t_F^* \) such that \( \frac{dW_H}{dt_H} \bigg|_{\tau = 1} < 0 \) when \( t_F > t_F^* \),
and \( t_F \) such that \( dW_F = dt_F \) > 0 when \( t^F < t_F \). In particular, it can be shown that \( t^F < t_F \) so that, when \( \dot{\zeta} < \dot{\zeta}_{\text{cluster}} \), a continuum of equilibrium tax rates exists such that \( t_F \in [t^F, t_F] \) and, for any given \( t_F \) in that interval, \( t_H \) satisfies (40). For low values of \( \dot{\zeta} \), both \( t^F \) and \( t_F \) are decreasing functions of \( \dot{\zeta} \), which means that, once trade costs are low enough, further reductions in such costs decrease the tax differential (see (40)) but increase the tax levels. These results are consistent with those in Kind, Midelfart-Knarvik and Schjelderup (2000).

To sum up:

Proposition 5 Assume capital-income tax competition and \( 0 < \dot{\zeta} < \dot{\zeta}_{\text{cluster}} \). Then in equilibrium:

(i) if countries are equal-sized \( (\frac{\gamma}{4} = 1 = 2) \), governments do not intervene \( (t_H = t_F = 0) \) and the location of \( \text{rms} \) is the free-market one \( (\sigma^T = \sigma^M) \);

(ii) if countries are different-sized \( (\frac{\gamma}{4} > 1 = 2) \), all \( \text{rms} \) cluster in the larger country \( (\sigma^T = 1) \) and the larger country sets its tax rate at the highest level compatible with the smaller country being unable to affect the location of \( \text{rms} \). In particular, there exists a continuum of tax rates and these satisfy (40) and (41).

6 Coordination

The previous section has shown that tax competition may act as a dispersion force. This follows from two results. First, the threshold value below which \( \text{rms} \) are all clustered in the larger country is lower under tax competition than at the free market outcome. Second, when under both regimes \( \text{rms} \) are not clustered in the larger country, the share of those in the larger country is smaller under tax competition than at the free market outcome. The reason is larger subsidies to capital in the smaller country.

This section studies the welfare implications of tax competition. Straightforward calculations reveal that, when (10) holds, we have:

\[
\frac{3}{4} < \sigma^T < \sigma^S < \sigma^M \tag{42}
\]

and

\[
\dot{\zeta}_{\text{cluster}} < \dot{\zeta}_{\text{cluster}}^T < \dot{\zeta}_{\text{cluster}}^S < \dot{\zeta}_{\text{cluster}}^M \tag{43}
\]

These results show that under tax competition, when \( \text{rms} \) are not clustered in the larger region, their international distribution is too much balanced from
a welfare point of view. Moreover, there is an interval of trade costs between $\zeta_T^{\text{cluster}}$ and $\zeta_S^{\text{cluster}}$ in which ..rms are not clustered under tax competition while they are at the optimum. In other words, the dispersion force due to tax competition is too strong to yield an efficient spatial distribution of ..rms.

The welfare loss due to tax competition is then:

$$W^{(oS)} - W^{(oT)} = \frac{L(2^{\frac{3}{4}} - 1)^2(3bA + cK)}{8cA^2(8bA + 3cK)(12bA + 5cK)^2} \left[ 3(2bA + cK)^2 \right]$$

which is positive, increasing in the size asymmetry between countries ($\frac{3}{4}$), and decreasing in trade costs ($\zeta$).

Such loss is nonetheless smaller than (25). Indeed, we have:

$$W^{(oT)} - W^{(oM)} = \frac{LK(2^{\frac{3}{4}} - 1)^2(bA + cK)}{8cA^2(12bA + 5cK)^2} \left[ 2aA + \zeta(7bA + 3cK) \right]$$

which is positive given condition (10). This implies that, even if suboptimal, tax competition is nonetheless welfare improving with respect to the free market outcome and therefore also with respect to tax harmonization ($t_H = t_F$). Such improvement is larger the larger the size asymmetry between countries $\frac{3}{4}$.

Things are different when complete clustering occurs. Indeed, for $\zeta_T^{\text{cluster}} < \zeta < \zeta_S^{\text{cluster}}$ the free market outcome yields efficient clustering of ..rms while tax competition provides an inefficient presence of ..rms also in the smaller country.

To summarize:

**Proposition 6** The efficiency properties of the tax-competitive outcome differ depending on the level of trade costs. In particular:

(i) if $0 < \zeta < \zeta_T^{\text{cluster}}$ the tax-competitive outcome and the optimum coincide;

(ii) if $\zeta_T^{\text{cluster}} < \zeta < \zeta_S^{\text{cluster}}$ the optimum yields complete clustering of ..rms in the larger country while the tax-competitive outcome has some ..rms also in the smaller country;

(iii) if $\zeta_S^{\text{cluster}} < \zeta < \zeta_{\text{trade}}$ while both the tax-competitive outcome and the optimum yield a more than proportionate presence of ..rms in the larger country, the share of ..rms in the larger country is smaller at the tax-competitive outcome than at the optimum.
Moreover:

**Proposition 7** The efficiency properties of the tax-competitive outcome with respect to the free market one differ depending on the level of trade costs. In particular:

(i) if \(0 < \hat{\lambda} < \hat{\lambda}_{\text{cluster}}^T\) the tax-competitive and the free-market outcomes coincide;

(ii) if \(\hat{\lambda}_{\text{cluster}}^T < \hat{\lambda} < \hat{\lambda}_{\text{cluster}}^S\) the free market outcome dominates the tax-competitive one;

(iii) if \(\hat{\lambda}_{\text{cluster}}^S < \hat{\lambda} < \hat{\lambda}_{\text{trade}}\) the tax-competitive outcome dominates the free market one.

The remaining question is whether it is possible to improve upon the tax competition outcome via ..scal coordination. Obviously, there exists a pair of taxes that leads to the efficient allocation. We need that, capital-income tax rates are set to maximize overall welfare \(W_H + W_F\). While the level of the chosen tax rates is indeterminate, the obvious result is that tax coordination implements the tax rate differential that sustains the optimum. At an interior solution, this is a differential tax rate such that \(r_H(\alpha^S) - t_H = r_F(\alpha^S) - t_F\), that is:

\[
t_H - t_F = \frac{\hat{\lambda} L(2a_i + b_b + cK)(2\beta + 1)}{2A(8b\alpha + 3cK)}
\]

which is positive and smaller than (37) provided (10) holds. The tax differential (46) is increasing in the level of trade costs (\(\hat{\lambda}\)) and in the size asymmetry between countries (\(\beta\)). Therefore, trade integration reduces the tax differential required to achieve the efficient allocation. The more so the smaller the size asymmetry.

Would coordination improve the welfare of both countries? Since the coordinated outcome is a tax differential, there is a degree of freedom left. Increasing the level of capital taxation while keeping the tax differential at (46) allows governments to transfer resources from the capital exporting country to the capital importing one. In other words, the choice of the level of capital taxation can be used as an indirect side payment mechanism in order to make coordination not only efficient but also Pareto-improving (Peralta and van Ypersele, 2002).
7 Conclusion

Economic integration usually dismantles barriers to goods and factors mobility while allowing governments to function independently in most policy areas. This raises the natural issue whether such independence is good or not. We have tackled such issue from the angle of tax competition for mobile capital by asking three related questions. Does tax competition yield an inefficient international specialization in production? Does it yield inefficient shipments of goods across countries? If such inefficiencies exist, are they related to the extent of trade integration?

The existing literature identifies the basic requirements that a model must satisfy in order to tackle those questions: international externalities, different country sizes, imperfect competition, and trade costs. Nonetheless it does not provide any model that fulfills all those requirements while proposing at the same time a full-fledged global welfare analysis. We have developed one such model and shown that, unless firms are all clustered in one country, tax competition for mobile firms is efficiency-enhancing with respect to the free market outcome. Nonetheless, while the latter entails too many firms in the larger country, the former has too many firms in the smaller one. Under both scenarios the resulting inefficiencies in international specialization and trade flows vanish when trade costs are low enough. Otherwise, only international tax coordination can implement the efficient spatial distribution of firms.

References


