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Is Competition for FDI Bad for Regional Welfare?

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Abstract

We investigate the impact on regional welfare of policy competition for FDI when a multinational firm can strategically react to differences in statutory corporate tax rates and shift taxable profits to lower-tax jurisdictions. We show that competing governments may have an incentive to tax discriminate between domestic and multinational firms even in the presence of profit shifting opportunities for the latter. In particular, tax discrimination leads to higher welfare for the region as a whole than lump-sum subsidy competition when the difference in statutory corporate tax rates and/or their average is high enough. We also find that policy competition increases regional welfare by changing the firm's investment decision when profit shifting motivations might induce the firm to locate in the least profitable country.

Keywords: Policy competition for FDI; Profit shifting; Tax discrimination

JEL Classification: F23; H25; H26; H32; H73

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1 Introduction

> Sandoz [...] is trying to exploit latent tax competition between Germany, Austria and Switzerland [...]. The group, the generics subsidiary of Switzerland's Novartis, has been based in Vienna since its creation last year. But [...] is considering a move to Munich or Basel [and it] has asked all three countries to state what they could offer in terms of taxes and other benefits. (Financial Times, April 14, 2005)

> Foreign direct investment plans reported to the South Korean government fell 9.6 per cent last year [...] The fall in FDI plans was expected as a tax reduction period for foreign investors had been cut to seven years from 10 years from the beginning of 2005. The [Commerce] ministry said: "It will be difficult for the FDI to increase significantly because of [...] competition with a neighboring country." (Financial Times, January 6, 2006)

The ones above are just two of the many examples illustrating the importance of taxes and fiscal incentives for the investment decisions of multinational firms. In addition, they put forward the idea that countries compete against each other in order to attract foreign investors within their national borders.

In recent years, indeed, governments throughout the world - at the national or subnational level - have designed and implemented policies with the aim of attracting foreign direct investments (FDI). Competition for foreign investments in major production facilities mostly occurs at an intra-regional level, i.e., between countries belonging to the same geographic or economic area (e.g., Latin America, South-East Asia, Central and Eastern Europe) or between regions within the same country. The incentives offered to foreign investors often consist in corporate tax reductions, tax breaks, tax holidays, investment tax allowances, or other kinds of specific tax concessions. For instance, during the 1990s, Brazil has experienced several cases of inter-regional competition for FDI in the automobile sector, and fiscal incentives typically included state and local tax holidays (for as long as ten years) in addition to tax breaks on imported materials. In Western Europe, over the last 20 years, Ireland has successfully employed incentive packages - including a considerable lowering of corporate taxes - to attract FDI. In 1998 the Czech government, after having lost potential FDI inflows in previous years in favor of neighboring countries - like Hungary and Poland - eventually approved a package of incentives including corporate tax relief for ten years for newly-established companies in the country.[1]

The empirical evidence focuses mainly on how taxes affect the volume and distribution of FDI (see, e.g., De Mooij and Ederveen, 2003, for a survey). But there are contributions that analyze more specifically the impact of corporate taxation on firms'

[1] All of these examples are taken from Charlton (2003). For an overview of the policy-competition-for-FDI issue, see Oman (2001).

location decisions.[2] On the one hand, Devereux and Griffith (1998) find a significant effect of *effective* average tax rates on the location choice of subsidiaries of U.S. firms within Europe. On the other hand, Buettner and Ruf (2007) show that *statutory* tax rates are at least as important as labor cost differences for explaining the observed location decisions of German multinationals. Moreover, the statutory tax rate is found to have a considerably stronger predictive power than the effective average tax rate, and this "might indicate that multinationals take account of profit-shifting opportunities in the choice of location of their subsidiaries" (Buettner and Ruf, 2007, p. 162).

The relationship between corporate taxation and the location of multinational firms is an important issue on the political agenda of both the European Union and the OECD. There is general agreement on the idea that national corporate tax systems should not discriminate between taxation of purely domestic and of multinational firms. The non-discrimination principle is recommended by both the European Union and the OECD (European Communities, 1992, 1998; OECD, 1998) to counter "harmful" tax competition between governments seeking to attract investments by foreign multinational firms. In such a sense, one of the major attempts worldwide to limit policy competition for FDI is represented by State Aid Control in the European Union. If a EU Member State lowers the tax rate or grants other types of tax advantages only to certain sectors or to certain types of firms (e.g., coordination centers for multinational firms in Belgium) or to enterprises located in a certain area within the Member State, this would constitute State aid. The EU State Aid Control system should prevent countries from offering subsidies in order to attract foreign investors. In spite of that, Vandenbussche and Tan (2005) provide empirical evidence of a more favorable tax treatment for foreign multinationals compared to similar domestic firms in Belgium. As their results are not driven by profit shifting issues, there should exist other fiscal incentives besides cross-country tax differentials to justify lower tax payments by multinational firms. A possible interpretation is that the country offers specific fiscal incentives (in terms of, e.g., under-the-counter subsidies) to foreign investors.

From a theoretical viewpoint, the literature about policy competition for FDI typically addresses the questions as to which country wins the competition and whether the winner, in equilibrium, taxes or subsidizes the foreign firm. In particular, the strand that accounts for imperfect product market competition, country-size asymmetry, and intra-regional trade costs, develops from the contribution by Haufler and Wooton (1999, henceforth H&W). This paper analyzes competition between countries of unequal market size trying to attract a foreign-owned monopolist. In equilibrium, the big country succeeds in attracting FDI since the firm prefers locating in the big market in order to save on trade costs, and the country can even levy a lump-sum tax on the foreign firm's profits if the size difference is large enough. Ferrett and Wooton (2005) extend H&W's

[2] At the sub-national level, Bartik (1985) shows that the corporate tax rate has a significant impact on business location decisions within the U.S. Subsequent empirical studies on interregional location decisions have confirmed this result. See Phillipps and Goss (1995) for a survey.

model to study policy competition for investments by two firms from the same industry and show that either one firm locates in each country and all of the firms' profits are taxed away by host countries or the big country is able to attract both firms by taxing them due to its market access advantage. Hence, tax competition under duopoly would not necessarily create a "race to the bottom" in corporate tax rates. Bjorvatn and Eckel (2006) modify H&W's set-up by introducing a private competitor for the foreign investor in the big country. The equilibrium policy may be either a subsidy or a tax depending on whether the location advantages offered by the two countries are similar or not. An interesting result is that aggregate welfare (the sum of regional welfare and the investor's profits) rises whenever the introduction of policy competition changes the investor's location decision. Finally, in a simpler but more general model, Ferrett and Wooton (2006) show that tax/subsidy competition for mobile plants is not affected by the international distribution of firm ownership. Policy competition, indeed, equalizes the firm's after-tax profits across countries, thereby making capital owners indifferent to the location of production. However, none of these papers takes into account the fact that multinational firms consider profit-shifting opportunities when choosing the location of their subsidiaries, and most of them lack a regional welfare analysis of policy competition.[3]

Our paper aims at investigating the impact on regional welfare of policy competition for FDI when the foreign multinational can strategically react to differences in statutory corporate tax rates and shift taxable profits to lower-tax jurisdictions. In particular, we want to understand whether it can be welfare-improving for the region as a whole that countries compete against each other by offering further tax incentives when their national corporate tax systems already give the multinational some opportunities to minimize its worldwide tax liabilities. Our main result indicates that, in the presence of profit shifting, tax discrimination might be more desirable - in terms of regional welfare - than subsidy competition as a policy instrument to attract FDI. This raises doubts about the pertinence of the non-discrimination principle in the European Union context.

The rest of the paper is organized as follows. In Section 2, we present and justify the main assumptions and the structure of the theoretical framework we use to analyze policy competition for FDI. In Section 3, we analyze a set-up where no profit shifting takes place and discuss the welfare implications of policy competition. Section 4 introduces the possibility of profit shifting in response to statutory tax rate differentials. We then perform an analysis that parallels that of the previous Section and compare the results. Finally, Section 5 summarizes the main conclusions emerging from this work.

[3]Fumagalli (2003) investigates the effects on regional welfare of subsidy competition for FDI when the location of the multinational firm exerts a positive externality in terms of a technological spillover to local firms. One of the competing countries benefits more from the inward investment but, in the absence of incentives, the other, more advanced, country is the multinational's preferred location. Hence, subsidies may increase regional welfare by inducing the multinational to locate where it generates the highest welfare gains.

2 The model

We develop a model in which two potential host countries, A and B, belonging to the same region (or economic or geographical area) compete between them to attract investments by a foreign-owned firm from a third-country - we call the latter country F and we can think of it as the rest of the world. Once located in the region, the firm will be the only supplier of some final good to the consumers of the whole region and it will thus behave as a monopoly. To this end, it must establish a production facility in either A or B.[4]

We want to investigate the regional welfare effects of policy competition for FDI when the foreign multinational can strategically react to differences in corporate tax rates and shift taxable profits to lower-tax jurisdictions. Hence, we represent policy competition by a three-stage game with complete information characterized by the following sequence of decisions:

- In stage 1, the governments of countries A and B simultaneously and irreversibly post bids to attract the foreign investor.
- In stage 2, the foreign multinational decides whether to establish its production plant in A or in B, and realizes profits by serving the regional market.
- In stage 3, the foreign multinational chooses the amount of profits to declare to the tax authorities of the countries where it operates, that is either A or B and F.

We solve our three-stage game by backward induction to find its subgame perfect Nash equilibrium in pure strategies. Such a game structure is similar to the one used by Bernheim and Whinston (1998) to analyze exclusive dealing contracts. In their model, two manufacturers simultaneously bid for representation by a retailer; then, the latter chooses to represent one (or both or neither) manufacturer; and finally, the retailer enters into a contract with the party it has chosen to represent. In our model, we restrict the strategy set of the agent (the foreign multinational) to the choice of only one principal (the country where it will invest). In addition, we assume complete information throughout the paper whereas an asymmetric information problem arises in the third stage of their model.[5]

Based on the equilibrium outcomes of the different policy competition scenarios we consider, we discuss the regional welfare impact of these alternative forms of competition for FDI between countries. As for the policy-competition-stage (stage 1), indeed, we

[4]Exports of the final good from country F are not a viable option for the foreign firm if we assume that trade costs between country F and the region are prohibitively high. On the other hand, assuming that the costs for intra-regional trade are low enough rules out the possibility that duplicating a costly investment, i.e. setting up two production plants, one in A and one in B, is a profitable strategy for the foreign firm.

[5]A possible extension to our paper could treat the relative profitability of alternative locations and/or the value of outside options as private information of the multinational firm.

analyze - and compare among them - four alternative scenarios. In the first one, *no policy competition* takes place between the two countries but the multinational firm faces exogenous statutory corporate profit tax rates. In the second scenario, which we call *subsidy competition*, we let the two countries compete for FDI by offering lump-sum subsidies S_i $(i = A, B)$ to the foreign multinational, that still faces exogenous statutory tax rates. In the last two scenarios, governments are allowed to tax discriminate between domestic and multinational firms. In particular, under *perfect tax discrimination*, which we could also call *non-linear-tax competition*, we let them choose an *ad hoc* corporate tax package for the multinational firm; such a package consists of a corporate tax rate $\tau_i \in [0, 1]$ - that country i applies just to the profits the multinational firm declares there - and of a lump-sum tax (or entrance fee) T_i $(i = A, B)$. On the other hand, under *tax discrimination*, or *tax competition*, the only fiscal policy instrument at the governments' disposal is the corporate tax rate $\tau_i \in [0, 1]$ $(i = A, B)$.

As for the profit-declaration-stage (stage 3), we first analyze the trivial situation where declared profits in one country coincide with those actually realized there. We then discuss the impact of profit shifting opportunities by allowing for profit misdeclaration when corporate tax rates differ across countries.

2.1 Profits of the multinational firm

We denote by Π_i $(i = A, B)$ the before-tax or operating profits that the multinational firm *realizes* when it locates its production plant in country i. They represent the profits that the firm earns by selling the final good to *all* the consumers of the region.[6]

The before-tax profitability of the two countries is not the same from the foreign firm's perspective. For instance, one country might represent a cheaper production location than the other or it might ensure an easier access to specific inputs (e.g., high-skilled workers, raw materials, etc.) for the foreign firm. Similarly, in the presence of intra-regional trade costs, differences in country - notably, market - size might be relevant for the firm's location decision. In what follows, we assume, without loss of generality, that country B is the *best* location for the firm's production plant in the absence of tax motivations, i.e. it benefits from a *location advantage* over country A:

Assumption 1 $\Pi_B > \Pi_A > 0$

Assumption 1 further implies that the foreign firm has always an incentive to invest in the region regardless of any tax incentive offered by the two countries. In such a sense, Π_A and Π_B may be considered as the extra-profits that the foreign multinational obtains by locating in the region with respect to some outside option from investing somewhere else.

[6]Before-tax profits may include any kind of fixed and/or variable production costs. Note also that fixed set-up costs do not affect the investment decision of the multinational as long as they are symmetric across the two countries. In this case, treating them as tax-deductible or non-tax-deductible does not change our results.

Fiscal considerations, however, might play a role in driving the investment decision of the foreign multinational. As it is common in the literature, we assume that international corporate taxation follows the *source* principle, so that profits are taxed where they are generated.[7] To this end, we denote by $t_A, t_B \in [0,1]$ the *statutory* corporate tax rates set by countries A and B, respectively. Similarly, we let country F tax the profits declared by the multinational firm in its residence country at the rate $t_F \in [0,1]$. These are the legally imposed rates of corporate taxation which, in principle, should be applied in order to determine tax liabilities of both domestic and foreign firms operating within one country's national borders. To make the analysis of policy competition for FDI interesting, we assume that country B has a *fiscal disadvantage* relative to country A:[8]

Assumption 2 $t_B > t_A$

In this way, the foreign multinational always faces a trade-off when deciding in which country to invest.

We do not make any other specific assumption about the relationship between the three countries' statutory tax rates. We want to stress, however, that any tax rate differential creates profit shifting opportunities for the multinational firm. In fact, firms engaging in horizontal (or vertical) FDI own fiscal entities at different locations and can shift profits from high-tax to low-tax jurisdictions in many different ways: for instance, by manipulating transfer prices on intra-firm traded goods; or by allocating high-interest debt to high-tax jurisdictions; or even by re-assigning common expenses to affiliates in high-tax countries. All of these techniques allow a multinational firm to minimize its worldwide tax bill while imposing significant accounting and other costs on the firm itself.[9]

To account for the possibility of profit misdeclaration, we denote by π_i and π_F the amount of profits that the multinational firm *declares* to country i and country F tax authorities, respectively, and we postulate that they may differ from the profits that the firm actually *realizes* at each location, denoted by Π_i and Π_F. Our argument is that the firm has to declare the totality of its worldwide profits, i.e. $\pi_i + \pi_F = \Pi_i + \Pi_F$, but it may choose how to allocate taxable profits across the countries where it operates in an attempt to minimize its overall tax liability. Hence, declared and realized profits in one country need not coincide. In particular, the amount of profits that the firm *shifts* from

[7] Keen (1993), for instance, argues that the effective taxation of multinational firms is source-based, even though tax codes may stipulate differently.

[8] It should be clear that if country B enjoys both a location and a fiscal advantage over country A, policy competition cannot turn the latter into a more attractive location for FDI.

[9] The existence of profit shifting - notably, from the United States to low-tax countries (or tax havens) - is widely documented. See Hines (1999) for a comprehensive survey of the empirical literature on this issue. Bartelsman and Beetsma (2003) have recently provided evidence that profit shifting opportunities exist among OECD countries as well. For an exhaustive overview of the theoretical literature on international taxation and of its connections with empirical observations, we refer the reader to Gresik (2001).

country i to country F (or the other way around) in response to cross-country tax rate differentials is given by $\pi_s \equiv \pi_i - \Pi_i = \Pi_F - \pi_F$. It is evident that, if the firm wishes to declare more profits than those actually realized in country i ($\pi_i > \Pi_i$), it has to declare less profits than those actually realized in its residence country ($\pi_F < \Pi_F$).

Profit shifting entails some costs, which may involve expected fines or hiring tax experts in order to conceal any profit misdeclaration from tax authorities. We assume these costs to be increasing in the difference between realized and declared profits, that is in the amount of profits that the firm reallocates across the two countries, and we let them also depend on an exogenous parameter, $\gamma \geq 0$, which might reflect governments' intensity in controlling tax avoidance by multinational firms, or, alternatively, international tax base mobility. More specifically, the costs for profit shifting in either direction, i.e., out of (into) country i into (out of) country F, are given by:

$$C\left(\gamma, \Pi_i - \pi_i\right) = \frac{\gamma}{2}\left(\Pi_i - \pi_i\right)^2, \; i = A, B$$

As it shall become clear below, such a cost specification leads to the result that tax motivations make the multinational firm shift the same amount of profits irrespective of the level of realized profits.[10] If we assumed, instead, following Hines and Rice (1994) and Huizinga and Laeven (2007), that the costs of profit shifting are proportional to the ratio of shifted to realized profits, the amount of profit shifting would depend on the level of the profits realized in the higher-tax country. This, however, does not seem to provide additional insights into the issue we are interested in with respect to the cost formulation we adopt. Moreover, it has a major drawback in that we would need to analyze different tax scenarios depending on how t_A and t_B compare to t_F and between them.

The objective of the multinational firm is to pick the location which maximizes its after-tax profits. Since it evaluates both profit shifting opportunities and possible fiscal incentives when taking such a decision, its after-tax profits from investing in country i can be written as follows:

$$\Pi^i = \Pi_i + \Pi_F - t_i\pi_i - t_F\left(\Pi_i + \Pi_F - \pi_i\right) - \frac{\gamma}{2}\left(\Pi_i - \pi_i\right)^2 + S_i, \quad i = A, B \tag{1}$$

where

- $S_i = 0$ under no policy competition;
- $S_i > 0$ under subsidy competition (for given statutory tax rates);
- $t_i = \tau_i$ and $S_i = -T_i < 0$ under perfect tax discrimination;
- $t_i = \tau_i$ and $S_i = 0$ under tax discrimination.

[10] The profit-shifting cost function we use here is common in the literature. See, e.g., Swenson (2001), Kind *et al.* (2005), Peralta *et al.* (2006), and Amerighi (2008).

2.2 Governments and welfare

We assume that the governments of countries A and B are both interested in maximizing national social welfare and that they decide their fiscal policies to attract FDI independently. In particular, we let the social welfare of country i when investment takes place in country j take the following form

$$W_j^i = \begin{cases} SB_i^i + TR_i - S_i & \text{if } i = j \\ \\ SB_j^i & \text{otherwise} \end{cases} \tag{2}$$

with $i, j = A, B$, and where $TR_i = t_i \pi_i \geq 0$ denotes the revenue arising from taxation of the profits declared by the multinational firm to country i's tax authorities, and S_i measures either the lump-sum subsidy paid to attract FDI (under subsidy competition) or the entrance fee charged to the foreign firm (under perfect tax discrimination). These components of country i's welfare function are equal to zero when investment takes place in country j.

The first term of the welfare function in (2) captures all the other components of social welfare that are affected by the investment decision of the foreign multinational but that do not depend on the amount of profits the latter declares in country i. For example, domestic consumer surplus, profit dividends to domestic residents from other firms in the economy, labor market conditions, etc. We call SB_j^i the *social benefits* for country i when FDI goes to country j and we denote by $\Delta SB^i \equiv SB_i^i - SB_j^i \geq 0$ the gain to country i from inward FDI. In fact, country i may benefit from hosting the foreign firm because domestic consumer surplus is higher - when there are costs for shipping the final good within the region - or due to other social benefits for the country itself in terms of, e.g., job-creating opportunities, vertical linkages with domestic suppliers, technological spillovers which enhance the productivity of local firms in other sectors, and so on.[11]

To focus on the role fiscal policies play to attract FDI in the presence of profit shifting, we make the simplifying assumption that the gain in terms of social benefits from receiving the investment of the foreign multinational is the same for the two countries:

Assumption 3 $\Delta SB^A = \Delta SB^B$

This allows us to analyze policy competition by using the following reduced form of the welfare function in (2)

$$W_j^i = \begin{cases} TR_i - S_i & \text{if } i = j \\ \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

[11] Of course, inward FDI may also generate negative externalities, which would lower the gain to the country from hosting the foreign firm: e.g., the industrial wastes of the production facility may contaminate the surrounding environment. In reality, however, national governments seem to value more the potential benefits from FDI as they are often prone to offer incentives to attract foreign investors within their borders.

The maximum amount (lump-sum subsidy) that country i is willing to offer to the foreign investor, S_i^{max}, consists in the country's welfare gain from inward FDI. Hence, it is represented by a full reimbursement of the taxes paid by the multinational firm on the profits it declares to country i's tax authorities, i.e., $S_i^{max} = TR_i = t_i\pi_i$, $i = A, B$.

3 No profit shifting

We analyze as a benchmark the basic set-up where we do not allow the foreign multinational to reallocate taxable profits in response to cross-country tax differentials. Hence, our model reduces to a two-stage game where the profits declared to one country's tax authorities coincide with those earned by operating there, i.e., $\pi_i = \Pi_i,\ i = A, B, F$.

In the absence of policy competition for FDI between countries A and B, the foreign multinational invests in country B if the latter's location advantage outweighs its fiscal disadvantage with respect to country A. In particular, FDI goes to country B as long as the following condition holds:

$$(1 - t_B)\,\Pi_B > (1 - t_A)\,\Pi_A \tag{4}$$

Otherwise, tax savings motivations make the foreign firm choose to invest in the least profitable (before-taxes) location.

We now investigate how fiscal policy competition affects the investment decision of the multinational. To this end, we assume that the location advantage of country B cannot be so large - relative to its fiscal disadvantage - that this country attracts FDI by levying a lump-sum tax on the foreign firm's profits while keeping its corporate tax rate t_B constant:

Assumption 4 $(1 - t_B)\,\Pi_B < \Pi_A$

This is a sufficient condition to have a positive subsidy paid by country B to the foreign firm in the absence of profit shifting. As it shall become clear below, Assumption 4 also implies that country B can set a positive lump-sum tax on the foreign multinational's profits only if $t_B = 0$.

We solve our two-stage game backwards and we easily show that the three forms of fiscal policy competition we consider here are *equivalent* in the absence of profit shifting. Namely, they always induce the foreign firm to invest in the country where it benefits from a location advantage; this, moreover, maximizes aggregate welfare, defined as the sum of the two countries' (or regional) welfare, $W_i^R = W_i^i + W_i^j$, and the multinational's after-tax profits, Π^i.

At the second stage, the multinational firm invests in country B if and only if

$$(1 - t_B)\,\Pi_B + S_B > (1 - t_A)\,\Pi_A + S_A$$

where the values of t_i and S_i depend on the fiscal scenario we consider.

At the first stage, policy competition for FDI between countries A and B takes place.

Under *subsidy competition* (for given statutory corporate tax rates), we know that the maximum subsidy country i is willing and able to offer to attract FDI is given by a full reimbursement of the taxes paid by the multinational firm on the profits it declares to local tax authorities, that is, in the absence of profit shifting, $S_i^{max} = t_i \pi_i = t_i \Pi_i$ $(i = A, B)$. The equilibrium subsidy results from an auction where the country representing the most attractive (subsidy inclusive) location receives the investment by the foreign firm.[12] However, the winning country need not actually pay its maximum subsidy but just the one which is necessary to outbid the rival country, which is given by $S_i^* \equiv (1 - t_j)\,\Pi_j + S_j^{max} - (1 - t_i)\,\Pi_i$, $i, j = A, B$, $i \neq j$. Therefore, if governments bid their maximum subsidies to attract FDI, country B wins the auction and investment takes place there if and only if

$$(1 - t_B)\,\Pi_B + S_B^{max} > (1 - t_A)\,\Pi_A + S_A^{max} \quad \Longleftrightarrow \quad \Pi_B > \Pi_A$$

which suggests that subsidy competition cancels out country B's fiscal disadvantage relative to A. In particular, it always induces the foreign firm to set up its production plant in the country where it benefits from a location advantage. It is also straightforward to check that subsidy competition maximizes aggregate welfare from FDI to country i. Indeed, we have that

$$W_B^R + \Pi^B = t_B \Pi_B - S_B^* + (1 - t_B)\,\Pi_B + S_B^* = \Pi_B > W_A^R + \Pi^A = \Pi_A$$

where the equilibrium subsidy is given by $S_B^* = (1 - t_A)\,\Pi_A + t_A \Pi_A - (1 - t_B)\,\Pi_B = \Pi_A - (1 - t_B)\,\Pi_B$, which is positive by Assumption 4.

Under *perfect tax discrimination* or *non-linear-tax competition*, we assume that country B's government chooses an *ad hoc* corporate tax rate, τ_B, which is applied just to the foreign firm's declared profits, and a lump-sum tax (or entrance fee), T_B, to maximize the revenue it can collect by taxing the multinational firm. Its fiscal policy decision is constrained by the fact that it is competing with country A. Hence, country B's offer has to outbid country A's best offer to the foreign firm, which is represented by the possibility of not paying taxes at all there $(\tau_A, T_A) = (0, 0)$. The problem of country B's government can then be written as follows:

$$\begin{aligned} \max_{\tau_B, T_B} \quad & \tau_B \pi_B + T_B \\ \text{s.t.} \quad & (1 - \tau_B)\,\Pi_B - T_B \geq \Pi_A \end{aligned}$$

where $\pi_B = \Pi_B$ as, for the time being, we do not allow the firm to misdeclare the profits actually realized at each location. Note that if the constraint of the problem above were not binding, there would be no real competition for FDI between the two

[12] The same equilibrium outcome arises if we assume Bertrand price competition between countries. We provide a more general and formal definition of the equilibrium of the policy-competition-for-FDI game in the Appendix.

countries. Then, as we are not interested in cases where policy competition resolves into a new tax instrument for country B, any fiscal package (τ_B^*, T_B^*) satisfying the constraint $t_B^* \Pi_B + T_B^* = \Pi_B - \Pi_A$ solves this problem. Due to Assumption 4, country B sets a positive lump-sum tax $T_B^* > 0$ if and only if $\tau_B^* = 0$; otherwise, for any $\tau_B^* > 0$, it pays a lump-sum subsidy $T_B^* < 0$; in particular, $\tau_B^* \in [0, 1]$ and $T_B^* \in [-\Pi_A, \Pi_B - \Pi_A]$. Therefore, country B always wins the competition for FDI by fully extracting the foreign firm's location gain from investing there, $\Pi_B - \Pi_A > 0$. As before, it is trivial to verify that perfect tax discrimination maximizes aggregate welfare.

Under *tax discrimination* or *tax competition*, the two governments just choose the rate τ_i at which the multinational firm's declared profits are taxed. In this case, country A's best offer is represented by a zero tax rate, i.e., $\tau_A = 0$, and the problem of country B's government simplifies to

$$\begin{aligned} \max_{\tau_B} \quad & \tau_B \pi_B \\ \text{s.t.} \quad & (1 - \tau_B)\, \Pi_B \geq \Pi_A \end{aligned}$$

For the same reason as before, the solution comes from the constraint holding with equality, which gives $\tau_B^* = 1 - \frac{\Pi_A}{\Pi_B} \in [0, 1]$. Once again, country B always wins the competition for FDI and aggregate welfare is maximized.

But what happens to regional welfare? Does policy competition for FDI allows the region as a whole and its residents to enjoy more resources?

In the first instance, we argue that whenever policy competition does not change the investment decision of the foreign multinational, regional welfare is always lower than in the no policy competition scenario. In fact, we want to focus on situations where both countries could potentially receive FDI, hence they really have to compete against each other to affect the firm's choice. Under no policy competition, if the multinational chooses to invest in country B, regional welfare is given by $W_{B,No}^R = t_B \Pi_B$. Under subsidy competition, country B always succeeds in attracting FDI but regional welfare decreases to $W_{B,Sub}^R = t_B \Pi_B - S_B^* = \Pi_B - \Pi_A < W_{B,No}^R$ since $S_B^* > 0$ by Assumption 4. Similarly, under either kind of tax competition, regional welfare is equivalent to the subsidy competition scenario, thus lower than without competition. In this case, country B might be able to fully extract the foreign firm's gain from locating there, but it has to forgive the opportunity of taxing the firm's profits by lowering its corporate tax rate to zero.

Absent policy competition and profit shifting, however, the firm might choose to invest in the fiscally-advantageous country A in order to save on tax payments. If this were the case, any form of policy competition may increase regional welfare by making the multinational invest in the location-advantageous country B, and so we can state

Proposition 1 *When the difference in statutory corporate tax rates within the region is sufficiently large, the region as a whole benefits from any kind of policy competition for FDI between countries.*

Proof. See the Appendix. ■

The main message of this Section is that, in the absence of profit shifting, large differentials in statutory corporate tax rates between the two countries may drive the FDI decision of the multinational firm in a way which does not maximize welfare for the region as a whole. In this case, allowing countries to compete for FDI may increase regional welfare since policy competition makes the firm invest in the most profitable (before-taxes) location. In the next Section, we investigate whether the regional-welfare-improving impact of policy competition for FDI and the equivalence between the different fiscal policies we analyze are robust to profit shifting by the multinational firm in response to tax rate differentials.

4 Profit shifting

We now investigate the most interesting set-up where the foreign multinational is able to shift, at some cost, taxable profits to low-tax jurisdictions in response to cross-country tax differentials. To this end, we solve by backward induction the three-stage game described at the beginning of Section 2 to find its subgame perfect Nash equilibrium.

4.1 Stage 3: profit declaration

At the last stage of the game, the foreign multinational chooses the amount of profits to declare to the tax authorities of the countries where it operates, that is either A or B and F. When taking such a decision, the firm can observe statutory corporate tax rates in country i ($i = A, B$) and country F, the fiscal incentives offered by countries A and B if policy competition occurs, and the level of before-tax profits it can realize by locating in either country. The firm then chooses the amount of profits to declare to country i's tax authorities, π_i, in order to maximize its after-tax profits as given by (1). This, in turn, determines the level of declared profits in country F, π_F.

Using (1) and optimizing with respect to π_i, we obtain

$$\pi_i = \Pi_i - \frac{t_i - t_F}{\gamma} \quad \text{and} \quad \pi_F = \Pi_F + \frac{t_i - t_F}{\gamma} \tag{5}$$

from which it follows that no profit misdeclaration takes place when countries i and F tax corporate profits at the same rate. However, for any $t_i \neq t_F$, the multinational always declares higher profits than those actually realized in the lower-tax country and lower profits in the higher-tax country. Note also that any kind of lump-sum subsidies/taxes set by countries A and B does not affect the multinational firm's profit declaration choice.

Since we do not want the firm to declare negative profits in the high-tax country, which would otherwise subsidize it at the prevailing corporate tax rate, we need to

assume that profit shifting is costly enough, i.e.

$$\gamma > \frac{|t_i - t_F|}{\min\{\Pi_i, \Pi_F\}}, \quad i = A, B \tag{6}$$

as we are not making any specific hypothesis about the relationship between Π_i and Π_F. This guarantees that the multinational firm shifts part of its realized profits from the high-tax to the low-tax country and at the same time declares nonnegative profits in both of the countries where it operates. In what follows, we call (6) the *non-negative-profit-declaration condition*.

4.2 Stage 2: FDI decision

At the second stage, the foreign multinational chooses whether to establish its production plant in country A or in country B, and, depending on its investment decision, realizes profits (Π_A or Π_B) by serving the regional market. At this stage of the game, the firm takes the fiscal policies of the two countries as given and invests in the country where it earns larger after-tax profits.

Using the firm's objective function (1), where we substitute for stage-3 optimal declared profits (5), and rearranging terms, the multinational's after-tax profits from investing in country i and shifting profits out of (or into) country F under the policy competition scenario $k \in \{No, Sub, Tax, Disc\}$ can be rewritten as[13]

$$\Pi^{i,k} = (1 - t_i)\,\Pi_i + (1 - t_F)\,\Pi_F + S_i + \frac{(t_i - t_F)^2}{2\gamma}, \quad i = A, B \tag{7}$$

where the last term represents the net gain to shift taxable profits from the high-tax to the low-tax country in response to any tax differential between them.

If countries A and B do not compete to attract FDI ($S_i = 0$, $i = A, B$), the foreign multinational invests in country B as long as the following condition holds:

$$(1 - t_B)\,\Pi_B + \underbrace{\frac{(t_B - t_A)\left(\bar{t} - t_F\right)}{\gamma}}_{\text{relative PS gain/loss}} > (1 - t_A)\,\Pi_A \tag{8}$$

where $\bar{t} \equiv \frac{t_A + t_B}{2}$ is the *average* statutory corporate tax rate in the region and PS is an acronym for profit shifting. A comparison of (8) with the corresponding condition in the absence of profit shifting, i.e., condition (4), suggests that, for a given $t_B > t_A$, profit shifting opportunities may turn the fiscally-disadvantageous country B into a relatively more attractive location for the foreign firm's investment. In particular, when the average tax rate prevailing in the region is higher than the residence country's tax rate $\left(\bar{t} > t_F\right)$, the multinational finds it relatively more interesting to invest in the higher-tax country as profit shifting partially offsets country B's fiscal disadvantage. Otherwise,

[13]The terms No, Sub, Tax, and Disc, stand for no policy competition, subsidy competition, perfect tax discrimination, and tax discrimination, respectively.

when $\bar{t} < t_F$, profit shifting opportunities work in favor of the lower-tax country. Stated differently, if profit shifting goes out of (into) the region, the country setting the higher (the lower) corporate tax rate becomes, *ceteris paribus*, more attractive. In spite of that, in the presence of profit shifting, larger tax differentials always make the fiscally-advantageous country A more profitable from the foreign firm's perspective as the gain from shifting profits out of the high-tax country cannot compensate for the cost of paying taxes there. Then, condition (8) is less likely to hold. This can be easily seen by differentiating (8) with respect to t_A or t_B and recalling the non-negative-profit-declaration condition (6).

Under subsidy competition (for given statutory corporate tax rates), countries A and B offer lump-sum subsidies that affect the relative profitability of the two alternative locations. In particular, when each country bids its maximum subsidy, S_i^{max} $(i = A, B)$, the foreign multinational invests in country B if and only if

$$(1 - t_B)\,\Pi_B + \frac{(t_B - t_A)\left(\bar{t} - t_F\right)}{\gamma} + S_B^{max} > (1 - t_A)\,\Pi_A + S_A^{max} \tag{9}$$

Under perfect tax discrimination, countries A and B are endowed with two fiscal policy instruments and compete over both tax rates, τ_i, and lump-sum taxes, T_i $(i = A, B)$. Then, the multinational firm chooses to invest in country B if and only if

$$(1 - \tau_B)\,\Pi_B + \frac{(\tau_B - \tau_A)\,(\overline{\tau} - t_F)}{\gamma} - T_B > (1 - \tau_A)\,\Pi_A - T_A \tag{10}$$

where $\overline{\tau} \equiv \frac{\tau_A + \tau_B}{2}$ is the average *ad hoc* corporate tax rate of the two countries and the fiscal package (τ_i, T_i) represents country i's offer to the foreign investor.

Finally, under tax discrimination, countries A and B compete just over tax rates, τ_i, and the foreign multinational invests in country B as long as

$$(1 - \tau_B)\,\Pi_B + \frac{(\tau_B - \tau_A)\,(\overline{\tau} - t_F)}{\gamma} > (1 - \tau_A)\,\Pi_A \tag{11}$$

where the tax rate τ_i results from the welfare maximization problem of country i, which we analyze - together with subsidy competition and perfect tax discrimination - in the next subsection.

4.3 Stage 1: policy competition for FDI

At the first stage, the governments of countries A and B simultaneously and irreversibly post bids to attract the foreign investor. The objective of each country's government is to maximize the national welfare gain from receiving FDI.

As we claimed before, we investigate four alternative policy-competition-for-FDI scenarios. Under no policy competition, the two countries do not offer any tax incentive to the foreign multinational. Hence, the firm takes its investment decision according to condition (8) and regional welfare and the firm's after-tax profits are given, respectively,

by $W^R_{A,No} = t_A\pi_A$ and $\Pi^{A,No} = (1-t_A)\,\Pi_A + (1-t_F)\,\Pi_F + \frac{(t_F-t_A)^2}{2\gamma}$ if FDI goes to country A, or $W^R_{B,No} = t_B\pi_B$ and $\Pi^{B,No} = (1-t_B)\,\Pi_B + (1-t_F)\,\Pi_F + \frac{(t_F-t_B)^2}{2\gamma}$ otherwise, where π_A and π_B are the firm's optimal declared profits in (5). In the other scenarios, we let the two countries compete for FDI either by offering to the multinational lump-sum subsidies (for given statutory tax rates), or by choosing both the corporate tax rate and a lump-sum tax on the firm's profits, or simply the *ad hoc* corporate tax rate.

Under subsidy competition, the maximum subsidy country i is willing and able to offer is represented by a full reimbursement of the taxes paid on the profits declared by the firm to country i's tax authorities, that is, $S_i^{max} = t_i\pi_i$ $(i = A, B)$. Namely, since profit shifting allows the firm to misdeclare realized profits at each location in response to tax rate differentials, the maximum subsidies bid by countries A and B are given by

$$S_A^{max} = t_A\left(\Pi_A - \frac{t_A - t_F}{\gamma}\right) \quad \text{and} \quad S_B^{max} = t_B\left(\Pi_B - \frac{t_B - t_F}{\gamma}\right) \tag{12}$$

where we replace π_i with stage-3 optimal declared profits (5). We know from condition (9) that the foreign firm invests in the country representing the most profitable (subsidy inclusive) location. Substituting for the two countries' maximum subsidies (12) and rearranging terms, this condition reduces to

$$\Pi_B - \Pi_A > \frac{(t_B - t_A)\,\bar{t}}{\gamma} \tag{13}$$

which suggests that subsidy competition induces the multinational to invest in country B as long as profit shifting motivations are less important for the firm than the location advantage of setting up a production plant there. In the presence of profit shifting, indeed, subsidy competition cannot offset country B's fiscal disadvantage relative to A. When condition (13) holds, country B wins the competition for FDI. In equilibrium, however, it does not need to pay its maximum subsidy but just the one which is necessary to outbid its competitor. Hence, the equilibrium subsidy country B pays to attract FDI in the presence of profit shifting opportunities for the firm amounts to

$$\tilde{S}_B^* = S_B^* + \frac{2t_Bt_F - t_B^2 - t_A^2}{2\gamma}$$

where S_B^* is country B's equilibrium subsidy in the absence of profit shifting. Thus, depending on statutory corporate tax rates, $\tilde{S}_B^*$ can be either higher or lower than S_B^*. In particular, if the multinational is interested in shifting taxable profits into the region $(t_F > t_A, t_B)$ or simply to the lower-tax country $(t_B > t_F > t_A)$, the subsidy country B has to pay to attract the foreign investor is higher than without profit shifting, i.e. $\tilde{S}_B^* > S_B^*$. Otherwise, for $t_A, t_B > t_F$, the multinational finds it relatively more profitable to invest in the higher-tax country as it can now shift taxable profits out of the region, which leads to $\tilde{S}_B^* < S_B^*$.

The discussion above allows us to conclude that, in the presence of profit shifting, both countries can win subsidy competition for FDI. If country B attracts the foreign

investor, regional welfare is equal to

$$W^R_{B,Sub} = t_B \pi_B - \tilde{S}^*_B = \Pi_B - \Pi_A - \frac{(t_B - t_A)\,\bar{t}}{\gamma}$$

and, substituting for $\tilde{S}^*_B$ into equation (7), the multinational's after-tax profits from investing in country B and shifting profits out of (or into) country F are given by

$$\Pi^{B,Sub} = \Pi_A + (1 - t_F)\,\Pi_F + \frac{t_F^2 - t_A^2}{2\gamma}$$

On the other hand, if it is country A that receives FDI, regional welfare is given by

$$W^R_{A,Sub} = t_A \pi_A - \tilde{S}^*_A = \frac{(t_B - t_A)\,\bar{t}}{\gamma} - (\Pi_B - \Pi_A) = -W^R_{B,Sub}$$

where $\tilde{S}^*_A = \Pi_B - (1 - t_A)\,\Pi_A + \frac{2t_A t_F - t_B^2 - t_A^2}{2\gamma}$ is derived in the same way as $\tilde{S}^*_B$. It is then immediate to compute the multinational's after-tax profits from investing in country A and shifting profits out of (or into) country F by replacing $\tilde{S}^*_A$ into equation (7).

The following Proposition summarizes our findings about subsidy competition for FDI in the presence of profit shifting:

Proposition 2 *In the subgame perfect Nash equilibrium of the subsidy-competition-for-FDI game*

- *if country B's location advantage is more important for the foreign firm than profit shifting opportunities, i.e., condition* (13) *holds:*
  - *country B wins the competition for FDI and pays a subsidy* $\tilde{S}^*_B$*;*
  - *the foreign firm invests in B and declares profits* $\pi_B = \Pi_B - \frac{t_B - t_F}{\gamma}$ *and* $\pi_F = \Pi_F + \frac{t_B - t_F}{\gamma}$*;*
  - *the payoffs to country B (hence, to the region), to country A, and to the foreign firm are given by* $W^B_B = W^R_{B,Sub} = \Pi_B - \Pi_A - \frac{(t_B - t_A)\bar{t}}{\gamma}$*,* $W^A_B = 0$*, and* $\Pi^{B,Sub} = \Pi_A + (1 - t_F)\,\Pi_F + \frac{t_F^2 - t_A^2}{2\gamma}$*, respectively;*
- *if profit shifting opportunities are more important for the foreign firm than country B's location advantage, i.e., condition* (13) *does not hold:*
  - *country A wins the competition for FDI and pays a subsidy* $\tilde{S}^*_A$*;*
  - *the foreign firm invests in A and declares profits* $\pi_A = \Pi_A - \frac{t_A - t_F}{\gamma}$ *and* $\pi_F = \Pi_F + \frac{t_A - t_F}{\gamma}$*;*
  - *the payoffs to country B, to country A (hence, to the region), and to the foreign firm are given by* $W^B_A = 0$*,* $W^A_A = W^R_{A,Sub} = \frac{(t_B - t_A)\bar{t}}{\gamma} - (\Pi_B - \Pi_A)$*, and* $\Pi^{A,Sub} = \Pi_B + (1 - t_F)\,\Pi_F + \frac{t_F^2 - t_B^2}{2\gamma}$*, respectively.*

Proof. See the Appendix. ■

Under perfect tax discrimination, the two countries choose both the corporate tax rate and a lump-sum tax on the foreign firm's profits. In particular, when we allow for profit shifting opportunities, the problem of country B's government can be written as follows:

$$\begin{aligned} \max_{\tau_B, T_B} \quad & \tau_B \pi_B + T_B \\ \text{s.t.} \quad & (1-\tau_B)\,\Pi_B - \frac{t_B\,(2t_F - t_B)}{2\gamma} - T_B \geq \Pi_A \end{aligned}$$

where $\pi_B = \Pi_B - \frac{\tau_B - t_F}{\gamma}$ from the firm's optimal declared profits in (5) and the constraint comes from condition (10) with $\tau_A = T_A = 0$ as country B's offer has to outbid country A's best offer to the foreign firm. We easily show that the tax pair

$$(\tau_B^*, T_B^*) = (0, \Pi_B - \Pi_A)$$

solves this problem. Hence, country B always wins the competition for FDI by levying a zero tax rate on declared profits and by fully extracting the foreign firm's location gain from investing there by means of a positive lump-sum tax. As a result, regional welfare is given by $W_{B,Tax}^R = W_B^B = \Pi_B - \Pi_A$. This allows us to state

Proposition 3 *In the subgame perfect Nash equilibrium of the game where countries compete in non-linear-taxes*

- *country B always wins the competition for FDI by setting $(\tau_B^*, T_B^*) = (0, \Pi_B - \Pi_A)$;*
- *the foreign firm always invests in B and declares profits $\pi_B = \Pi_B + \frac{t_F}{\gamma}$ and $\pi_F = \Pi_F - \frac{t_F}{\gamma}$;*
- *the payoffs to country B (hence, to the region), to country A, and to the foreign firm are given by $W_B^B = W_{B,Tax}^R = \Pi_B - \Pi_A$, $W_B^A = 0$, and $\Pi^{B,Tax} = \Pi_A + (1-t_F)\,\Pi_F + \frac{t_F^2}{2\gamma}$, respectively.*

Proof. See the Appendix. ■

The intuition for such a result is simple. When the two countries' governments are allowed to offer fully flexible tax packages to the foreign investor, the distortions introduced by statutory corporate tax rate differentials and by the profit shifting behavior of the multinational firm can be eliminated. Then, the country where the firm may enjoy the largest (before-tax) profits always wins the competition for FDI.[14] In equilibrium, the maximum profit shifting opportunities for the multinational firm arise when $\tau_B = 0$

[14] This reminds us the well-known result in the IO literature on vertical product differentiation according to which if a high and a low quality good are offered at the same price, then all consumers will buy the high quality good (see, e.g., Pepall *et al.*, 2008). Here, absent tax distortions, country B will benefit from a higher intrinsic quality relative to country A because of its location advantage.

- that is, when country B offers a *tax holiday* to the firm - and the lump-sum tax allows country B itself to extract all the relative location rents from investing there.

Under tax discrimination (or tax competition), the two governments do not have the non-distortionary lump-sum tax at their disposal and just compete over the rate τ_i at which the multinational firm's declared profits are taxed. In this case, the problem of country B's government is given by

$$\begin{aligned} \max_{\tau_B} \quad & \tau_B \pi_B \\ \text{s.t.} \quad & (1-\tau_B)\,\Pi_B + \frac{(\tau_B - \tau_A)\,(\overline{\tau} - t_F)}{\gamma} \geq (1-\tau_A)\,\Pi_A \end{aligned}$$

where $\pi_B = \Pi_B - \frac{\tau_B - t_F}{\gamma}$ from (5). In the Appendix, we show that the solution to this problem $\tau_B^*(\tau_A)$, given country A's best offer to the foreign firm, $\tau_A = 0$, is

$$\tau_B^*(0) \equiv \hat{\tau}_B = \gamma\Pi_B + t_F - \sqrt{(\gamma\Pi_B + t_F)^2 - 2\gamma\,(\Pi_B - \Pi_A)}$$

which is always positive and smaller than 1 for any $\gamma > \frac{1-2t_F}{2\Pi_A}$.[15] Note also that, under the last condition, $\hat{\tau}_B$ is always increasing in Π_B, which suggests that the larger the before-tax profitability from investing in B (due to, e.g., a larger market size relative to A), the lower the incentive to tax discriminate in favor of foreign firms, i.e., the higher the tax rate that country B bids to attract the foreign investor.

Hence, in equilibrium, country B always wins the competition for FDI by setting a positive tax rate on the foreign firm's declared profits. Regional welfare is then given by $W_{B,Disc}^R = W_B^B = \Pi_B - \Pi_A - \frac{\hat{\tau}_B^2}{2\gamma}$ and it represents the marginal contribution of country B to aggregate welfare (or total surplus), defined as the unweighted sum of regional welfare and the firm's after-tax profits.[16] In fact, such a contribution corresponds to the location advantage of B over A, $\Pi_B - \Pi_A$, minus the loss in terms of overall potential gains from profit shifting, that is, $\left[t_F \frac{t_F - \hat{\tau}_B}{\gamma} - \frac{(t_F - \hat{\tau}_B)^2}{2\gamma}\right] - \left[t_F \frac{t_F}{\gamma} - \frac{t_F^2}{2\gamma}\right] = -\frac{\hat{\tau}_B^2}{2\gamma}$.

We summarize our results about tax discrimination in

Proposition 4 *In the subgame perfect Nash equilibrium of the tax-competition-for-FDI game*

- *country B always wins the competition for FDI by setting $\hat{\tau}_B \in (0,1)$;*
- *the foreign firm always invests in B and declares profits $\pi_B = \Pi_B - \frac{\hat{\tau}_B - t_F}{\gamma}$ and $\pi_F = \Pi_F + \frac{\hat{\tau}_B - t_F}{\gamma}$;*

[15] We cannot say *a priori* whether this condition is more or less stringent than the non-negative-profit-declaration condition (6). In any case, we assume that the most stringent of the two holds.

[16] Our results can be easily interpreted in the light of the common agency literature since our model considers two principals (the two governments) that submit offers to a common agent (the foreign investor). In particular, Chiesa and Denicolò (2008) show that in a common agency game with two principals and complete information, each principal's payoff corresponds exactly to its marginal contribution to social surplus even when we relax the assumption of truthful strategies.

- *the payoffs to country B (hence, to the region), to country A, and to the foreign firm are given by $W_B^B = W_{B,Disc}^R = \Pi_B - \Pi_A - \frac{\hat{\tau}_B^2}{2\gamma}$, $W_B^A = 0$, and $\Pi^{B,Disc} = (1-\hat{\tau}_B)\,\Pi_B + (1-t_F)\,\Pi_F + \frac{(\hat{\tau}_B - t_F)^2}{2\gamma}$, respectively.*

Proof. See the Appendix. ■

4.4 Welfare implications

In this Section, we evaluate the welfare impact of profit shifting by the foreign multinational investing in the region. We analyze first the implications for aggregate welfare and then investigate whether the introduction of policy competition may enhance regional welfare by changing the foreign firm's investment decision. Finally, we show under which conditions tax discrimination has to be preferred to subsidy competition.

It is easy to check that, even in the presence of profit shifting, any of the three forms of policy competition for FDI maximizes aggregate welfare. Namely, it always induces the multinational firm to take the investment decision which yields higher welfare for the economy as a whole. For example, under subsidy competition, aggregate welfare is maximized when FDI goes to B as long as

$$W_{B,Sub}^R + \Pi^{B,Sub} > W_{A,Sub}^R + \Pi^{A,Sub} \quad \Longleftrightarrow \Pi_B - \Pi_A > \frac{(t_B - t_A)\,\bar{t}}{\gamma}$$

which is equivalent to condition (13), that drives the firm's FDI choice. Under perfect tax discrimination, instead, we have that

$$W_{B,Tax}^R + \Pi^{B,Tax} > W_{A,Tax}^R + \Pi^{A,Tax} \quad \Longleftrightarrow \Pi_B > \Pi_A$$

as this form of competition eliminates the distortions introduced by corporate taxation and profit shifting opportunities and leads the firm to invest in the country where it benefits from a location advantage.

Both subsidy competition for FDI and the two forms of tax discrimination maximize aggregate welfare. However, they are no longer equivalent in the presence of profit shifting. When countries compete over non-linear taxes, both of them offer a tax holiday to the foreign firm. The latter takes into account the possibility of not paying taxes at all on the profits it declares in the country where it sets up its production plant. Hence, it optimally shifts into the host country as much of its profits as it can since the corporate tax rate it has to face there is nil. As the potential profit shifting gain is the same in both countries, the one which benefits from a location advantage, i.e., country B, always receives FDI. Moreover, it can extract the firm's profit gain from investing there by means of the lump-sum tax. Under tax discrimination, country B is still able to set a tax rate which induces the foreign firm to invest there but it cannot fully enjoy the location rent because of the loss in terms of profit shifting. By contrast, lump-sum subsidy competition does not affect profit declaration and profit shifting motivations play a decisive role for the FDI choice.

To investigate the effects on regional welfare of policy competition for FDI in the presence of profit shifting, we assume that either form of competition always decreases regional welfare when it does not change the multinational firm's investment decision:

Assumption 5 $W^R_{i,k} < W^R_{i,No},\ k \in \{Sub, Tax, Disc\}$

This allows us to exclude from the analysis the cases where policy competition resolves into a new tax instrument for the host country and to focus on situations where competition for FDI actually takes place as both countries represent profitable locations (either before or after taxes) for the firm. Assumption 5 thus implies that under subsidy competition, both countries have to pay positive equilibrium subsidies to attract FDI; or under either form of tax discrimination, the cost for country B of lowering the corporate tax rate on the foreign firm's profits (either to zero or to some positive value) cannot compensate for the gain from (full or partial) rent extraction.

Due to our initial Assumptions 1 and 2 and based on our results of Section 4.3, Assumption 5 allows us to rank regional welfare from FDI to country B as follows:

$$W^R_{B,No} > W^R_{B,Tax} > W^R_{B,Sub} \quad \text{and} \quad W^R_{B,No} > W^R_{B,Tax} > W^R_{B,Disc}$$

meaning that no competition has to be always preferred to any form of policy competition for FDI; if competition takes place, however, perfect tax discrimination always yields higher regional welfare than subsidy competition or tax discrimination.

Concerning regional welfare from FDI to country A, we have that

$$W^R_{A,No} > W^R_{A,Sub}$$

as neither form of tax discrimination can induce the firm to invest there. Note also that $\frac{\partial W^R_{A,No}}{\partial t_A} > 0$ if and only if $\gamma > \frac{2t_A - t_F}{\Pi_A}$.[17] Since $t_B > t_A$ by Assumption 2, a lower t_A, for a given t_B, increases the tax difference between them and, if γ is high enough, i.e, if profit shifting is sufficiently costly, it decreases regional welfare from FDI to B under no policy competition.

We want to show that policy competition may increase regional welfare by changing the firm's FDI decision. In particular, as perfect tax discrimination always leads to higher regional welfare than the other two forms of policy competition, we focus on the comparison between $W^R_{B,Sub}$ and $W^R_{A,No}$. The latter is the best situation for the region as a whole when FDI goes to A, and, for this to happen, the multinational has to find it profitable to invest in country A in the absence of policy competition, i.e., $\Pi^{A,No} > \Pi^{B,No}$ must hold. It is also easy to check that the welfare of country B - hence, of the region - corresponds to the marginal contribution of country B to aggregate welfare,

[17] If $t_F < t_A$, the firm shifts taxable profits to country F and $W^R_{A,No}$ increases with t_A if and only if γ is high enough, meaning that profit shifting is limited by its cost. If $t_F > 2t_A$, $W^R_{A,No}$ always increases with t_A since t_F is so high that γ becomes negligible. Finally, if $t_F \in (t_A, 2t_A)$, the firm shifts taxable profits to country A, which can increase its tax revenue by increasing t_A as long as γ is high enough.

and it can thus be defined as the difference between aggregate welfare when the firm invests in B and when it invests in A, i.e., $W^R_{B,Sub} = W^R_{B,No} + \Pi^{B,No} - \left(W^R_{A,No} + \Pi^{A,No}\right)$. Therefore, provided that $\Pi^{A,No} > \Pi^{B,No}$, regional welfare increases as a result of subsidy competition as long as

$$W^R_{B,No} > \Pi^{A,No} - \Pi^{B,No} + 2W^R_{A,No}$$

which is more likely to be true when the relative after-tax profitability from investing in A over B essentially depends on a low statutory corporate tax rate t_A or on an important difference between t_A and t_B. Indeed, a lower t_A increases $\Pi^{A,No}$ but, if profit shifting is costly enough, it simultaneously reduces tax revenues (hence, regional welfare from FDI to A). This allows us to claim

Proposition 5 *In the presence of profit shifting, subsidy competition for FDI may be beneficial to the region if the difference in statutory corporate tax rates within the region is large enough.*

In fact, for a statutory tax rate difference sufficiently large, we know that the multinational firm prefers to invest in the fiscally-advantageous country A absent policy competition. But as we let this difference increase further - by decreasing t_A, for a given t_B - regional welfare from FDI to A may decrease. Hence, subsidy competition may be regional-welfare improving since it induces the firm to invest in the location-advantageous country B. This is true provided that profit shifting is so costly that a reduction in t_A does not allow country A to increase the revenue it can collect by taxing the multinational firm's profits.

Lastly, we want to demonstrate that, in the presence of profit shifting, tax discrimination might be more desirable than subsidy competition as a policy instrument to attract FDI. To this end, we need to compare $W^R_{B,Disc}$ and $W^R_{B,Sub}$, notably the impact of profit shifting under the two policies, which would otherwise be equivalent. It is then straightforward to show that

$$W^R_{B,Disc} > W^R_{B,Sub} \quad \Longleftrightarrow \quad \hat{\tau}_B \in \left(0, \sqrt{(t_A - t_B)(t_A + t_B)}\right)$$

since $\hat{\tau}_B$ cannot be negative. Such a condition is more likely to hold the higher the statutory corporate tax rate difference or the sum (i.e., the average) of tax rates or both are. We can thus state

Proposition 6 *In the presence of profit shifting, tax discrimination is more likely to yield higher regional welfare than subsidy competition for FDI when the difference in statutory corporate tax rates within the region and/or the average statutory corporate tax rate prevailing in the region are large enough.*

To understand why this is so, we just need to look at regional welfare from FDI to country B under subsidy competition, $W^R_{B,Sub} = \Pi_B - \Pi_A - \frac{(t_B - t_A)\bar{t}}{\gamma}$, since regional

welfare under tax discrimination, $W^R_{B,Disc}$, does not depend on the statutory corporate tax rates t_A and t_B. We know that $W^R_{B,Sub}$ represents country B's marginal contribution to aggregate welfare, where the latter is defined as the sum of regional welfare and the firm's after-tax profits, thereby excluding country F. For a given average statutory tax rate in the region $\bar{t}$, a larger difference $(t_B - t_A)$ decreases country B's marginal contribution since the amount of taxable profits the multinational firm shifts into the region shrinks (or, similarly, profit shifting to the residence country F gets larger). On the other hand, for a given statutory tax rate difference within the region $(t_B - t_A)$, a higher average tax rate $\bar{t}$ lowers country B's marginal contribution because a symmetric increase in statutory tax rates - that keeps the difference between them constant - has a negative effect on aggregate welfare and such an effect is stronger for the country with the higher statutory tax rate.

5 Concluding remarks

The phenomenon of competition for FDI is pervasive and mostly takes place between countries belonging to the same geographic or economic area. The incentives offered to foreign investors often consist in tax holidays or other kinds of specific tax concessions. Moreover, the empirical evidence seems to suggest that multinational firms might consider profit shifting opportunities when deciding the location of their foreign subsidiaries. In order to counter what policymakers label "harmful" tax competition between governments, both the European Union and the OECD recommend member countries not to discriminate between taxation of purely domestic and of multinational firms. In such a sense, one of the major attempts worldwide to limit policy competition for FDI is represented by State Aid Control in the European Union. This system should prevent countries from offering subsidies in order to attract foreign investors. But there is empirical evidence to the contrary.

The objective of this paper has been to investigate the impact on regional welfare of policy competition for FDI when a foreign multinational can strategically react to differences in statutory corporate tax rates and shift taxable profits to lower-tax jurisdictions. In particular, we have tried to understand whether it can be welfare-improving for the region as a whole that countries compete against each other by offering further tax incentives when their national corporate tax systems already give the multinational some opportunities to minimize its worldwide tax liabilities. To this end, we have set up a model of policy competition for FDI between two countries belonging to the same region, and we have assumed that one country has a *location* advantage but a *fiscal* disadvantage relative to the other one.

If we rule out profit shifting opportunities, any form of policy competition eliminates tax distortions and induces the foreign multinational to invest in the location-advantageous country. Moreover, when the statutory tax rate difference is large enough, policy competition increases regional welfare by changing the investment decision of the

firm. On the other hand, when we take profit shifting opportunities into account, subsidy competition can no longer offset tax distortions. Then, profit shifting motivations may induce the firm to invest in the fiscally-advantageous country. By contrast, either form of tax discrimination cancels out the distortions arising from statutory tax rate differentials and induces the foreign firm to choose the most efficient location for its investment. In spite of that, subsidy competition may still be regional-welfare-improving when the statutory tax rate difference is large enough.

Our main contribution has been to prove that, in the presence of profit shifting, tax discrimination might be preferable - in terms of regional welfare - to subsidy competition as a policy instrument to attract FDI. This is more likely to be true when the statutory tax rate difference within the region and/or the average tax rate prevailing in the region are high. Such a result has important policy implications for, e.g., the European Union. Indeed, it challenges the propriety of the non-discrimination principle in an area characterized by both high tax levels and high tax differentials. In this context, tax discrimination, i.e., a policy which is more able to adjust to the profit shifting activities of multinational firms, might lead to larger benefits than lump-sum subsidy competition.

We conclude with two remarks on our modeling choices. First, we restrict attention to tax instruments to attract FDI. This is because we want to focus on policies that affect profit declaration by the multinational firm, hence its profit shifting ability in response to the fiscal incentives offered by competing countries. To this end, we do not let governments choose, e.g., the level of public infrastructure (roads, bridges, rail connections, airports, etc.) supplied to the firm. This, however, might be captured by the exogenous difference in before-tax profitability between the two locations as long as we consider infrastructure as a *local* public good, whose benefits can be enjoyed by the firm only by locating in the country where the investment has been made.[18]

Second, our set-up is characterized by complete information, i.e., the economic agents (the governments and the multinational firm) know everything they need to know to take the decisions which maximize their payoffs. But there are several ways to introduce asymmetric information in our framework.[19] For instance, by assuming that the foreign multinational possesses private information on its outside option from not investing in

[18]In general, when countries face a set of firms heterogeneous with respect to their infrastructure needs, they have an incentive to differentiate to the maximum extent as this allows them to reduce the dissipation of welfare resulting from subsequent tax competition. In such a sense, infrastructure competition can relax tax competition in the same way as product differentiation can relax price competition between firms. Hindiks *et al.* (2008), however, show that the opposite result may hold under revenue sharing when countries are heterogeneous *ex ante* in their capacity to attract capital. In particular, countries strategically choose to under-invest in public infrastructure as they anticipate that public investments, by enhancing the productivity of capital, will exacerbate subsequent capital tax competition. See Dembour (2008) for a recent survey of the literature about tax and infrastructure competition.

[19]Bond and Samuelson (1986), e.g., analyze a situation where the firm is uncertain as to the productivity of the country where it will potentially invest, and show that tax holidays are an optimal means by which high-productivity countries can reveal their type.

the region. That is, the two governments just have some common expectations about the profitability of an alternative location outside the region for the foreign multinational. If governments are not able to elicit information from the firm, however, the uncertainty about the value of such an outside option simply resolves into a further constraint that they may have to take into account when competing for FDI. A more interesting situation, instead, occurs when the fiscal policy of the host country indirectly affects the value of the outside option. If, for example, the outside option of the foreign multinational is given by the possibility of not investing abroad, operating just in its residence country and paying taxes at some unknown rate there, profit shifting creates a link between the fiscal policies of the residence and of the host country. Hence, the host country might be able to design a fiscal policy which induce truthful revelation by the foreign firm. But this goes beyond the scope of our model and represents a task for future research.

Appendix

No profit shifting

Policy-competition-for-FDI equilibrium

The problem of country i's government under the three forms of policy competition we analyze can be generally formulated in the following way:

$$\begin{array}{ll} \max\limits_{t_i(\pi_i)} & t_i\left(\pi_i\right) \\ \text{s.t.} & \Pi_i - t_i\left(\pi_i\right) \geq \Pi_j - t_j\left(\pi_j\right),\ i,j = A,B,\ i \neq j \end{array}$$

where the fiscal policy implemented by country i, $t_i\left(\pi_i\right)$, is a function of the profits the multinational firm declares to country i's tax authorities.

The policy-competition-for-FDI game between countries A and B is a Bertrand-competition-like game in prices with multiple equilibria. In particular, the equilibrium can be defined as follows

$$\begin{aligned} t_A^*\left(\pi_A\right) &= \epsilon,\ \text{with } \epsilon \in (0,\infty) \\ t_B^*\left(\pi_B\right) &= \Pi_B - \Pi_A \end{aligned}$$

The proof is a straightforward application of the Bertrand-competition solution. Indeed, for country A, any $\epsilon \in (0,\infty)$ is a best reply to country B's equilibrium strategy since A's payoff is always nil, i.e., it can never attract the foreign investor. For country B, any other strategy $t'_B\left(\cdot\right)$ such that $t'_B\left(\cdot\right) > \Pi_B - \Pi_A > 0$ is not an equilibrium strategy since country A will have the opportunity of attracting FDI by setting $t_A^*\left(\cdot\right) = \epsilon < t'_B\left(\cdot\right)$. By contrast, any other strategy $t'_B\left(\cdot\right) < \Pi_B - \Pi_A$ is not a best reply to $t_A^*\left(\cdot\right)$ because it leaves money on the table, i.e., to the foreign multinational firm.

Proof of Proposition 1

When $(1-t_A)\,\Pi_A > (1-t_B)\,\Pi_B$, the foreign multinational invests in country A in the absence of policy competition and regional welfare is given by $W_A^R = t_A \Pi_A$. Competition between countries changes the FDI decision of the foreign multinational and regional welfare amounts to $W_B^R = \Pi_B - \Pi_A$. We want to show that $\Pi_B - \Pi_A > t_A \Pi_A$ may hold, in which case policy competition increases regional welfare. For this to be possible, two conditions have to be satisfied:

(i) the foreign investor chooses to invest in country A in the absence of policy competition if and only if

$$\Pi_B < \frac{1-t_A}{1-t_B}\Pi_A$$

that is if the gain in before-tax profits from investing in B cannot compensate for the fiscal disadvantage of operating in the high-tax country;

(ii) regional welfare increases if and only if

$$\Pi_B > (1+t_A)\,\Pi_A$$

Therefore, policy competition increases regional welfare by inducing the firm to invest in the location-advantageous country if and only if the last two conditions simultaneously hold, that is if and only if

$$\frac{1-t_A}{1-t_B} > 1+t_A \quad \Longleftrightarrow \quad t_B > \hat{t}_B\,(t_A) \equiv \frac{2t_A}{1+t_A} \geq t_A$$

For $t_B \in \left[t_A, \hat{t}_B\right)$, any kind of policy competition decreases regional welfare, whereas the opposite holds true for $t_B \in \left(\hat{t}_B, 1\right)$.

Profit shifting

Subsidy competition

If country B's location advantage is more important for the foreign firm than profit shifting opportunities, i.e., condition (13) holds, country A can never succeed in attracting FDI even by bidding its maximum lump-sum subsidy S_A^{max}. On the other hand, if condition (13) does not hold, it is country B that can never win the competition for FDI. Hence, similarly to the no-profit-shifting case, the equilibrium of the subsidy-competition-for-FDI game between countries A and B can be defined as follows

$$\begin{aligned} &S_i^* = \epsilon, \quad \text{with } \epsilon \in (0, S_i^{max}) \\ &\tilde{S}_j^* : \Pi^j(\tilde{S}_j^*) = \Pi^i\left(S_i^{max}\right), \text{ for } i,j = A,B,\ i \neq j \end{aligned}$$

The proof is once again a straightforward application of the Bertrand-competition solution. Indeed, depending on condition (13), one of the two countries, say country i, can

never attract the foreign investor. For country i, any bid $\epsilon \in (0, S_i^{max})$ is a best reply to country j's equilibrium strategy since i's payoff is always equal to zero. For country j, any other strategy $S'_j < \tilde{S}_j^*$ is not an equilibrium strategy since country i will have the opportunity of attracting FDI by setting S_i^{max}, which would imply $\Pi^i(S_i^{max}) > \Pi^j(S'_j)$. By contrast, any other strategy $S'_j > \tilde{S}_j^*$ is not a best reply to S_i^* because it leaves to the foreign firm an extra-benefit that country j could extract.

Perfect tax discrimination or non-linear-tax competition

Under non-linear tax competition, country B's government chooses the tax pair (τ_B, T_B) which maximizes the revenue it can collect by taxing the foreign multinational. Such a choice is constrained by the tax pair set by country A. Hence, for country B to win, its offer has to outbid the competing country's best offer, which is represented by $(\tau_A, T_A) = (0, 0)$. We substitute the latter into condition (10) to get the constraint for country B's maximization problem, which can be written as

$$\begin{aligned} \max_{\tau_B, T_B} \quad & \tau_B \pi_B + T_B \\ \text{s.t.} \quad & (1-\tau_B)\,\Pi_B - \frac{\tau_B\,(2t_F - \tau_B)}{2\gamma} - T_B \geq \Pi_A \end{aligned}$$

where $\pi_B = \Pi_B - \frac{\tau_B - t_F}{\gamma}$ from the firm's profit declaration choice. Denoting by λ the Lagrange multiplier for the constraint of this problem, the corresponding Lagrangian function is

$$L = \tau_B \Pi_B - \tau_B \frac{\tau_B - t_F}{\gamma} + T_B + \lambda \left[(1-\tau_B)\,\Pi_B - \frac{\tau_B\,(2t_F - \tau_B)}{2\gamma} - T_B - \Pi_A \right]$$

and first-order and complementary slackness conditions are

$$\begin{aligned} & \frac{\partial L}{\partial \tau_B} = 0 \iff \Pi_B - \frac{2\tau_B - t_F}{\gamma} - \lambda \Pi_B - \lambda \frac{t_F - \tau_B}{\gamma} = 0 \\ & \frac{\partial L}{\partial T_B} = 0 \iff \lambda = 1 \\ & \lambda \left[(1-\tau_B)\,\Pi_B - \frac{\tau_B\,(2t_F - \tau_B)}{2\gamma} - T_B - \Pi_A \right] = 0,\ \lambda \geq 0 \end{aligned}$$

Since $\lambda = 1$, the constraint always holds with equality, and the first condition reduces to $-\frac{\tau_B}{\gamma} = 0$, from which it follows that $\tau_B^* = 0$. Hence, it is straightforward to conclude that country B's welfare maximizing fiscal package is given by

$$(\tau_B^*, T_B^*) = (0, \Pi_B - \Pi_A)$$

Such a tax pair always induces the multinational to invest in B and leads to a welfare in that country (and in the region as a whole) equal to $W_B^B = W_B^{R,Tax} = \Pi_B - \Pi_A$.

This is the equilibrium of the non-linear-tax-competition-for-FDI game between countries A and B. Indeed, it is always possible for country B to post a bid such

that country A can never attract the foreign investor. Any fiscal package (τ'_B, T'_B) which leaves lower after-tax profits to the foreign firm is not an equilibrium strategy for country B as it gives country A the opportunity of attracting FDI with its best offer (or even less). A fiscal package more generous than (τ^*_B, T^*_B), instead, would leave money to the firm. For country A, then, any bid (τ_A, T_A) is a best reply to country B's equilibrium strategy since A's payoff is always nil.

Tax discrimination or tax competition

Under tax discrimination, the two governments just compete over the rate τ_i at which the multinational firm's declared profits are taxed, and the problem of country B's government is given by

$$\begin{aligned} \max_{\tau_B} \quad & \tau_B \pi_B \\ \text{s.t.} \quad & (1-\tau_B)\,\Pi_B + \frac{(\tau_B - \tau_A)\,(\overline{\tau} - t_F)}{\gamma} \geq (1-\tau_A)\,\Pi_A \end{aligned}$$

where $\pi_B = \Pi_B - \frac{\tau_B - t_F}{\gamma}$ from (5). Since we are dealing with a single-variable maximization problem with one constraint, the solution is either an unconstrained maximum - resulting from the maximization of the objective function without the constraint - or it comes from the constraint itself, which is binding. But if the constraint is not binding, there is no real competition for FDI between countries and the latter resolves into a new tax instrument for country B. Hence, we just consider the binding situation and we define

$$f(\tau_A, \tau_B) \equiv (1-\tau_B)\,\Pi_B + \frac{(\tau_B - \tau_A)\,(\overline{\tau} - t_F)}{\gamma} - (1-\tau_A)\,\Pi_A = 0$$

so that the solution to country B's problem is given by

$$\tau^*_B(\tau_A) = \gamma\Pi_B + t_F \pm \sqrt{(\gamma\Pi_B + t_F)^2 + \tau_A(\tau_A - 2t_F) - 2\gamma\left[\Pi_B - (1-\tau_A)\,\Pi_A\right]}$$

which, given country A's best offer to the foreign firm, i.e., $\tau_A = 0$, reduces to

$$\tau^*_B(0) = \gamma\Pi_B + t_F \pm \sqrt{(\gamma\Pi_B + t_F)^2 - 2\gamma(\Pi_B - \Pi_A)}$$

Note that $f(\cdot,\cdot)$ is a convex function of τ_B which is increasing for $\tau_B > \gamma\Pi_B + t_F$. If the two roots that we have just defined do not exist, this means that $f(\cdot,\cdot) > 0$, i.e., the after-tax profits from investing in B always exceed those from investing in A, hence country B always attracts FDI for any τ_B it sets. If the two roots exist, instead, they will both be positive, but the only acceptable solution is the smaller one as the larger one violates the non-negative-profit-declaration condition, which requires $\tau_B < \gamma\Pi_B + t_F$. Therefore, country B always attracts FDI by setting

$$\tau^*_B(0) \equiv \hat{\tau}_B = \gamma\Pi_B + t_F - \sqrt{(\gamma\Pi_B + t_F)^2 - 2\gamma(\Pi_B - \Pi_A)}$$

and regional welfare is given by $W^R_{B,Disc} = W^B_B = \hat{\tau}_B \left(\Pi_B - \frac{\hat{\tau}_B - t_F}{\gamma} \right) = \Pi_B - \Pi_A - \frac{\hat{\tau}_B^2}{2\gamma}$ where the last equality is obtained by using $f(0, \tau_B) = 0$.

The equilibrium of the tax-discrimination game between countries A and B can be defined as follows:

$$\tau_A^* = \epsilon, \quad \text{with } \epsilon \in (0, \infty)$$
$$\hat{\tau}_B : \Pi^B(\hat{\tau}_B) = \Pi^A(0)$$

Indeed, it is always possible for country B to set a tax rate such that country A can never attract the foreign investor. Any $\tau_B > \hat{\tau}_B$ is not an equilibrium strategy for country B as it gives country A the opportunity of attracting FDI with its best offer, i.e., $\tau_A = 0$. By contrast, any $\tau_B < \hat{\tau}_B$ would leave money to the firm. For country A, then, any $\tau_A \in (0, \infty)$ is a best reply to $\hat{\tau}_B$ since A always earns a zero payoff.

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