Exports Versus Horizontal FDI with Profit Shifting*

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Current version: August 2006

Abstract

We study the optimal decisions of a monopolist concerning: i) where to locate its first - and possibly unique - production plant; and ii) the mode of penetration of two markets of different size, i.e. whether to serve one of them locally and the other one through exports or both of them through local sales. As an “exporter”, the firm pays taxes on its overall realized profits just in the country where it locates its single production plant. As a “multinational”, the firm has a production plant in each country and pays taxes to different tax authorities which might levy unequal tax rates on its declared profits. Our main purpose is to evaluate from the firm’s perspective the (dis)advantages of horizontal FDI relative to exports when country-size asymmetry and profit shifting opportunities are taken into account. We show how the monopolist’s optimal location-organization choice is driven by the level of tax rates and their relative difference. Finally, we discuss the way in which the costs of becoming multinational and/or of cross-country profit shifting shape the firm’s decisions.

Keywords: Horizontal FDI; Exports; Corporate Taxation; Profit Shifting; Location and Organization Choice

JEL Classification: F23; H26; H32; H87; L23

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*We wish to thank Kristian Behrens, Giacomo Calzolari, Giuseppe De Feo, Jean Hindriks, Pierre M. Picard, Cecilia Vergari, as well as participants at the Doctoral Workshop in Economics at UCL, for valuable comments and suggestions. The usual disclaimer applies.

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1 Introduction

In the present paper, we study the optimal decisions of a monopolist concerning: i) where to locate its first - and possibly unique - production plant; and ii) whether to serve one of the two markets through exports or both markets through local sales. Our main purposes are to investigate the relationship between tax and non-tax determinants of “horizontal” foreign direct investment (hereafter, FDI) and to evaluate from the firm’s perspective the (dis)advantages of FDI relative to exports.\footnote{We therefore abstract here from “vertical” FDI involving fragmentation of the firm’s production process across countries. See, e.g., Markusen (2002, Ch. 9) for a discussion of this form of FDI.} To this end, we develop a model where two countries of asymmetric size levy corporate tax rates on the profits generated within their borders and do not allow the firm to deduct its investment (fixed) costs from the corporate tax base. We then analyze how the firm’s location-organization choice between exports and horizontal FDI depends on the tax rates set by the two countries and on other key parameters of the model.

In the absence of taxes, a firm can be induced to establish a production plant in a country simply because the latter represents a large market for the final good. When production occurs where the good is sold, the firm does not have to incur any trade costs to export the product from another country. However, setting up a plant entails a (fixed) cost (e.g. building the factory, buying machines, training workers, etc.) for the firm.

Corporate taxation introduces further motives for preferring exports to horizontal FDI or vice versa. An “exporter” pays taxes on its overall profits just in the country where its - unique - production plant is located. A “multinational” has a production plant in each country and pays taxes to different national tax authorities which possibly levy unequal tax rates on the firm’s profits. Hence, becoming multinational allows the firm to shift taxable profits - at some cost - to the lower-tax country. By contrast, being an exporter which operates in the lower-tax country can be an indirect way of minimizing tax liabilities on worldwide profits.

The motivation for our research can be found in the empirical evidence. On the one hand, several studies show a robust positive relationship between market size and the likelihood to attract FDI.\footnote{See, e.g., Devereux and Griffith (1998) and Head and Mayer (2002).} On the other hand, most of the literature finds that the corporate tax rate of the host country has a negative and significant effect on inward FDI.\footnote{See De Mooij and Ederveen (2002) for a synthesis of empirical studies based on EU data.} Therefore, it seems evident the need to study both effects in a theoretical set-up which can capture them and which also takes profit shifting opportunities into account.

The rest of the paper is organized as follows. In Section 2, we summarize the main theoretical contributions on which our model builds. Section 2.1 surveys the “New Economic Geography” literature which has grown out of the so-called “core-periphery” model. Namely, we focus on those studies which introduce multi-plant firms in the presence of agglomeration forces and trade costs - or more precisely the firm’s decision whether to operate one or two production plants. In Section 2.2 we present the literature on policy competition for FDI. We begin from the traditional results of the public finance literature on tax competition between symmetric or asymmetric countries. We then restrict our attention to recent papers which have investigated the issue of policy competition for FDI by allowing for imperfectly competitive markets (either monopoly or oligopoly), country-size asymmetries and the presence of trade costs. In Sections 3 and 4 we illustrate our theoretical framework which allows us
to characterize the optimal location and organization choices of a monopolist in the absence and in the presence of corporate taxes set by the two governments. To better convey the intuition underlying our results, we then analyze different limit situations. In Section 5, we derive and discuss the firm’s optimal choices for the symmetric-country case. In Section 6, instead, we focus on asymmetric countries but we fix the value of other key parameters of the model, i.e., the additional fixed cost to set up a production plant abroad or the cost to shift taxable profits in response to cross-country tax rate differentials. Finally, we conclude by suggesting open issues and possible extensions to our set-up.

2 Related literature

The way we build our theoretical framework is based both on some ideas taken from a recent strand of the so-called “New Economic Geography” (hereafter NEG) literature and on the literature on policy competition for foreign direct investment (hereafter FDI).

2.1 NEG and horizontal FDI

One of the main issues that emerges from the NEG literature is the possibility that economic integration, in terms of lowering trade (e.g. transport) costs, leads to spatial agglomeration of economic activities with divergent economic structures across the integrating regions. In particular, the analysis of the spatial location of production factors relies on the “core-periphery” (hereafter CP) model developed by Krugman (1991), which is based on the Dixit and Stiglitz (1977) monopolistic competition framework. In the CP model, the economic space is made of two regions and there are two kinds of production: agriculture, a constant-returns and perfectly competitive sector; and manufacturing, a sector characterized by increasing returns and imperfect (i.e. monopolistic) competition. Each region is endowed with two production factors, which are each specific to one sector: on the one hand, peasants produce agricultural goods, they are evenly distributed across the two regions and completely immobile; on the other hand, workers produce manufactured goods and they are free to move between the two regions. Furthermore, while homogeneous agricultural output is costlessly traded between the two regions, transport costs for differentiated manufactured goods take the so-called “iceberg” form.\footnote{Transport costs for manufactured goods are incurred in the good transported: if we ship one unit of the good, only \( \tau < 1 \) units reach the final destination and can be sold.}

Given this scenario, Krugman identifies the tendency of the manufacturing sector to end up concentrated in one region (the “core”) with the other region remaining relatively undeveloped (the “periphery”). Such an agglomeration result is driven by “pecuniary” externalities associated with either demand or supply linkages. In the first instance, a big region constitutes a large domestic market and a firm with a large domestic demand tends to be more profitable than a firm facing a small domestic demand in a world where goods are traded at a cost. Thus, firms located in the larger of the two regions may offer higher nominal wages than those offered by firms in a smaller region, thereby attracting more workers (“backward” linkage). Secondly, the larger of the two markets tends to have a lower price index because for a comprehensive survey of the existing NEG literature, we refer the reader to the book by Baldwin et al. (2003), which illustrates some of the insights that these models can provide for theoretical policy analysis.\footnote{For a comprehensive survey of the existing NEG literature, we refer the reader to the book by Baldwin et al. (2003), which illustrates some of the insights that these models can provide for theoretical policy analysis.}
many products are sold at prices that do not include transport costs; this, in turn, implies higher real wages, which again attract more workers to the larger region ("forward" linkage).

The emergence of a CP pattern primarily depends on the interaction between economies of scale and transport costs. Indeed, plant-level scale economies in manufacturing lead each firm to concentrate its production in a single location from which it exports to the other market; other things equal, the firm’s preferred location will be the largest market, as locating there minimizes its transport costs. In addition, workers - who are at the same time consumers - prefer to live in the region with more firms, since it offers a greater variety of manufactured goods. Similarly, the share of manufactures in total income positively affects the agglomeration process. In this setting, the unique force pushing toward regional convergence comes from the demand for manufactures by immobile peasants left behind in the “periphery”, since firms located there will face less competition for the local market than firms in the larger region. Therefore, Krugman’s results seem to offer a theoretical basis to the idea that economic integration is likely to be a politically charged issue, proving particularly unpopular with immobile factors stranded in the undeveloped “periphery”.

One of the questionable limitations of this model lies in its treatment of manufacturing firms. The assumption of plant-level scale economies implies that each variety of a differentiated good will be produced by only one firm at a single location. Then, the firm’s location decision simply reduces to the choice of the region in which to produce - and from which to export - and multi-plant production is not allowed for. In reality, however, there do exist multinational firms which choose the number and location of production facilities, making direct investments in foreign markets, and which carry out a large and growing proportion of international economic activity. For example, foreign-owned multinationals employ 1 worker in every 5 in European manufacturing and 1 in every 7 in US manufacturing; they sell 1 euro in every 4 of manufactured goods in Europe and 1 dollar in every 5 in the US (OECD, 2001). At an aggregate level, the empirical evidence indicates that - due to the existence of trade costs - FDI by multinationals grew rapidly in the last 15 years of the 20th century, far outpacing the growth of international trade among industrialized countries. Moreover, it is generally acknowledged that industries characterized by scale economies and imperfect competition are often dominated by this kind of firms. It seems thus evident the need to include them into Krugman’s set-up.

This has been accomplished by Raybaudi-Massilia (2000) and Ekholm and Forslid (2001) which extend the CP framework by letting manufacturing firms decide to be either single-plant exporters or double-plant horizontal multinationals producing the same good in both regions. In addition to a fixed plant cost (such as for buildings and machinery), each firm must incur a corporate or firm-specific cost (e.g. for R&D, management and marketing) if it wants to operate internationally (either by exporting or by becoming a multinational). Hence, the two models display both plant-level and multi-plant (or firm- or corporate-level) scale economies.

Both papers rely on numerical simulations to derive their results and - while adopting dif-

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6 These stylized facts are documented and discussed in Markusen (1995), Markusen and Venables (1998), and Barba Navaretti et al. (2004).
7 Ekholm and Forslid (2001) also consider the case of vertical multinationals which geographically separate headquarters from production facilities. This case leads to less clear-cut results and we will not discuss it in the following.
8 The latter imply that it is less costly to set up a second plant in a new region than to set up an entirely new firm.
ferent equilibrium concepts - they reach similar conclusions about the agglomeration process in the presence of multinational firms. In particular, equilibrium configurations where (only) multinationals operate in both regions may arise when the two regions are of similar size and workers are equally divided between them and/or when transport costs (or multi-plant scale economies) are large relative to the additional plant cost of becoming multinational. As in the CP model, a high share of expenditure on manufactures favors concentration of production in a single region by generating large migration effects. In spite of that, it is less likely to have equilibria with manufacturing firms located just in one region.

In the light of these results, the alarming effects on manufacturing location that economic integration would bring about in the CP model may have to be reconsidered and qualified. Although reduced transport costs may increase the tendency toward agglomeration, technical improvements that make it less costly to set up production units in various locations are likely to have the opposite effect. Notably, the current trend of rapid technical progress in information technology may lead to an increase in the degree of multi-plant scale economies. Therefore, when multinationals enter into the picture, it seems fair to argue that a dispersed production pattern may well continue to be supported in spite of far-reaching economic integration.

The main problem when dealing with the previous models is that they are highly non-linear so that numerical simulations are necessary to obtain any result. By contrast, Ottaviano, Tabuchi and Thisse (2002) have developed a model of agglomeration and trade - also known as the OTT model - which has allowed them to derive analytically Krugman’s results and to perform a welfare analysis of agglomeration.\footnote{Similarly, Ludema and Wooton (2000) set up an analytically tractable variant of the CP model in which manufacturing firms are quantity-setting oligopolists in a homogeneous-product market. They study how tax competition between national governments affects the location of manufacturing workers.} More recently, Behrens and Picard (2005a,b) have extended the OTT framework to include horizontal multinationals. Namely, they let firms endogenously choose both their location and their production structure, i.e. whether to operate a single production plant or one plant in each of the two countries. They focus on a short-run setting with a fixed mass of firms and they are able to fully characterize the spatial equilibria analytically.\footnote{Note that each firm produces a single variety, meaning that the number of varieties is fixed as well. However, a firm can decide to operate a second production plant abroad to serve the foreign market locally rather than through exports. This implies that the number of plants can vary and that its maximum value will equal twice the number of firms.}

On the one hand, Behrens and Picard (2005a) study whether the world economy as a whole may benefit or lose from the presence of double-plant firms - possibly coexisting with single-plant exporting firms. To this end, they consider a world with two countries of asymmetric size and compare the market equilibrium with the first-best.\footnote{In the first-best, the social planner’s objective consists of the aggregate welfare of the two countries which includes the total consumer surplus minus the total (fixed) costs of production. The planner is able to control firms’ location and organization structure and imposes marginal cost pricing.} They identify two potential inefficiencies in the space-economy: i) too many exporting firms are generally clustered into the larger country, i.e. there is too much agglomeration in equilibrium;\footnote{Such a “spatial” inefficiency has already been put forward in the literature by, e.g., Ottaviano and Thisse (2002).} ii) firms may not choose to operate the socially efficient number of plants, i.e. there can be either over- or under-investment in production plants. In particular, when the fixed costs to set up a second plant are low enough, too many firms may choose to become multinationals.
Intuitively, a larger number of multinationals increases competition and decreases prices in the world economy, thereby making market access for exporters more difficult relative to local sales of multinational firms. Hence, even more firms will decide to establish a second plant abroad and the subsequent waste of resources may not be compensated by sufficient savings on transport costs.\(^\text{13}\)

On the other hand, Behrens and Picard (2005b) analyze the impact of horizontal FDI on capital tax/subsidy competition between two symmetric countries. They show that tax competition for mobile firms (i.e. capital) can be substantially weakened when firms are allowed to set up an additional plant rather than simply relocating capital from one country to the other. Namely, the outcome of the tax competition game depends on the level of trade costs and on the (net of subsidies) cost of capital. If the former are low compared to the latter, firms will always choose to be single-plant exporters and will thus represent a fully mobile tax base. Therefore, the two countries’ tax rates turn out to be strategic complements and capital will end up being subsidized in any non-cooperative equilibrium. On the contrary, if trade costs are high relative to the cost of capital, only double-plant firms will exist so that the tax base becomes immobile. In that case, governments may actually tax away firms’ organizational rents, which lessens the incentives for harmful tax competition.\(^\text{14}\) Finally, for intermediate values of trade costs, both single- and double-plant firms will operate in equilibrium. As a result, the tax base is partially immobile and capital may be either taxed or subsidized, depending on firms’ profitability (before subsidies).

### 2.2 Policy competition for FDI

It is often argued that competition between potential host countries for FDI by large and footloose multinationals will result in a “race to the bottom” over time in corporate tax rates and an inflation in subsidy payments. At the policy level, both the European Commission (1997, 2001) and the OECD (1998) have launched initiatives to fight against what they call “harmful” tax competition. In spite of that, the empirical evidence seems to suggest that tax competition for FDI does not invariably lead to a “race to the bottom”.\(^\text{15}\)

From a theoretical viewpoint - starting from the pioneering contribution by Zodrow and Mieszkowski (1986), also known as the “basic tax competition model” - a standard result of the public finance literature is that “independent governments engage in wasteful competition for scarce [mobile] capital through reduction in tax rates and public expenditure levels” (Wilson, 1999, p. 269). This literature generally assumes perfect competition in factor and product markets. In particular, Zodrow and Mieszkowski (1986) consider a number of (small) identical countries which impose taxes on the capital employed within their borders in order to finance the provision of a public good. Capital is perfectly mobile internationally so that its after-tax rate of return must be equal across countries. The key insight is that an increase in one country’s tax rate generates a positive externality on the other countries.

\(^{13}\)In a different setting based on the so-called “footloose capital” model by Martin and Rogers (1995) with CES utility, Toulemonde (2004) shows that there is always under-investment with respect to the first-best because of the absence of such pro-competitive effects.

\(^{14}\)This result is similar to the one obtained by Baldwin and Krugman (2004) in a model with asymmetric countries where the bigger one displays a “home market effect” and may usually tax away “agglomeration rents”.

\(^{15}\)See, e.g., Devereux et al. (2002). They show that over the 1980s-1990s “effective” marginal tax rates across 18 countries - the EU and G7 - remained stable, while average rates fell slightly.
Indeed, the after-tax rate of return in that country will decrease and this will lead capital to relocate abroad so that the other countries will enjoy higher tax revenues. However, if national governments non-cooperatively choose their tax rates, they will fail to take these external benefits into account and, as a result, tax rates and public good provision will be set at inefficiently low levels.

Another strand in the public finance literature with perfectly competitive markets focuses on tax competition between countries of different size. A general result is that the larger country will choose the higher tax rate in a non-cooperative Nash equilibrium. The smaller country, in turn, will end up hosting a disproportionate share of firms and it will achieve the higher per-capita utility level, meaning that it will “win” the competition for internationally mobile capital. The impact of asymmetries in market size on tax rates and on the probability of attracting FDI seems to be more than a theoretical issue. For instance, Devereux et al. (2004) analyze OECD countries’ tax-setting behavior over the period 1982-1999 and find that country size - measured by GDP - positively affects statutory corporate tax rates. Nevertheless, the traditional public finance approach is more appropriate when dealing with competition for portfolio investments rather than for FDI since trade costs are typically not accounted for.

A different set of papers studies two-country policy competition by incorporating positive spillovers from FDI. The presence of potential benefits from the investment generally induce countries to a subsidy competition to attract the multinational. In Black and Hoyt (1989), FDI increases the population to which public goods are provided at a decreasing average cost. Government’s objective is to minimize the taxes necessary to cover the costs of producing these goods. Therefore, in an attempt to realize such scale economies in public good provision, both countries will end up subsidizing investment by the multinational. In Haaparanta (1996), inward FDI has positive spillovers due to the existence of regional unemployment in countries which differ both in their size and in their exogenously fixed wage rate. In equilibrium, both countries offer positive subsidies to the multinational since they try to relieve the domestic unemployment problem. Haaland and Wooton (1999) and Fumagalli (2003) consider instead vertical industry linkages which reduce production costs of existing domestic firms. On the one hand, Haaland and Wooton (1999) find that providing investment subsidies to foreign-owned multinationals may be in the national interest due to vertical linkages with local suppliers and agglomeration effects. In their model, FDI raises the net value of domestic production because multinational firms generate demand for intermediate inputs which are produced by domestic workers in an increasing-return-to-scale sector. The presence of agglomeration forces makes FDI even more desirable. Indeed, a first comer - attracted by a subsidy - may induce several firms to invest in that country, thereby establishing a new modern sector. On the other hand, Fumagalli (2003) provides a welfare analysis of subsidy competition between two potential host countries which differ in the technology of their local firms. Because of the greater technological gap between investing and local firms, spillovers from FDI will be stronger in the less advanced country. With no subsidies, the multinational is willing to limit the extent of such technological spillovers and will thus prefer to invest in the more advanced country. However, allowing for subsidies shifts FDI to the less advanced

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17 By contrast, when the location of a firm causes negative externalities for the host country (e.g. by polluting its environment), policy competition between countries may result in excessively high tax rates. See Markusen et al. (1995).
country which has more to gain and, as a result, aggregate welfare in the two countries may increase.\footnote{In a similar way, Barros and Cabral (2000) study the welfare effects of subsidy competition between a small country suffering from unemployment and a large country without such a problem. In the absence of policy intervention, the large country represents the more attractive location for FDI. However, the small country has more to gain from attracting the investment and subsidy competition may induce the investor to locate there. Hence, investment subsidies may increase aggregate welfare by inducing FDI to take place in the country with the unemployment problem.}

Another branch in the literature on policy competition for FDI allows for imperfectly competitive markets (either monopoly or oligopoly), country-size asymmetries and the presence of trade costs.\footnote{Other contributions in the literature consider the effects of regional integration and external trade restrictions on the likelihood of a firm from a third country to invest in the integrating region. See Motta and Norman (1994, 1996).} Hau
er and Wooton (1999) analyze tax competition between two countries of unequal size trying to attract a foreign-owned monopolist. The two countries are integrated, in the sense that there is no price discrimination between them. However, the existence of trade costs for shipping the goods between countries implies that the firm will prefer to locate in the larger market where it will be able to charge a higher producer price.\footnote{Note that higher trade costs strengthen the argument in favor of locating in the larger country in order to save on such costs.} Therefore, even if both countries are willing to offer a subsidy to the firm, in equilibrium the large country will “win” the competition for FDI. Moreover, if the country-size difference is great enough, the large country may be able to levy a positive (lump-sum) profit tax on the foreign firm.

Ferrett and Wooton (2005) extend the previous model to analyze competition between rival governments to attract FDI of two firms from the same industry producing homogeneous goods in either of the two countries. Specifically, they solve a three-stage game where the order of moves is the following: \(i\) governments make lump-sum bids to attract FDI;\footnote{Subsidies (taxes) are equivalent to positive (negative) bids.} \(ii\) each firm chooses the location of its investment, i.e. where to operate its production facilities from which it can serve both countries; \(iii\) Cournot competition takes place in the two markets. The qualitative nature of the bidding equilibrium is shown to depend on the country-size asymmetry. When the latter is “small”, one firm locates in each country and all of the firms’ profits are taxed away by host countries. On the contrary, when country-size asymmetry is “large”, both firms locate in the larger country and are taxed. In particular, despite the small country’s willingness to subsidize any investment within its borders, the large country is able to impose a tax and attract both firms due to its “market access” advantage. Therefore, since the two firms are taxed in both of the bidding equilibria, a general conclusion stemming from this paper is that tax competition under duopoly does not create a “race to the bottom” in corporate tax rates.

Bjorvatn and Eckel (2006) similarly study the impact of policy competition between asymmetric countries on the location decision of a foreign multinational and on the welfare of the host countries. This paper differs from Hau
er and Wooton (1999) mainly in that the larger country houses a local firm which competes with the foreign investor in the regional market, while there are no competitors in the smaller country. Markets are segmented and the presence of a local firm does affect both location choice and investment policy (i.e. tax or subsidy). In the absence of policy competition, the investor’s location decision is driven by a trade-off between the advantage of locating in the larger market (“market size” effect) and
the benefit of being a monopolist in the smaller market ("competition" effect). When the two countries offer relatively similar location advantages, policy competition will be fierce and lead both countries to offer an investment subsidy; this, in turn, may decrease regional (i.e. the sum of the two countries’) welfare. Otherwise, policy competition will be less intense and the resulting equilibrium policy will be an investment tax which still attracts the foreign investor. An interesting result is that aggregate welfare (the sum of regional welfare and the investor’s profits) rises whenever the introduction of policy competition leads to a change in the investor’s location decision.

Finally, Haufler and Wooton (2006) develop a three-country model to study competition between a union of two countries and a third potential-host country for the location of a monopolistic firm which is able to segment its market. The incentive to attract FDI arises from a desire to avoid trade costs. These costs are lower on trade within the union than between the union and the outside country. Therefore, if the firm settles in one of the union countries, it will enjoy a location rent whose size depends on the relative costs for trade within and outside the union and on the relative size of the three different markets. Relative to a benchmark scenario where all countries compete against each other, there are two types of gains for the union when regional tax or subsidy policies are coordinated while the union as a whole still competes with the third country. First, for investments that would have taken place in the union in the absence of coordination, coordination allows an increase in equilibrium taxes (or a decrease in equilibrium subsidies) which transfers location rents from the firm to the union countries. Second, by internalizing the benefits to all union members from the location of a foreign production plant, the union as a whole may be able to attract the firm by means of a lower tax (or a higher subsidy) whereas non-cooperative policies of its members would have led the firm to settle outside the region. These results provide a theoretical support for regionally coordinated tax or subsidy policies. However, the direction such policies should take depends on the extent to which the firm prefers locating in the union relative to locating in the outside country.

3 The model

We develop a partial equilibrium model in which a firm will be a monopoly supplier of a final good in two countries (or regions) of different size. The firm faces exogenous corporate tax rates and has to choose the most profitable way to serve the two markets. In line with Haufler and Wooton (1999), we assume that there is a single consumer in country $A$ and $n > 1$ identical consumers in country $B$. Hence, without loss of generality, country $A$ (resp., country $B$) represents the "small" ("large") market for the final good. Namely, the firm faces the following linear demands in the two countries:

$$q_A(p_A) = \alpha - p_A, \quad q_B(p_B) = n(\alpha - p_B),$$  \tag{1}

where $q_i$ and $p_i$ are the quantity and the price to consumers prevailing in country $i$’s market, $i = A, B$.

We follow the empirical evidence by Head and Mayer (2000) and Haskel and Wolf (2001)
and postulate that the firm is able to segment its market, i.e. to set different consumer prices for the same final good sold in different markets.

We assume that the firm has to make both a location and an organization choice. In other words, we let the firm decide where to locate its first - and possibly unique - production plant at a fixed cost, \( f \). The final good is then produced at a constant - and identical across countries - marginal cost, \( w \). Without loss of generality, we normalize \( f = w = 0 \). Moreover, the firm has to choose whether to export the final good to the other country or to engage in horizontal FDI and open a second production plant abroad. When the monopolist chooses the former option, we shall refer to it as a “single-plant exporter” (\( S_i \) with \( i = A \) or \( B \) depending on the country where the production plant is located); otherwise, we will call it a “double-plant multinational” (\( m \)). Shipping the final good to the other country entails a per unit trade cost, \( \tau > 0 \).\(^{23}\) Opening a second plant abroad instead implies an additional fixed cost, \( F \geq 0 \).\(^{24}\) We denote by \( q_{ij} \) and \( p_{ij} \) the quantity sold and price set for the final good produced in country \( i \) for country \( j \)'s market. Hence, operating profits of a single-plant exporter located in country \( i \) are given by

\[
\Pi^*_i = p_{ii} q_{ii} + (p_{ij} - \tau) q_{ij}, \quad i, j = A, B, \ i \neq j.
\]  

(2)

Since the multinational serves each country’s market through local sales, its pricing decisions are equivalent to those of an exporter whose production plant is located in the same country. Thus, operating profits of a double-plant multinational can be written as

\[
\Pi^m = p_{ii} q_{ii} + p_{jj} q_{jj} - F, \quad i, j = A, B, \ i \neq j.
\]  

(3)

The firm sets prices specific to each country’s market in order to maximize its operating profits. We must stress that price and quantity choices are independent of any corporate tax rates imposed by the two countries. Substituting the market demand functions (1) into (2) and (3) and differentiating yields profit maximizing consumer prices for each location–organization choice by the firm

\[
p^*_{AA} = p^*_{BB} = \frac{\alpha}{2}, \quad p^*_{AB} = p^*_{BA} = \frac{\alpha + \tau}{2}.
\]

Accordingly, profit maximizing quantities are given by

\[
q^*_{AA} = \frac{\alpha}{2}, \quad q^*_{AB} = n \frac{\alpha - \tau}{2},
\]

and

\[
q^*_{BB} = n \frac{\alpha}{2}, \quad q^*_{BA} = \frac{\alpha - \tau}{2}.
\]

\(^{23}\)Note that positive trade costs are needed to separate the two markets, so that the location decision of the firm has real implications. Indeed, if trade costs were zero, operating profits of a single-plant exporter would be the same independently of where the firm locates its unique production plant.

\(^{24}\)Our model would be unchanged if we allow the fixed costs of the second plant to be either smaller or larger than those needed to operate the first one, i.e. by letting \( F = \xi f \), with \( \xi \geq 0 \) and \( f \neq 0 \). In the former case, namely for \( \xi \in [0, 1) \), we say that there exist firm-level scale economies. In the latter, i.e. for \( \xi > 1 \), we have firm-level scale diseconomies.
which lead to the following equilibrium operating profits

\[
\Pi_A^* = \frac{\alpha^2}{4} + n\frac{(\alpha - \tau)^2}{4}, \\
\Pi_B^* = \frac{\alpha^2}{4} + \frac{(\alpha - \tau)^2}{4}, \\
\Pi_m^* = \frac{\alpha^2}{4} + n\frac{\alpha^2}{4} - F.
\]

In order to have positive exports by the firm - whenever it chooses to run a unique production plant - we impose a restriction on the value of \(\alpha\), i.e. \(\alpha > \tau\). In what follows, we also let

\[H \equiv \frac{\alpha^2}{4} > 0 \quad \text{and} \quad L(\tau) = L \equiv \frac{(\alpha - \tau)^2}{4} > 0\]

denote operating profits from local sales ("High") and from exports ("Low"), respectively.\(^{25}\) The monopolist will earn higher profits by selling its product locally than by exporting it to the other country’s market since it will save on trade costs: \(H > L\) and \(nH > nL\) as long as \(\tau > 0\). Moreover, the firm will enjoy higher profits both from local sales and from exports when the final good is sold in the large country’s market: \(nH > H\) and \(nL > L\) since \(n > 1\) by assumption. However, we cannot say a priori whether operating profits from local sales in the small country’s market (\(H\)) are higher than operating profits from exports to the large country’s market (\(nL\)). Indeed, we have that

\[H > nL \iff n < \frac{\alpha^2}{(\alpha - \tau)^2}.
\]

If the difference in country size \((n)\) is small enough and/or trade costs \((\tau)\) are sufficiently high, the former are likely to be higher than the latter, i.e. \(H > nL\). On the contrary, when the size difference between the two markets is very important and/or trade is free enough, operating profits from exports to the big market may be higher than those from local sales in the small country, i.e. \(nL > H\).

### 3.1 Location and organization choices

In the absence of corporate profit taxes, the optimal location and organization choices by the firm are easy to determine. The location decision is relevant just in the case where the firm decides to operate as a single-plant exporter and depends on the difference between the profits it can realize by locating in one of the two countries and exporting to the other one. In particular, a size effect leads a single-plant firm to prefer the big market:

\[\Pi_B^* - \Pi_A^* = (n - 1)\Delta(\tau) > 0\]

since \(\Delta(\tau) \equiv H - L > 0\) because \(\tau > 0\), and \(n > 1\) by assumption. \(\Delta(\tau)\) is the profit gain of serving the small market locally rather than through exports and turns out to be positively related to the level of trade costs.\(^{26}\) Intuitively, when the firm has to choose the country from which to export the final good, it will always prefer to operate a production plant in the large country in order to minimize trade cost payments. In the absence of such costs, the

\(^{25}\)Note that \(\partial L(\tau)/\partial \tau < 0\) meaning that lower trade costs lead to higher operating profits from exports. Moreover, we have that \(L(0) = H\).

\(^{26}\)To ease the notation, we will sometimes use \(\Delta\) instead of \(\Delta(\tau)\) in what follows.
The firm would just be indifferent between locating in $A$ or in $B$ although one market is bigger than the other.

The firm’s organization decision is thus driven by the difference between the profits of a single-plant exporter from country $B$ and those of a double-plant multinational

$$\Pi_B^* - \Pi^m = -\Delta(\tau) + F$$

from which it follows that

$$\Pi_B^* > \Pi^m \iff F > \Delta(\tau).$$

The firm decides to operate as a single-plant exporter when the fixed costs it has to incur to open a second plant are sufficiently high and/or trade costs - i.e. the difference between the profits from local sales and those from exports - are low enough. Otherwise, it is more profitable for the firm to engage in horizontal FDI in order to serve each market locally. Such a basic result recalls the well known proximity-concentration trade-off, according to which firms are more likely to expand production horizontally across borders the higher are transport costs and trade barriers and the lower are investment barriers and the size of scale economies at the plant level relative to the corporate level.\(^{27}\)

For future reference, it is useful to introduce the following notation. We will say that $F \in F^B$ if $F > \Delta(\tau)$ and $F \in F^m$ when $F < \Delta(\tau)$.

### 3.2 Corporate profit tax rates and profit shifting

We now consider a situation where the two countries levy taxes on the firm’s profits. In particular, country $i$ taxes corporate profits at the rate $t_i \in [0,1]$, $i = A, B$. To simplify our analysis, we further assume that both countries do not allow the firm to deduct its investment (fixed) costs from the corporate tax base.\(^{28}\)

The introduction of corporate profit taxes affects both location and organization choices by the monopolist in a non-trivial way. We assume that international taxation follows the “source” principle, i.e. profits are taxed where they are generated. Indeed, as Keen (1993) argues, the effective taxation of multinationals is source-based, even though tax codes may stipulate differently.\(^{29}\) This implies that the overall profits of a single-plant exporter with its production plant in country $i$ are taxed at the rate $t_i$. Hence, since price and quantity choices are independent of taxes, equilibrium after-tax profits of an exporter whose unique

\(^{27}\)See, for example, Horstmann and Markusen (1992), Brainard (1993, 1997), and Markusen and Venables (2000). More recently, Helpman, Melitz and Yeaple (2003, 2004) have emphasized the role of intra-industry firm heterogeneity - in terms of productivity differences - in explaining the structure of international trade and investment when firms face a proximity-concentration trade-off.

\(^{28}\)We make such an assumption in order to focus on the firm’s optimal strategy in response to any tax rate differential across the two countries. Allowing for cross-country differences in the deductibility of investment costs from the corporate tax base would introduce a second fiscal policy instrument at the government’s disposal. But this goes beyond the scope of our paper. Moreover, Haufler and Schjelderup (2000) show that, in the presence of profit shifting, optimal corporate tax systems call for an incomplete - rather than a full - deductibility of investment expenditures as this allows governments to lower tax rates and reduces the incentive for the firm to shift profits abroad.

\(^{29}\)Implicitly, we assume that the sales-office is a legal resident of the foreign country, i.e. it is a subsidiary (rather than a branch) of the multinational firm. See Gresik (2001, footnote 20) for the different tax treatment of branches and subsidiaries.
production plant is located in country \( A \) or in country \( B \) are given, respectively, by:

\[
\Pi^*_A = (1 - t_A) (H + nL), \quad (4)
\]

\[
\Pi^*_B = (1 - t_B) (nH + L). \quad (5)
\]

As an example, we can think of an Italian shoes producer selling its product to a French reseller: the firm undertakes the entire production stage in Italy, sells a part of its production on the Italian market and another part of it - by incurring some trade costs - to the French reseller. The profits the firm earns from domestic sales as well as those it realizes by exporting the product to the foreign reseller are taxed at the corporate tax rate prevailing in Italy.

The profits of a double-plant multinational are instead taxed at (possibly) different rates. The Italian shoes producer of our previous example may decide to incur an additional fixed cost and build a second production plant in France. This allows the firm to save on trade costs and to serve both the Italian and the French market through local sales. However, the Italian multinational has to pay taxes in both countries. One of the most well documented trends in the world economy over the last two decades has been the rise in FDI and multinational firm activity.\(^{30}\) At the same time, the ability of multinationals to shift taxable profits across countries (namely to low-tax countries or “tax havens”, but also among OECD countries) has become an issue on the agenda of both policymakers and academics.\(^{31}\) To account for such a situation, we postulate that whenever the firm engages in horizontal FDI rather than exports, it can take advantage of an existing corporate tax differential by shifting - at some cost - taxable profits across the two jurisdictions where its production plants operate.

We let \( \Pi^m_i \) denote the profits actually realized by the multinational at each location \( i \), and \( \pi^m_i \) represent the profits declared to tax authorities in country \( i \), \( i = A, B \). The double-plant multinational has to declare the totality of its worldwide profits, i.e. \( \pi^m_A + \pi^m_B = \Pi^m_A + \Pi^m_B \), but declared and actual profits in one country need not coincide. In particular, \( \Pi^m_A - \pi^m_A = \pi^m_B - \Pi^m_B \), meaning that our model allows for “tax avoidance” but not for “tax evasion”. As usual in the literature, we model a cost to shift profits from country \( i \) to country \( j \) (\( i, j = A, B, i \neq j \)).\(^{32}\) These costs are higher the larger is the difference between the profits realized and those declared in country \( i \) and may involve hiring tax experts in order to conceal any profit misdeclaration from local authorities or expected future fine payments. They also depend on an exogenous parameter, \( \gamma \), which can represent either corporate tax base international mobility (e.g., a lower \( \gamma \) corresponds to a more mobile tax base and decreases profit shifting costs) or governments’ intensity in controlling tax avoidance by multinationals. Moreover, such costs are assumed to be proportionally lower the higher the amount of profits actually realized in country \( i \). In particular, we postulate that the costs to shift 1 euro of profit out of a country are lower the larger the profits actually realized in that country.\(^{33}\) This is meant to capture the idea that “the return to clever tax-avoiding activity is a function of the amount of income that can be reasonably rerouted” (Hines, 2002, p. 118). The possibility that large markets offer more profit shifting opportunities than small

\(^{30}\)See, e.g., Markusen (2002).

\(^{31}\)Both the OECD and the European Commission have issued documents where the problem of profit shifting is explicitly mentioned. See, for instance, European Communities (1992, 1998) and OECD (1995, 1998). For a comprehensive survey of the empirical literature about tax-motivated profit shifting by multinationals, we refer the reader to Hines (1999).

\(^{32}\)See, e.g., Swenson (2001), Kind et al. (2004), and Peralta, Wauthy and van Ypersele (2006).

\(^{33}\)The alternative specification where these costs depend only on the amount of shifted profits would induce the firm to shift the same amount irrespective of the level of realized profits.
markets is also mentioned by Bartelsman and Beetsma (2003) and Gresik (2001). More specifically, when country $i$ is the higher-tax country so that the multinational is willing to shift part of its realized profits to country $j$, this will entail a cost

$$C (\gamma, \pi_i^m, \Pi_i^m) = \frac{\gamma (\Pi_i^m - \pi_i^m)^2}{2 \Pi_i^m}, \quad i = A, B, \gamma \geq 0.$$  

As a possible explanation, we can think of the multinational manipulating the transfer price charged on some intra-firm traded intermediate inputs, e.g. the cap of a beer bottle. Suppose that the multinational sells 1 million of bottles in the United States and 10 thousand in Portugal. Then, the same tiny difference between the transfer price of a cap and its market price allows the firm to shift a larger amount of profits out of (or into) the United States than out of (or into) Portugal. Moreover, such a tiny manipulation is likely to be undetected by tax authorities and the multinational has to allocate few resources to conceal its tax avoidance activity. By contrast, if the multinational wants to shift the same amount of taxable profits out of (or into) Portugal, it needs to manipulate the transfer price of a cap to a greater extent, thereby incurring higher costs. In this example, the gain from cross-country profit shifting is positively related to the volume of intra-firm trade the multinational can manipulate the transfer price on.

Since multinationals are allowed to optimize on their level of declared profits, the introduction of profit shifting considerations does not change the pricing decisions of firms. Hence, operating profits are given by $\Pi_A^m = H$ and $\Pi_B^m = nH$, and the multinational’s after-tax profits can be written as follows:

$$\Pi^m = H + nH - t_i \pi_i^m - t_j (\Pi_i^m + \Pi_j^m - \pi_i^m) - \frac{\gamma (\Pi_i^m - \pi_i^m)^2}{2 \Pi_i^m} - F, \quad i, j = A, B, i \neq j.$$  

In general, the multinational is willing to declare higher profits in the lower-tax country while no profit shifting incentive exists when the two countries tax corporate profits at the same rate. When $t_i > t_j$, the multinational is induced to declare less profits than those actually realized in country $i$ and to report profits higher than the actual ones in country $j$. Namely, we let the multinational firm choose the amount of profits to be declared in country $i$ ($\pi_i^m$) in order to maximize its after-tax profits, which leads to the following amount of profits shifted to country $j$ as a share of the profits realized in country $i$:

$$\frac{\Pi_i^m - \pi_i^m}{\Pi_i^m} = \frac{t_i - t_j}{\gamma} > 0.$$  

Since the share of profit shifted from country $i$ to country $j$ cannot exceed unity, we will assume in the following that $\gamma > 1$. This ensures that the multinational will shift part of its realized profits from the high-tax to the low-tax country and at the same time declare positive profits in both of them. Indeed, using $\Pi_A^m = H$ and $\Pi_B^m = nH$, we can rewrite

---

34 The former provide evidence that multinationals are able to shift taxable profits not only to “tax havens” but also among OECD countries (including the United States). The latter speaks about the size of the firm instead of market size, but it still points out the general idea that larger-scale operations offer more room for profit shifting activities.

35 A straightforward envelope argument yields this result.

36 If we do not put any restriction on $\gamma$, the multinational may be willing to declare negative profits in one of the two countries in response to a sufficiently large corporate tax differential. This would imply that the country would be subsidizing the multinational at the announced tax rate, an unrealistic situation we wish
optimal declared profits in the two countries as
\[
\pi^m_A = H \left( 1 - \frac{t_A - t_B}{\gamma} \right) > 0 \quad \text{and} \quad \pi^m_B = nH \left( 1 - \frac{t_B - t_A}{\gamma} \right) > 0.
\]

Therefore, when profit shifting is costly enough or the corporate tax base is not perfectly mobile, equilibrium after-tax profits of a double-plant multinational are given by
\[
\Pi^m_A^* = (1 - t_A) H + (1 - t_B) nH - F + H \frac{(t_A - t_B)^2}{2\gamma}, \quad \text{if} \quad t_A > t_B \tag{6}
\]
and
\[
\Pi^m_B^* = (1 - t_A) H + (1 - t_B) nH - F + nH \frac{(t_A - t_B)^2}{2\gamma}, \quad \text{if} \quad t_B > t_A \tag{7}
\]
where the last term in both expressions represents the net gain to shift taxable profits in response to a tax differential across the two countries.

4 Taxes and the location-organization choice

4.1 Location choice with taxes

When each country can tax the overall profits of a single-plant exporter, the location decision of the firm is driven by the difference between its after-tax profits when the production plant is located in country A or in country B. Such a difference may be decomposed into a size and a fiscal effect. Namely, using equations (4) and (5) and rearranging terms, we obtain
\[
\Pi^s_B^* - \Pi^s_A^* = \underbrace{(n - 1) \Delta (\tau)}_{\text{size effect}} + \underbrace{t_A (H + nL) - t_B (nH + L)}_{\text{fiscal effect}}.
\]
This implies that
\[
\Pi^s_A^* > \Pi^s_B^* \iff t_A < t^{AB} (t_B) < t_B
\]
where
\[
t^{AB} (t_B) \equiv t_B \frac{nH + L}{H + nL} = \frac{(n - 1) \Delta (\tau)}{H + nL} \tag{8}
\]
identifies the corporate profit tax rate country A can set such that the firm is indifferent between locating its unique production plant in the small or in the large country. In what follows, we will refer to condition (8) as the “location” condition.\footnote{Note that $t^{AB} (t_B) < t_B$ for any $t_B \in [0, 1)$ and $t^{AB} (1) = 1$, meaning that the location condition lies below the 45°-line on the $(t_B, t_A)$-space over the interval $t_A, t_B \in [0, 1]$, except at $t_A = t_B = 1$.}

First of all, we want to stress that when the large country’s corporate profit tax rate is low enough, i.e. $t_B < (n - 1) \Delta (\tau) / (nH + L)$, the small country can never succeed in inducing the firm to open its unique production plant within its borders. In this case, country B enjoys both a size and a fiscal advantage over country A. In spite of that, the small country may now be able to attract the monopolist while this is not possible in the absence of taxes, for the size effect always favors country A. Indeed, the firm will choose to locate its unique production plant in the small country and export the final good to the large country when country A sets to avoid. In Section 6.2, we will relax such an assumption by analyzing the limit case where profit shifting is costless, i.e. $\gamma = 0$. Moreover, in Section 6.3, we will study the opposite extreme case of prohibitively expensive profit shifting ($\gamma = \infty$).
a sufficiently low tax on the firm’s profits and country B’s tax rate is high enough. The fiscal advantage country A must offer to the firm has to override its size disadvantage relative to country B. Otherwise, the firm will choose to open its production plant in the large country and serve the small country’s market through exports. Stated differently, country B can set a higher tax rate than country A due to its size advantage and still induce the firm to locate there.

4.2 Organization choice with taxes

The firm’s organization choice depends on the difference between the after-tax profits it can earn by operating as a single-plant exporter located in one country and those it can realize by opening a second production plant in the other country. In the former case, the firm saves on the additional fixed cost necessary to set up a second production plant abroad but incurs trade costs on its exports. In the latter case, the firm saves on trade costs and can benefit from shifting profits to the more lightly taxed location. In the next subsection, we highlight the main trade-offs (from the multinational’s perspective) and we discuss the optimal location-organization choice of the firm for the general case with $\gamma > 1$. However, we do not provide the exact expressions for the tax thresholds, which are derived and whose properties are analyzed in the Appendix.

4.3 Double-plant multinational or single-plant exporter?

We first consider the case where the firm prefers to locate its first production plant in country B rather than in country A, i.e when $t_A > t_A^B(t_B)$. The firm has then the choice between operating as a single-plant exporter from the big country and becoming a multinational. As long as country A’s corporate tax rate is greater than that of country B ($t_A > t_B$), the monopolist will compare the after-tax profits of a multinational shifting taxable profits from A to B and the after-tax profits it can earn by operating as an exporter from B. Using (5) and (6), we get

$$\Pi^m - \Pi^* = (1 - t) \Delta(\tau) - F + \frac{H(t_A - t_B)^2}{2\gamma} - (H + L) \frac{(t_A - t_B)}{2}$$

(9)

where $t \equiv \frac{t_A + t_B}{2}$ is the average tax rate of the two countries.

In the presence of corporate taxes, the organization choice is driven by two distinct effects: a modified proximity-concentration trade-off, which depends on the level of taxes, and a fiscal effect due to any difference in the two countries’ tax rates. The modified proximity-concentration trade-off is such that the gain to serve markets locally is weighted down by the average tax rate prevailing in the two countries. This effect is likely to be positive - thereby pushing the firm to prefer a multinational organization - for low average tax rates and/or low fixed costs $F$. Intuitively, higher tax rates reduce the additional net profit stemming from serving the small market locally rather than through exports; in addition, high fixed costs discourage the firm from running a second production plant abroad. The fiscal effect may be further decomposed into a positive profit-shifting component and a negative tax bill one. The former represents the net gain of the firm (as a multinational) from shifting taxable profits out of the high-tax country. The latter is due to the different taxation of the profits realized
in the small country: as an exporter, the firm realizes low profits, which are taxed in the low-tax country \( B \); as a multinational, instead, the firm earns high profits but it has to pay taxes in the high-tax country \( A \). The tax bill component drives the sign of the fiscal effect, which is always negative. To see this, define \( x \equiv t_A - t_B > 0 \) and \( g(x) \equiv \frac{x}{2} \left( \frac{x}{2} - (H + L) \right) \). It is easy to check that \( x H - (H + L) < \frac{3}{2} - H - L < 0 \), for all \( x \in (0, 1) \), hence \( g(x) < 0 \) in the relevant tax range. The fiscal effect is thus an incentive for the firm to prefer a single-plant over a double-plant organization. Such an incentive is a non-monotonic function of the tax difference. This is because the tax bill disadvantage of operating as a multinational increases linearly with the tax difference, while the profit-shifting advantage increases quadratically with it. So, when the tax difference gets sufficiently high, the incentive to operate as an exporter decreases with \( t_A - t_B \). Finally, we want to stress that the fiscal effect becomes relatively less important (i.e., less negative) for low values of \( \gamma \) and/or high values of \( \tau \): on the one hand, the net gain from profit shifting is higher the lower the cost of this activity; on the other hand, the higher the level of trade costs the smaller the profits from exports. As a result, large differences in the two countries’ tax rates, coupled with low costs of profit shifting (or a high mobility of the corporate tax base) and/or with a high level of trade costs, will work against the choice of an exporting structure.

When country \( B \)'s corporate tax rate is greater than that of country \( A \) but the firm still prefers to locate its first plant in country \( B \), i.e. when \( t_B > t_A > t^{AB}(t_B) \), the monopolist compares the after-tax profits of a multinational shifting taxable profits from \( B \) to \( A \) and the after-tax profits it can earn by operating as an exporter from \( B \). Using (5) and (7), we obtain an expression analogous to (9)

\[
\Pi^{m*} - \Pi_B^* = (1 - t) \Delta(\tau) - F + n H \frac{(t_B - t_A)^2}{2\gamma} + (H + L) \frac{(t_B - t_A)}{2} \]

where the only dissimilarity is the profit shifting part of the fiscal effect. When \( t_B > t_A \), profit shifting goes in the opposite direction, i.e., from \( B \) to \( A \), and it is of a higher magnitude than before. Moreover, the tax bill component is positive: operating as a multinational rather than as an exporter from the big country allows the firm to pay taxes on high profits at the lowest tax rate \( t_A \) instead of paying taxes on low profits at the highest tax rate \( t_B \). Hence, the fiscal effect works in favor of a multinational organization, and it increases with the tax difference.

We finally analyze the case where the monopolist prefers to locate its first production plant in country \( A \), i.e. when \( t_A < t^{AB}(t_B) \). The firm has the choice between operating as a single-plant exporter from the small country and becoming a multinational. Since \( t_B > t^{AB}(t_B) > t_A \), the monopolist will compare the after-tax profits of a multinational shifting taxable profits from \( B \) to \( A \) and the after-tax profits it can earn by operating as an exporter from \( A \). Using (4) and (7), we get

\[
\Pi^{m*} - \Pi_A^* = (1 - t) n \Delta(\tau) - F + n H \frac{(t_B - t_A)^2}{2\gamma} - n (H + L) \frac{(t_B - t_A)}{2}.
\]

The modified proximity-concentration effect has the same sign and interpretation as before, except that it is scaled by \( n \), as the firm decides from where to serve the big market instead of the small one. Moreover, we easily check that the fiscal effect is always negative by letting \( x \equiv t_B - t_A > 0 \) and \( h(x) \equiv n H \frac{x^2}{2\gamma} - n (H + L) \frac{x}{2} = ng(x) \).
From the discussion above, it is clear that the fiscal effect alone works in favor of a single-plant organization whenever the exporter would operate from the low-tax country. On the contrary, when it comes to the choice between a single-plant exporter from the big and high-tax country \( B \) and a multinational structure, the fiscal effect acts in the opposite direction.

In general, the monopolist will decide to become a single-plant exporter when both taxes are sufficiently high. In such a situation, the negative fiscal effect overrides the modified proximity-concentration trade-off, which is less likely to be positive (and can even be negative). When the fixed costs are not too high and both taxes are low enough, instead, it can be optimal for the firm to choose a multinational organization as the positive effect becomes relatively more important. Similarly, when the two countries’ tax rates are very different, operating as a multinational can represent the optimal choice for the firm: the fiscal effect, indeed, gets less negative for large differences in tax rates; moreover, with one of the tax rates being very low, the average tax rate will not be so high and the modified proximity-concentration trade-off can be positive.

It should be clear by now that the shape and position of the location–organization indifference loci on the \((t_B, t_A)\)-space rest on a bunch of parameters: country size asymmetry \((n)\) and trade costs \((\tau)\), which jointly determine the relative ranking of operating profits from local sales in the small country’s market \((H)\) and from exports to the large market \((nL)\); the cost of shifting taxable profits across the two countries \((\gamma)\); the additional fixed cost the firm has to incur in order to open a second plant abroad \((F)\). This implies that the optimal outcome from the monopolist’s perspective can be determined just by imposing restrictions on the range of some parameters. Therefore, we will illustrate below the firm’s location and organization optimal choices in some special and limit cases where we fix the value of one of the parameters while letting the other ones vary. We believe that this way of proceeding may prove useful to grasp the main forces at work in our model.

5 Symmetric Countries

It is instructive to begin with a situation where the two countries have the same size \((n = 1)\) but can set unequal corporate tax rates. In this case - depicted in Figure 1 - the firm’s decision is symmetric around the axis \( t_A = t_B \) since the location condition (8) coincides with the 45 °-line. This means that the firm will always find it optimal to locate its first production plant in the lowest-tax country. Note also that the two organization indifference loci \( t^{Am}\) and \( t^{Bm}\) cross when \( t_A = t_B = 1 - F/\Delta(\tau) \). Hence, the location–organization choice depends on whether \( F \) belongs to \( F^B \) or \( F^m \).

We summarize our findings in the following Proposition:

**Proposition 1** When countries are symmetric:

(i) If \( F \in F^B \), then the monopolist operates as a single-plant exporter from the country with the lowest tax rate.

(ii) If \( F \in F^m \), then the monopolist operates as a multinational when both tax rates are low and close enough or when they are sufficiently different; otherwise, it operates as a single-plant exporter from the lowest-tax country.

38We refer the reader to the Appendix for all the computations.
The intuition for such a result is as follows. Suppose that the two countries’ tax rates are equal, \( t_A = t_B \equiv t^* \), so that we abstract from profit shifting motivations, i.e. the fiscal effect is nil. Then, the firm’s organization choice just depends on the modified proximity-concentration trade-off between the net profit gain of serving one of the two markets locally rather than through exports, \((1 - t^*)\Delta(\tau)\), and the increased fixed cost to run a second plant, \( F \). For a given value of \( F \), as \( t^* \) decreases (resp. increases), the relative importance of the former effect increases (decreases) and operating as a single-plant exporter becomes less (more) attractive for the monopolist. Obviously, there is a threshold value of \( t^* \) that makes the profitability of operating as an exporter lower than that of becoming multinational.\(^{39}\)

Consider now what happens for \( t_A > t_B \). In this case, the relevant net profit difference corresponds to equation (9). As pointed out before, the fiscal effect alone suggests that large differences in the two countries’ tax rates can induce the firm to become multinational as long as the costs of profit shifting are low enough and/or trade costs are sufficiently high. Moreover, for a given fixed cost \( F \), the firm’s choice is more likely to be illustrated by the left panel of Figure 1 the lower is \( \gamma \) and/or the higher is \( \tau \). We thus focus on this panel and analyze a situation where \( t^* \) is so low that the firm optimally chooses to become multinational but as \( t_B \) decreases - for a given \( t_A \) - it decides to be a single-plant exporter from country \( B \) and then a multinational again. Starting from a situation where \( t_A = t_B \equiv t^* \), we let \( t_B \) decrease for \( t_A \) and \( F \) fixed. This implies that the average tax rate \( t \) decreases as well and the modified proximity-concentration trade-off pushes the firm to prefer a multinational structure over an exporting one. However, the fiscal effect goes against this choice and gets more negative as \( t_B \) decreases further so that, at some point, this second effect overrides the former and the firm optimally chooses to be an exporter. Eventually, when the difference in tax rates is large enough, the fiscal effect becomes less important than the modified proximity-concentration trade-off, which drives again the firm’s decision to operate as a multinational. Finally, we must stress that when \( t_A \) is sufficiently low, the monopolist goes multinational for all values of \( t_A > t_B \). This is because the advantage of operating as a single-plant exporter from country \( B \), i.e. saving tax payments in the highest-tax country, becomes tiny.

From the above Proposition, we can conclude that the introduction of taxes - even in a

\(^{39}\)Alternatively, we could say that there exists a value of \( t^* \) such that the firm will find it more profitable to pay a non tax-deductible cost - the fixed cost \( F \) - instead of a tax-deductible cost - the trade cost \( \tau \).
symmetric-country set-up - changes the monopolist’s decision in an important manner. For values of \( F \) such that the monopolist always operates as a multinational in the absence of taxes, it may now happen that it decides to become a single-plant exporter. Furthermore, in a tax-free economy, the monopolist is always indifferent between being a single-plant exporter from either country since countries are of the same size. This is no longer the case here and a marginal tax rate difference makes the monopolist prefer the lowest-tax country.

6 Asymmetric countries

We now move to the analysis of asymmetric countries \( (n > 1) \). Given the further complication arising from the larger size of country \( B \) relative to country \( A \), we will discuss specific cases regarding the fixed cost \( F \) and the cost to shift taxable profits \( \gamma \). We begin by supposing that there is no additional fixed cost to become multinational \( (F = 0) \). We then proceed to the study of costless \( (\gamma = 0) \) and prohibitively expensive \( (\gamma = \infty) \) profit shifting.

6.1 No additional fixed costs

In the first instance, we consider a situation where no additional fixed costs are required to open a second production plant abroad. This may capture the idea that the firm has to pay the first fixed cost, \( f \), for R&D (i.e. to develop a new product), marketing and advertising of its product, or general management, whereas production per se does not entail any fixed cost, but only marginal costs related to the amount of output produced.

When \( F = 0 \), the location condition (8) is unchanged and always lies below the 45°-line on the \((t_B, t_A)\)-space. On the contrary, the net profit difference (10) is no longer relevant for the firm’s choice. Moreover, the modified proximity-concentration trade-off will always be nonnegative so that it is more likely that the monopolist chooses a multinational rather than an exporting structure.

When establishing a second plant abroad does not entail any fixed cost, although in the absence of taxes the monopolist would always choose to become multinational, that is not necessarily the case here. On the one hand, when \( t_A > t_B \), the firm will operate either as a multinational shifting profits to country \( B \) or as an exporter from the big country. On the other hand, when \( t_A < t^{AB}(t_B) \), the firm’s organization choice is between becoming a multinational which shifts profits to country \( A \) or being an exporter from the small country. In particular, when both tax rates are sufficiently high and different enough, the monopolist will operate as a single-plant exporter from the lowest-tax country. In such a situation, the fiscal effect is negative and turns out to be more important than the modified proximity-concentration trade-off, thereby inducing the firm to operate as an exporter and pay taxes just in the low-tax country. In general, when tax rates differ, we have the same intuition as in the symmetric case. For a given \( t_A > t_B \), \( m \) dominates \( S_B \) for low and high \( t_B \), while \( S_B \) is better for intermediate values of \( t_B \). When \( t_A \) gets low enough, \( m \) is always the optimal organization, for the main advantage of operating as an exporter from country \( B \), which is to save tax payments in country \( A \), disappears. By contrast, when tax rates are equal, the advantage of going multinational is to increase profits in the foreign market by serving it locally rather than through exports, and this comes at no cost, since \( F = 0 \). Hence, whenever tax rates are identical, the optimal organization is always a multinational one. Finally, note that - once again - the attractiveness of becoming multinational is lower the higher the cost
of profit shifting and/or the lower the level of trade costs.

We summarize our results in the following Proposition:

**Proposition 2** When the monopolist does not incur any fixed cost to open a second production plant abroad, it does so as long as tax rates are (i) not too different or (ii) one relatively high and the other relatively low.

### 6.2 Costless profit shifting

We now consider a situation where the corporate tax base is perfectly mobile across countries, i.e., the firm, as a multinational, can shift taxable profits to the lower-tax country without incurring any cost ($\gamma = 0$). This may capture the idea that national tax authorities of the two countries are particularly lenient with multinational firms and with their tax avoidance activities. Similarly, we could argue that the two governments are more concerned about consumer surplus - i.e., having the final good produced and sold locally rather than through exports - than the fiscal revenue they can collect by taxing the profits of the multinational.

Costless profit shifting does not alter the firm’s location decision and condition (8) is still valid. The multinational, however, will declare all of its worldwide profits in the lower-tax country. Thus, its equilibrium after-tax profits can be written as

$$\Pi^*_{\text{const}} = (1 - \min \{t_A, t_B\}) (n + 1) H - F.$$  

When $t_A > t_B$, the multinational declares its overall profits in country $B$ and no profits in country $A$. In such a tax range, moreover, it will always be more profitable to run a single production plant from the big than from the small country. Hence, the relevant net profit comparison is $\Pi^*_{\text{const}}$ with $\Pi^*_B$, which leads to

$$\Pi^*_B \geq \Pi^*_{\text{const}} \iff t_B \leq t^B_{\text{const}} = 1 - \frac{F}{\Delta(\tau)}. \quad (12)$$

Note that $F \geq \Delta(\tau)$ implies $t^B_{\text{const}} \leq 0$, meaning that it is always better to operate as a single-plant exporter from country $B$ than to become multinational.

When $t_B > t_A$, the multinational pays taxes on its worldwide profits just in country $A$ so that its equilibrium after-tax profits are

$$\Pi^*_{\text{const}} = (1 - t_A) (n + 1) H - (1 + \xi) f.$$  

In this case, the relevant net profit comparison may be with locating its first production plant either in the large or in the small country. In particular, for any $t_A \in \{t^A B, t_B\}$, the firm will prefer to operate as an exporter from the big country ($\Pi^*_B > \Pi^*_A$) and we need to compare $\Pi^*_B$ with $\Pi^*_A$. By contrast, for $t_A \in [0, t^A B, t_B)$, it will be more profitable to run a production plant in the small country and export the good to the large market, and we have to compare $\Pi^*_B$ with $\Pi^*_A$. It is thus straightforward to derive the following conditions:

$$\Pi^*_B \geq \Pi^*_A \iff t_A \leq t^A_{\text{const}}(t_B) = t_B \frac{nH + L}{(n + 1) H} + \frac{\Delta(\tau) - F}{(n + 1) H} \quad (13)$$

$$\Pi^*_B \geq \Pi^*_A \iff t_A \leq t^A_{\text{const}} = 1 - \frac{F}{n\Delta(\tau)} \quad (14)$$

Note that $F \geq \Delta(\tau)$ implies $t^A_{\text{const}} \leq 0$, meaning that it is always better to operate as a single-plant exporter from country $B$ than to become multinational.
Figure 2: No cost to shift profits

\[ F = 0 \]

\[ 0 < F < \Delta(\tau) \]

\[ \Delta(\tau) < F < n\Delta(\tau) \]

\[ F > n\Delta(\tau) \]

Figure 2 illustrates the optimal location–organization choice of the firm when the corporate tax base is perfectly mobile internationally. We immediately observe that the monopolist will never choose to become a double-plant multinational which declares positive profits in both countries. As we stressed above, costless profit shifting implies that if one country sets a higher tax rate than the other country, then the multinational will be induced to - and able to - declare zero profits in the former and its overall profits in the latter.

It is also easy to check that, whenever \( F > n\Delta(\tau) \), it will never pay to operate as a multinational. Even if profit shifting is costless, when the fixed costs to operate a second plant abroad are high enough, the location condition drives the optimal location–organization choice of the firm, which will always be an exporter from either country. As it is evident from the lower-left panel of Figure 2, condition (14) crosses the location condition at \( t_A = 1 - \frac{F}{n\Delta} \). Hence, the firm has the choice between operating as an exporter from the big country or becoming a multinational when \( t_A < 1 - \frac{F}{n\Delta} \), which never happens for \( F > n\Delta(\tau) \). In
that case, indeed, condition (14) gives a negative tax rate.

As the additional fixed cost $F$ decreases, the firm will find it relatively more profitable to become multinational. However, when $\Delta(\tau) < F < n\Delta(\tau)$, it never pays to be a multinational declaring zero profits in the small country. If country A’s tax rate is so high that the firm would declare all its profits in the big country, then it prefers to become an exporter from there. Otherwise, the monopolist may optimally decide to operate two plants and declare its overall profits in the small country in order to avoid taxation in country $B$. For lower values of $F$, i.e., $0 < F < \Delta(\tau)$, instead, both of the previous options - the multinational declaring zero profits in either country - can represent the firm’s optimal choice. Eventually, if no additional fixed cost is required to open a second production plant abroad ($F = 0$) and if profit shifting does not entail any cost either, the firm will always be a multinational declaring its overall profits in the lower-tax country and zero profits in the higher-tax country.

In other words, we find that when $F \in F^m$, the presence of corporate taxes can make the firm choose a single-plant configuration from any of the two countries. The reverse is also true: for some range of $F \in F^B$, it may happen that the firm operates as a single-plant exporter from the small country, or as a multinational.

We summarize our findings in the following Proposition:

**Proposition 3** If the monopolist - as a double-plant multinational - can shift taxable profits to the lower-tax country without incurring any cost:

(i) When fixed costs are high, the multinational structure is never optimal. The firm operates as a single-plant exporter from the big country, unless the tax rate of the small country is sufficiently low.

(ii) When fixed costs are intermediate, the multinational structure is optimal when there is a high tax rate in the big country and a low tax rate in the small country.

(iii) When fixed costs are low, the multinational structure is optimal when at least one of the tax rates is low.

(iv) When fixed costs are nil, the multinational structure is always optimal.

### 6.3 Prohibitively expensive profit shifting

We finally focus on a situation where profit shifting is so costly that the profits declared by the multinational in one country will always coincide with those effectively realized by selling the good on that country’s market, i.e. $\pi^n_i = \Pi^n_i$, $i = A, B$. As a possible justification, we might think that national tax authorities of both countries can easily monitor the multinational’s activities and are able to correctly determine the firm’s tax liabilities in each country. This may further reflect the idea that governments are eager to tax the profits of the multinational and only worry about a reduction of the corporate tax base resulting from profit shifting to the other country’s advantage.

The location condition (8) is once again unaffected when we set $\gamma = \infty$. However, if profit shifting is prohibitively expensive, the multinational always declares to one country’s tax authorities the entire amount of - positive - profits resulting from local sales in that country. Therefore, its equilibrium after-tax profits are given by

$$\Pi^n = (1 - t_A) H + (1 - t_B) nH - F.$$
Using (4) and (5), the firm’s organization choices between being an exporter from the large or from the small country and becoming multinational are now driven by the following conditions:

\[ t_B^m (t_B) = t_B L + \frac{\Delta (\tau) - F}{H} \]

\[ t_A^m (t_B) = t_B H + \frac{F - n \Delta (\tau)}{nL} \]

where both \( t_B^m \) and \( t_A^m \) are linear functions of \( t_B \). It is also straightforward to obtain that the three indifference loci - \( t_B^m \), \( t_A^m \), and \( t_{AB}^m \) - cross at \( t_B = 1 - F(nL + H)/(n \Delta (H + L)) \).

Based on this intersection point and on the fact that \( t_A^m \) has the greatest slope, and \( t_B^m \) the smallest, we may easily draw Figure 3, which allows us to state

**Proposition 4** If profit shifting is prohibitively expensive:

(i) When fixed costs are high, the multinational structure is never optimal. The firm operates as a single-plant exporter from the big country, unless the tax rate of the small country is sufficiently low.

(ii) When fixed costs are intermediate, the multinational structure is optimal when both tax rates are sufficiently low.

(iii) When fixed costs are nil, the multinational structure is optimal unless one of the tax rates is very high.

As Proposition 4 and Figure 3 suggest, the monopolist is likely to optimally choose a multinational organization when corporate profit tax rates are close enough. Intuitively, when the additional fixed cost to open a second production plant are sufficiently low, becoming multinational can be profitable since it allows the firm to save on trade costs. But if it is impossible to avoid taxes, one of the relative advantages of running two plants in two different countries disappears. By making the corporate tax base internationally immobile, we induce the firm to look for a different channel through which it can lower its overall tax liabilities.
Since a single-plant exporter pays taxes just in one country, while a multinational has to pay taxes in both of them, a more convenient way to benefit from a tax differential is to concentrate production in the lower-tax country. In such a sense, the decision to operate as a single-plant exporter from the lower-tax country represents an indirect way of shifting the overall corporate tax base.

7 Concluding remarks and possible extensions

In this paper we have determined the optimal (i.e. more profitable) location–organization choice by a monopolist facing exogenous corporate profit tax rates levied by two countries of different size. In particular, we have identified five possible location and organization configurations for the firm: i) single-plant exporter from the small country; ii) single-plant exporter from the large country; iii) double-plant multinational declaring positive profits in both countries; iv) double-plant multinational declaring its overall profits in the small (and low-tax) country and no profits in the large (and high-tax) country; v) double-plant multinational declaring its overall profits in the large (and low-tax) country and no profits in the small (and high-tax) country.

We have shown that the firm’s optimal choice primarily rests on the level of the two countries’ corporate tax rates and on their relative difference, but also on the extent of country-size asymmetry and trade costs. In addition, our results have put forward the importance in shaping the firm’s decisions of two other parameters: i) the cost of cross-country profit shifting, reflecting the international mobility of the corporate tax base; and ii) the additional fixed cost needed to operate a second production plant abroad. Since the optimal outcome from the firm’s perspective can be generally defined by imposing restrictions on the range of some parameters, we have chosen to focus on some limit (and instructive) cases.

When the two countries have the same size, the firm operates as an exporter from the lowest-tax country if fixed costs are high enough; otherwise, it goes multinational if both tax rates are low and sufficiently close or if their difference is very large.

When countries differ in size and production per se does not entail any fixed cost, the firm will be either a single-plant exporter from one of the two countries or a double-plant multinational declaring positive profits in both of them. Interestingly, the second choice turns out to be optimal not only if tax rates are very different but also if they are equal (or close enough). When the level of both tax rates and the cross-country tax differential get sufficiently high, instead, the firm will operate as a single-plant exporter from the lower-tax country.

When profit shifting is costless, the multinational can (and will) always declare its overall profits in the lower-tax country. As a result, the firm will never choose to become multinational and declare positive profits in both countries. In spite of that, due to the presence of additional fixed costs to establish a second production plant, the firm may optimally choose to operate as a single-plant exporter from either country. On the contrary, when profit shifting is prohibitively expensive, the multinational will always report correctly to national tax authorities the profits actually realized in each country. Even though the relative profitability of operating as a multinational decreases, the latter can still represent an optimal choice for the firm when fixed costs are low enough. By contrast, if these costs are sufficiently high, the firm’s optimal choice reduces to the decision about where to locate its unique production plant.
To conclude, we would like to point out some major limitations of our model and suggest possible extensions. In the first instance, we want to stress that while our results are derived starting from a linear market demand, we can easily generalize them to different functional specifications as long as we are able to maintain a ranking of before-tax profits from local sales in and exports to the large and the small country. Secondly, our analysis so far treats corporate tax rates as exogenous constraints to the firm. Our future research will obviously aim at making tax rates endogenous and at deriving optimal policies by competing governments. For instance, the government’s objective could consist of consumer surplus and tax revenue in order to capture the main trade-off at work here. Hopefully, this will also allow us to draw conclusions concerning the welfare effects of such policies and the desirability of some forms of tax harmonization and/or coordination between countries.

Appendix

Taxes and the location–organization choice

Single-plant exporter in $B$ versus multinational

When $t_A > t_B$, we solve (9) with respect to $t_A$ and find that $\hat{\Pi}_B^s > \hat{\Pi}^m$ if $t_A$ is between the two roots defined by

$$t_B + \gamma \pm \sqrt{\frac{\gamma}{H}} \sqrt{\gamma H + 2(F - \Delta (1 - t_B))}.$$ 

As $\gamma > 1$, the highest root is always greater than 1, hence not relevant for the firm’s decision. The smallest root, which we denote by $t_{Bm}$, exists as long as $2F + \gamma H - 2\Delta (1 - t_B) > 0$, i.e. if and only if

$$t_B > 1 - \frac{F}{\Delta} - \frac{\gamma H}{2\Delta}.$$ 

When $t_B = 1 - \frac{2F + \gamma H}{2\Delta}$, $t_{Bm} \left(1 - \frac{2F + \gamma H}{2\Delta}\right) = 1 - \frac{2F + \gamma H}{2\Delta} + \gamma$, implying that the existence point lies always above the 45°-line on the $(t_B, t_A)$-space. For any $t_B > 1 - \frac{2F + \gamma H}{2\Delta}$, $t_{Bm}(t_B)$ is a non-monotone and convex function which attains a minimum at $t_B = 1 - \frac{F}{\Delta} - \frac{\gamma H}{2\Delta} + \frac{\gamma \Delta}{2H}$; moreover, it crosses the 45°-line just once at $t_A = t_B = 1 - \frac{F}{\Delta}$.

Thus, since the inequality $1 - \frac{F}{\Delta} > 1 - \frac{F}{\Delta} - \frac{\gamma H}{2\Delta} + \frac{\gamma \Delta}{2H}$ is always satisfied, the point where $t_{Bm}(t_B)$ reaches its minimum lies above the 45°-line as well.

For any $t_B < 1 - \frac{2F + \gamma H}{2\Delta}$, a double-plant multinational shifting profits out of country $A$ will always earn higher profits than a single-plant exporter located in country $B$. To prove this, we take the net profit difference (9) and let $k(t_A) \equiv H (t_A - t_B)^2 - 2\gamma H t_A + 2\gamma Lt_B + 2\gamma \Delta - 2\gamma F$. Since the two roots do not exist for any $t_B < 1 - \frac{2F + \gamma H}{2\Delta}$, we know that $k(t_A)$ will be either always positive or always negative. We thus take $t_A = t_B = 1 - \frac{2F + \gamma H}{2\Delta} - \epsilon, \epsilon > 0$, which implies $k(t_A) = \gamma^2 H + 2\gamma \epsilon \Delta > 0$.

When $t_B > t_A > t^{AB}(t_B)$, we solve (10) with respect to $t_A$ and find that $\hat{\Pi}_B^* > \hat{\Pi}^m$ if $t_A$ is between the two roots defined by

$$t_B + \frac{\gamma}{n} \pm \frac{1}{n} \sqrt{\frac{\gamma}{H}} \sqrt{\gamma H + 2n(F - \Delta (1 - t_B))}.$$ 

Only the smallest root, which we call $t_{Bm}(t_B)$, matters for the firm’s organization decision since the greatest one is higher than $t_B$. The two roots exist as long as $\gamma H + 25$
2n \left(F - \Delta (1 - t_B)\right) > 0$, i.e. if and only if
\[ t_B > 1 - \frac{2nF + \gamma H}{2n\Delta}. \]

As before, $i_t Bm (t_B)$ is a non-monotone and convex function which now attains a minimum at $t_B = 1 - \frac{2nF + \gamma H}{2n\Delta}$ and which crosses the 45°-line just once at $t_A = 1 - \frac{F}{\Delta}$, i.e., at the same point where it crosses $i_t Bm (t_B)$. In addition, $i_t Bm (t_B) < t_B$ if and only if $t_B > 1 - \frac{F}{\Delta}$. Finally, the inequality $1 - \frac{F}{\Delta} > 1 - \frac{2nF + \gamma H}{2n\Delta}$ is always satisfied. Therefore, $i_t Bm (t_B)$ is always increasing for any $t_B > 1 - \frac{F}{\Delta}$, i.e. below the 45°-line.

**Single-plant exporter in \(A\) versus multinational**

When $t_B > t_t AB (t_B) > t_A$, we solve (11) with respect to $t_A$ and find that $\Pi_t A > \Pi_t m^*$ if $t_A$ is between the two roots defined by
\[ t_B = \frac{\gamma L}{H} \pm \frac{1}{H} \sqrt{\frac{\gamma}{n} \sqrt{\gamma n L^2 + 2 H (F - (1 - t_B) n \Delta)}}. \]

These two roots, which we denote by $t_t Am^+ (t_B)$ and $t_t Am^- (t_B)$, exist as long as $\gamma n L^2 + 2 H (F - (1 - t_B) n \Delta) > 0$, i.e. if and only if
\[ t_B > 1 - \frac{F}{n \Delta} - \frac{\gamma L^2}{2 H \Delta}. \]

When $t_B = 1 - \frac{F}{n \Delta} - \frac{\gamma L^2}{2 H \Delta}$, the two roots coincide and $t_t Am \left(1 - \frac{F}{n \Delta} - \frac{\gamma n L^2}{2 H \Delta}\right) = 1 - \frac{F}{n \Delta} - \frac{\gamma n L^2}{2 H \Delta} - \frac{\gamma L^2}{H \Delta}$, implying that the smallest root lies always below the 45°-line on the $(t_B, t_A)$-space.

For any $t_B > 1 - \frac{F}{n \Delta} - \frac{\gamma L^2}{2 H \Delta}$, $t_t Am^+ (t_B)$ is increasing and concave while $t_t Am^- (t_B)$ is a non-monotone and convex function which attains a minimum at $t_B = 1 - \frac{F}{n \Delta} + \frac{\gamma (H - 2 L)}{2 H \Delta}$. Moreover, $t_t Am^+ < t_B$ only for $t_B < 1 - \frac{F}{n \Delta}$ and it crosses the 45°-line just once at $t_A = t_B = 1 - \frac{F}{n \Delta} > 1 - \frac{F}{\Delta}$.

For any $t_B < 1 - \frac{F}{n \Delta} - \frac{\gamma L^2}{2 H \Delta}$, a double-plant multinational shifting profits out of country $B$ will always earn higher profits than a single-plant exporter located in country $A$. To prove this, we take the net profit difference (11) and let $l (t_A) = n H (t_A - t_B)^2 - 2 n H t_A + 2 \gamma n L t_B + 2 \gamma n \Delta - 2 \gamma F$. Since the two roots do not exist for any $t_B < 1 - \frac{F}{n \Delta} - \frac{\gamma L^2}{2 H \Delta}$, we know that $l (t_A)$ will be either always positive or always negative. We thus have $t_A = t_B = 1 - \frac{F}{n \Delta} - \frac{\gamma L^2}{2 H \Delta} - \epsilon$, $\epsilon > 0$, which implies $l (t_A) = \frac{\gamma n L^2}{2 H \Delta} + 2 \gamma \epsilon n > 0$.

Since we cannot say - without imposing some restrictions on the parameters - whether the existence point (where the two roots coincide) is above or below the location condition, both roots will generally matter for the firm’s organization decision. Moreover, we find that $t_t Am^+$ (or $t_t Am^-$), $i_t Bm^+$ and $t_t AB$ all intersect at the same two points, one of which is such that
\[ t_B = 1 - \frac{\sqrt{\gamma} (H + n L) \left[ \sqrt{2 (n - 1)^2 HF + \gamma n (H + L)^2} - \sqrt{\gamma n (H + L)} \right]}{\sqrt{\gamma} (n - 1)^2 H \Delta} < 1. \]

**Symmetric countries**

When the two countries are of the same size, i.e. $n = 1$, the location condition (8) reduces to $t_t AB (t_B) = t_B$ and the firm’s organization choice is symmetric around the 45°-line.
When \( t_A > t_B \), the firm will operate either as a single-plant exporter from country \( B \) or as a multinational shifting profits out of country \( A \), which leads to the tax threshold \( \bar{t}^{Bm}_B(t_B) \). The latter exists for \( t_B > 1 - \frac{F\theta_1 + \gamma H}{2L} \) and the existence point is given by \( (t_B, t_A) = \left( 1 - \frac{2F\theta_1 + \gamma H}{2L}, 1 - \frac{2F\theta_1 + \gamma H}{2L} + \gamma \right) \). Hence, since \( \gamma > 1 \) by assumption, this point will lie on the space \( (t_B, t_A) \in [0, 1] \times [0, 1] \) as long as

- \( t_B > 0 \), i.e. if \( F \leq \Delta (\tau) - \frac{\gamma H}{2} \), which is more likely to be satisfied for high values of \( \tau \) and/or low \( \gamma \);
- \( t_A < 1 \), i.e. if \( F > \frac{\gamma}{2} (H - 2L) \); as \( F \geq 0 \) by assumption, the last condition holds when the profits from local sales do not exceed twice the profits the firm can gain by exporting to the same market, \( H < 2L \), so that the term on its right-hand side is negative.

When \( t_A < t_B \), the firm will operate either as a single-plant exporter from country \( A \) or as a multinational shifting profits out of country \( B \). If we set \( n = 1 \) and then solve (11) with respect to \( t_A \), we find that \( \Pi^m_A > \Pi^m_A \) if \( t_A \) is between the two roots defined by

\[
 t_B - \frac{\gamma L}{H} \pm \frac{\gamma^2 L^2}{H^2} - \frac{2H(F - (1 - t_B)\Delta)}{2H^2} + \gamma L^2.
\]

These two roots coincide with - and have the same properties of - \( t^{Am+}(t_B) \) and \( t^{Am-}(t_B) \) when \( n = 1 \). Namely, they do exist if and only if

\[
 t_B > 1 - \frac{F}{\Delta} - \frac{\gamma L^2}{2H\Delta}.
\]

At the existence point, \( t^{Am} \left( 1 - \frac{F}{\Delta} - \frac{\gamma L^2}{2H\Delta} \right) = 1 - \frac{F}{\Delta} - \frac{\gamma L^2}{2H\Delta} - \frac{\gamma L}{H} \), implying that the smallest root lies always below the 45°-line on the \((t_B, t_A)\)-space.

For any \( t_B < 1 - \frac{F}{\Delta} - \frac{\gamma L^2}{2H\Delta} \), a double-plant multinational shifting profits out of country \( B \) will always earn higher profits than a single-plant exporter located in country \( A \). To prove this, we let \( n = 1 \) and take \( t_A = t_B = 1 - \frac{F}{\Delta} - \frac{\gamma L^2}{2H\Delta} - \epsilon \), \( \epsilon > 0 \), which leads to \( l(t_A) = \frac{\gamma^2 L^2}{2H\Delta} + 2\gamma \epsilon \Delta > 0 \).

For any \( t_B > 1 - \frac{F}{\Delta} - \frac{\gamma L^2}{2H\Delta} \), \( t^{Am+}(t_B) \) is increasing and concave while \( t^{Am-}(t_B) \) is a non-monotone and convex function which attains a minimum at \( t_B = 1 - \frac{F}{\Delta} + \frac{(H - 2L)^2}{2H\Delta} \). Moreover, we have that \( t^{Am+} < t_B \) only for \( t_B < 1 - \frac{F}{\Delta} \) and it crosses the 45°-line just once at \( t_A = t_B = 1 - \frac{F}{\Delta} \). The point where \( t^{Am-}(t_B) \) reaches its minimum is now given by \( (t_B, t_A) = \left( 1 - \frac{F}{\Delta} + \frac{(H - 2L)^2}{2H\Delta}, 1 - \frac{F}{\Delta} - \frac{\gamma L}{2H} \right) \). As before, this point will be in the space \((t_B, t_A) \in [0, 1] \times [0, 1] \) if and only if \( F \geq 2 \Delta (\tau) - \frac{\gamma H}{2} \) and \( H < 2L \) - implying \( t_B < 1 \) and \( t_A > 0 \), respectively - simultaneously hold.

To sum up, when the two countries are symmetric, the location condition and the organization indifference loci \( \bar{t}^{Bm}_B \) and \( t^{Am+} \) all intersect at the same point \( t_A = t_B = 1 - \frac{F}{\Delta} \). As \( F \) decreases, such an intersection point moves up along the 45°-line and the tax space where becoming multinational is more profitable than to be an exporter enlarges. In particular:

- when \( F > \Delta (\tau) \), the firm’s location–organization choice just depends on the location condition, \( t^{AB}(t_B) = t_B \);
- when \( F < \Delta (\tau) \), all of the previously defined conditions matter for the firm’s decision.
No additional fixed costs

Setting \( F = 0 \) leaves the location condition (8) unchanged. The other conditions, however, do depend on \( F \). In particular, when \( t_B > t_A > t^{AB}(t_B) \), the tax threshold \( t^{Bm}(t_B) \) is no longer relevant and the firm always chooses to become a multinational which shifts profits to the small and low-tax country. Indeed, for \( F = 0 \), \( t^{Bm}(t_B) < t_B \) if and only if \( t_B > 1 \).

When \( t_A > t_B \), we obtain the same tax threshold, \( t^{Bm}(t_B) \), as before - except that \( F = 0 \) - and the existence point is now given by \( (t_B, t_A) = \left( 1 - \frac{H}{2} - 1 - \frac{H}{2} + \gamma \right) \). Hence, since \( \gamma > 1 \) by assumption, this point will lie on the space \( (t_B, t_A) \in [0, 1] \times [0, 1] \) as long as

- \( t_B > 0 \), i.e. if \( \gamma < 2 \frac{H-L}{H} \), which is more likely to hold for low \( \gamma \) and/or high \( \tau \);
- \( t_A < 1 \), i.e. if \( H < 2L \).

We also need to stress that \( t^{Bm}(t_B) \) crosses both the 45°-line and the location condition only at \( t_A = t_B = 1 \) while it always lies above them for any \( t_B < 1 \).

For \( t_B > t^{AB}(t_B) > t_A \), we get the same tax thresholds as above, \( t^{Am+}(t_B) \) and \( t^{Am-}(t_B) \) with \( F = 0 \). In this case, we easily show that the existence point is always below the location condition since \( t^{Am+}(t_B) \) crosses both the 45°-line and the location condition only at \( t_A = t_B = 1 \) while it always lies below them for any \( t_B < 1 \). Moreover, we find that \( t^{Am-}(t_B) \) attains a minimum at the point \( (t_B, t_A) = \left( 1 + \frac{(H-L)}{2H}, 1 - \frac{H}{2H} \right) \). Such a point will be in the space \( (t_B, t_A) \in [0, 1] \times [0, 1] \) if and only if \( H < 2L \) and \( \gamma < 2 \frac{H-L}{H} \) - implying \( t_B < 1 \) and \( t_A > 0 \), respectively - simultaneously hold.

Therefore, when \( F = 0 \), \( t^{Am+}(t_B) \) and \( t^{Bm}(t_B) \) intersect just at \( t_A = t_B = 1 \), the former lying always below \( t^{AB}(t_B) \), the latter always above it for any \( t_B < 1 \). As the cost of profit shifting - as captured by \( \gamma \) - increases, the tax space where the firm optimally chooses to become multinational shrinks: on the one hand, the existence point for \( t^{Bm}(t_B) \) moves to the left; on the other hand, the point where \( t^{Am-}(t_B) \) attains its minimum moves down on the \( (t_B, t_A) \)-plane.

References


