Unilateral Tax Reform: Border Adjusted Taxes, Cash Flow Taxes, and Transfer Pricing*

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Abstract

We study the economic effects of unilateral adoption of corporate tax policies that include the choice between destination-based and source-based taxation and between cash flow and income taxes. We utilize a heterogeneous firm model in which monopolistically competitive North firms choose whether to outsource an intermediate good to an unrelated South firm or to produce in a subsidiary in the South. Standard pass through arguments no longer apply because of the income shifting behavior of multinationals and endogenous choice of organizational form. The high tax country North country will prefer a destination-based over a source-based tax base if it adopts a cash flow tax, but whether the cash flow tax is preferred to an income tax will depend on the volume of trade in the differentiated products sector. If the high tax country adopts a destination-based cash flow tax, the low tax country will prefer a destination-based income tax to capture rents from the foreign subsidiaries.

Keywords: border adjustments, destination-based taxes, source-based taxes, cash flow taxes, income taxes, transfer pricing, unilateral tax reform

JEL Classifications: F23, H21, H25, H26

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1 Introduction

As part of the debate over US corporate tax rates, the House Republicans developed a tax reform plan (Tax Reform Task Force, 2017) that proposed the unilateral change of the U.S. corporate tax law from one built around source-based income taxation (SBT) to one built around border-adjusted or destination-based cash flow taxation (DBCFT). Such a change would make two significant changes in the corporate tax system: income would be taxed based on where goods are sold rather than on where they are produced and capital expenditures would be deductible from taxable income.\(^1\) A key component of taxing on the basis of the location of sales is a border adjustment that excludes export sales from taxation, but prevents firms from deducting the cost of imported goods from taxable income.\(^2\)

Advocates of DBCFT (e.g., Auerbach et al 2017) argue that a cash flow tax will be a tax on economic rent and will not distort the international location of capital investments.\(^3\) It is also argued that the effect of the border adjustments will be similar to those of a Value Added Tax (VAT), which involve a rebate of tax on export sales and the taxation of imports and have been argued to have no effect on resource allocation by Grossman (1980) and Feldstein and Krugman (1990). Coinciding with the efficiency properties of DBCFT is the understanding that the incentive for multinational firms to shift income from high-tax into low-tax countries via transfer prices is eliminated.\(^4\) For example, Auerbach and Holtz-Eakin (2016) write in discussing the Republican plan, “Border adjustments eliminate the incentive to manipulate transfer prices in order to shift profits to lower-tax jurisdictions.”

Critics of DBCFT argue that a key assumption in this literature under which these efficiency properties and the elimination of profit-shifting incentives arise, and one not always made explicit, is

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\(^1\)Cash flow taxation can also affect the taxation of debt and interest payments. We abstract from these issues in this paper.

\(^2\)The Tax Cuts and Jobs Act (U.S. Congress, 2017) that was ultimately adopted did not convert the corporate income tax to a DBCFT. However it did move somewhat in the direction of a cash flow tax by allowing for the full expensing of intermediate duration capital purchases and by tightening the rules regarding transfer pricing. It also included some partial border adjustment in the form of the Base Erosion and Anti-Abuse Tax (BEAT), which limits the deductibility of payments by multinationals to foreign subsidiaries in low tax locations

\(^3\)Brown (1948) and Sandmo (1979) are the classic references on cash flow taxation

\(^4\)Significant income shifting behavior by multinational firms has been documented by numerous authors including recently Dowd, Landefeld, and Moore (2017), Guvenen et al (2017), and Flaen (2017) for U.S. multinationals, Cristea and Nguyen (2016) for Danish multinationals, and Chalendard (2016) for Ecuadorian firms.
that all countries adopt DBCFT. When only one country adopts DBCFT, tax distortions still exist and can affect firm behavior in very different ways relative to source-based taxation. A unilateral shift to DBCFT from SBT not only changes a multinational’s transfer price incentives, it also influences a firm’s pricing, its domestic and export sales decisions, and the organizational decision of international businesses to outsource intermediate good production or to produce intermediate goods in a foreign subsidiary.

Critics of DBCFT also question whether the border adjustments resulting from the unilateral adoption of the policy by the U.S. would in fact be neutral with regard to resource allocation, or whether they would in fact distort international trade flows. For example, Costinot and Werning (2019) show that the neutrality of border adjustments will not necessarily hold when firms are engaged in cross-border activity. Also, it has been pointed out that the elimination of income shifting incentives requires multilateral adoption of DBCFT. If only one country adopts, there will be an incentive to under-price imports to the adopting country to reduce taxable income in the country with source-based taxation.5

To address these issues, we provide a formal analysis of the equilibrium consequences of unilateral adoption of destination-based and/or cash flow taxes in a model with endogenous income shifting via transfer prices and endogenous choice of organizational form. We analyze a North/South model in which differentiated product firms in a high tax North country (referred to as country 1) are sourcing inputs from a low tax South country (country 2). Country 1 firms in the differentiated product sector choose whether to source through arm’s length transactions with unrelated firms in the South or through establishing a subsidiary in the South. Firms are heterogeneous in their ability to produce in the South, and must trade off their productivity advantage and transfer pricing benefits from establishing a subsidiary against the higher fixed costs they incur with a subsidiary. We focus on how the choice of the firm’s pricing and organizational form depend on two features of the North country’s tax policy: whether the North uses a corporate income tax or a cash flow tax and whether income is taxed on a destination or source basis.

5Shome and Schutte (1993) acknowledge this possibility in their survey on the early literature on cash flow taxes. More recently, Bond and Devereux (2002), Auerbach and Devereux (2018), and Auerbach et al (2017) all allude to this fact. Genser and Schulze (1997) derive optimal transfer prices when one country adopts a destination-based VAT and another adopts an origin-based VAT. Becker and Englich (2017) raise the issue of transfer price distortions in a non-technical discussion of the original U.S. tax reform proposal with regard to WTO compliance.
We identify two channels through which the switch from a source-based tax to a destination-based tax results in a non-neutrality with regard to resource allocation. The first is the transfer pricing effect. We show that while a firm in a high tax country has an incentive to use transfer pricing to transfer income to the low tax rate country under a source-based system, the firm has an incentive to transfer income out of the low tax country under a destination-based system. As a result, the switch to a destination-based system may either raise or lower the price of goods produced by multinational firms depending on which system generates the bigger gains from transfer price manipulation. The magnitude of the gains from transfer price manipulation will also affect the firm’s decision as to whether or not to become multinational. A second channel involves the impact of the tax system on the relative fixed capital costs incurred in the host and source country. We show that the introduction of a destination-based tax reduces the cost of fixed capital investments in the host country subsidiary, and thus makes integration more attractive relative to outsourcing. We also show that switching from an income tax to a cash flow tax will have the effect of expanding the output of the capital intensive differentiated product sector and shift the composition of differentiated product output from integrated firms to outsourcing firms because outsourcing firms are relatively more reliant on domestic capital.

Comparative statics results for policy changes are used to compare the welfare of the countries under the unilateral adoption of the respective tax policies. We show that for the high tax country, the adoption of DBCFT is superior to adopting SBCFT because DBCFT aligns the costs faced by firms with those faced by society. However, DBCFT will not necessarily dominate the use of an income tax because of the beneficial terms of trade effects that arise if export sales are sufficiently large. For the low tax country, we show that decision by the high tax country to switch to DBCFT would induce the low tax country to switch to choose a destination based tax. However, the low tax country would prefer a corporate income tax over a cash flow tax in order to capture economic rents from subsidiaries located in its country. Our results highlight the role of spillover effects from policy changes to trading partners in evaluating unilateral policy changes, and also the importance of distinguishing the effects of the source/destination aspect of tax policy from the income/cash flow tax aspect.

Our work is related to several existing strands of literature. Bond and Devereux (2002) were the
first to study the role of corporate taxes on the organizational choice of an international business by focusing on the production location decision of a representative monopolist. In their model, the firm chooses to either produce in its home country and export to a foreign country or vice versa. There is no role for transfer prices and no firm heterogeneity. Auerbach and Devereux (2018) extend this model to consider both production location and resource allocation decisions in which a representative firm can produce and sell in each of two countries. Their model introduces scope for transfer pricing but they assume no transfer price manipulation when they analyze a country’s incentives to unilaterally adopt DBCFT.\textsuperscript{6} In contrast, our model studies equilibrium behavior in which both outsourcing firms and multinationals co-exist (as is observed in practice), and we allow multinationals to endogenously set transfer prices.

The treatment of the firm’s sourcing decision is motivated by Grossman and Helpman (2002), who analyze the choice of a firm between integration and outsourcing in monopolistically competitive markets. In this regard, our approach is similar to that of Bauer and Langenmayr (2013), who focus on transfer price issues with heterogeneous firms under source-based income taxation, and Becker (2013), who focuses on double taxation issues with heterogeneous firms. One advantage of using the monopolistic competition framework is that by changing the elasticity of substitution among the monopolistically competitive products we can analyze the effects of tax policy changes in product markets ranging from the perfectly competitive, as in Auerbach and Devereux (2018), to those in which firms have substantial market power, as is the case in most standard trade models. As such we can better link the recent theoretical and empirical literature on international trade literature on formation of multinationals with heterogeneous firms (eg. Helpman, Melitz and Yeaple (2004), Arkolakis et al (2018)) with the tax literature on corporate taxation.

Our work is also related to literatures in trade and public finance that focus on the negative externalities on trading partners that can arise when a country adopts an optimal (unilateral) policy. In the international trade literature, Bagwell and Staiger (2002) emphasize that the role of trade agreements is to eliminate the terms of trade externalities that arise from national tariff

\textsuperscript{6}Baumann, Dieppe, and Dizioli (2017) look at the macroeconomic implications of DBCFT, but do not consider the role of multinational firms and hence they also do not analyze transfer pricing behavior. Benzell, Kotlikoff, and LaGarda (2017) do a dynamic general equilibrium simulation of the effects of introducing the House Republican tax plan.
policies. Similarly, fiscal externalities such as tax exporting can arise from a countries taxation of capital income. Gordon and Hines (2002) and Keen and Konrad (2013) provide surveys of the fiscal spillovers that can arise when countries or regions set polices unilaterally. Fiscal externalities such as tax exporting can arise when countries or regions set tax policies unilaterally. Our results are related in that we show that a country may not have an incentive to make a unilateral choice of a destination-based cash flow tax, even though global adoption might generate efficiency gains, because of the fact that some of the gains accrue to trading partners. The policy externalities in our model are similar to terms of trade and tax exporting externalities, although they differ slightly in that they arise from the presence of product variety and firm heterogeneity in a monopolistic competition model.

In section 2, we describe our model and define the tax parameters that we will use to characterize tax regimes. In section 3, we characterize the optimal decision of firms regarding price and organizational form. We use these decision rules to derive the conditions under which changes in country 1 tax policy will be neutral in their effect on resource allocation. Section 4 provides a welfare analysis of the effects of changes in country 1 tax policy on country 1 welfare. Section 5 analyzes the spillover effects of country 1 tax policy on country 2, and discusses the optimal policy of country 2 in response to the adoption of DBCFT by country 1. Section 6 offers concluding remarks.

2 The Model

We consider a two country model with two final goods: a perfectly competitive production sector (good Y) and differentiated good sector (good X) characterized by monopolistic competition. Country 1 can be thought of as a “North” country: it serves as headquarters for X sector firms and has a high tax rate. Country 2 is a “South” country: it has comparative advantage in producing an input that is required by X sector firms and has a low tax rate. The decision problem for X sector firms is whether to outsource production of the intermediate good to an independent supplier in country 2 or to set up a subsidiary in country 2 as in Grossman and Helpman (2002). We focus on how the tax policies of country 1 and the ability of multinational firms to manipulate transfer
prices on intra-firm transactions will influence the integration/outsourcing decision. Production of the competitive good is assumed to take place in each country.

2.1 Consumer Preferences and Production Structure

Preferences over the two goods by a representative consumer in each country are given by the quasi-linear utility function

\[ U_j = \mu_j \ln X_j + Y_j \]

for \( j = 1, 2 \), where \( X_j = \left( \int_{i \in \Omega_j} x_i^{\sigma-1} \, di \right)^{\frac{\sigma}{\sigma-1}} \), \( \Omega_j \) is the set of varieties of good \( X \) offered in country \( j \), and \( \sigma > 1 \) is the elasticity of substitution. Larger values of \( \sigma \) imply a more competitive \( X \) sector.

With these preferences, the demands for individual varieties and good \( Y \) in country \( j \) are given by

\[ x_j = \frac{q_j \mu_j p_j^{-\sigma}}{P_j^{1-\sigma}} \quad \text{and} \quad D_{Yj} = \frac{Z_j}{q_j} - \mu_j \]

respectively, where \( q_j \) is the price of good \( Y \), \( p_j \) is the price of the \( j^{th} \) variety of good \( X \), \( P_j = \left( \int_{i \in \Omega_j} p_j^{1-\sigma} \, di \right)^{\frac{1}{1-\sigma}} \) is the price index for the \( X \) good and \( Z_j \) is aggregate expenditure, all in country \( j \). The country \( j \) consumer spends \( q_j \mu_j \) on \( X \) sector goods and the remainder of its income on \( Y \) goods. We assume there are no trade costs or VATs.

Country \( j \) has an endowment of \( L_j \) units of a productive factor, which can either be used as a “labor” input or transformed into “capital.” We assume the endowment can be converted to capital at a constant rate, which we normalize to unity, so that the cost of a unit of capital will be equal to the wage rate in country \( j \), \( w_j \). The distinction between the use of the endowment as capital and labor will be important in the application of tax policy discussed below, because the cost of the capital input will be deductible from corporate income under a cash flow tax, but not under an income tax. Since our focus is on the taxation of capital income, we assume throughout that labor is deductible from taxation.\(^7\)

Good \( Y \) is produced using only labor in each country under conditions of constant returns to

\(^7\)Our approach to modelling a distinction between income and cash flow taxes is equivalent to that in Auerbach and Devereux (2018), in which the consumer has a unit of an endowment good that can be converted on a one-to-one basis into a private consumption good similar to good \( Y \), a public good, or capital. Our model does not include a public good but this difference is not driving our results.
scale and perfect competition. We simplify by assuming that the labor input requirement is unity in each country. Choosing good Y in country 2 as the numeraire, the pre-tax cost of a unit of good Y is \( w_1 \) in country 1 and 1 in country 2. Under the assumption that labor income is not subject to tax, the zero profit condition for sector Y ensures that \( q_1 = w_1 \) and \( q_2 = 1 \).

A variety of good X is produced using capital for headquarter services in country 1 and one unit of an intermediate good M, per unit of output. To simplify the discussion and focus on the choice of organizational form, we assume that the cost of production of M in country 1 is sufficiently high relative to that in country 2 that local production of the intermediate is not an option. If the firm chooses to outsource the good to an unrelated foreign firm, it incurs a cost of \( f^O \) units of capital for the headquarters in country 1 and purchases good M at a price of \( r \) per unit. Country 2 firms producing intermediate good M are assumed to use one unit of labor per unit of the intermediate, but we allow for \( r \geq 1 \) to cover the possibility of markup pricing by country 2 firms. The pre-tax cost of producing \( m \) units of output for an outsourcing firm will be \( C^O(m) = w_1 f^O + rm \).

If an X firm establishes a foreign subsidiary, it requires a capital investment \( f_1 \) to maintain a headquarters in country 1 and a capital investment \( f_2 \) in country 2 to organize production. Although we do not restrict the values of the individual fixed cost investments, we assume that the communication and coordination costs associated with organizing production in a subsidiary result in a greater total fixed cost for integrated firms than for outsourcing firms, \( f_1 + f_2 > f^O \). We assume that production in a subsidiary by an integrated firm requires \( a \) units of country 2 labor per unit of output labor, where \( a \) is distributed in the population of potential entrants according to the distribution function \( G(a) \) for \( a \in [a, \infty) \). The cost of producing \( m \) units of output for an integrated firm is \( C^I(m) = w_1 f_1 + f_2 + am \).

Firms are assumed to know their productivity at the time of entry, so they will choose between producing as an outsourcing firm or as an integrated firm. The fixed cost disadvantage of an integrated firm can be offset by the fact that the firm may have a lower variable cost of producing.

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8To simplify notation, we assume that there are no variable labor costs incurred in country 1 required to turn the intermediate input into the unit of final good. The results of section 3 are unaffected if sector X firms have a common unit labor requirement of \( b \) per unit of output in country 1 for outsourcing and integrated firms.

9Note that the assumption of fixed capital costs in the headquarters and the subsidiary play a key role in the theoretical and empirical analysis of the decision of firms between exporting and FDI by Helpman, Melitz, and Yeaple (2004). The evidence shows that the fixed costs result in the selection of the most productive firms into FDI. Their results mirror our results concerning selection between importing and FDI.
than the country 2 firms, $a < r$, and we will establish below that firm heterogeneity in the value of $a$ will lead to a sorting of firms in which the most productive firms will choose to be integrated. This sorting is consistent with the observation that the largest firms are the ones that become multinational.

2.2 Tax Policy Parameters

Our objective is to analyze the allocation and welfare effects of a change in the corporate tax system by country 1, where country 1 is a high tax country relative to country 2. To that end, we will define two tax policy parameters to focus on two features of the corporate tax system: whether income is taxed at the source and whether capital costs are deductible from income. In addition to comparing the current SBT with DBCFT, we can also allow for the choice of a cash flow tax that taxes income at its source (SBCFT) and a corporate income tax that taxes income on a destination basis (DBT). While we most often will refer to these four policy options, our analysis is more general and also allows us to consider intermediate options.

The low tax country 2 is assumed to tax income on a source basis at a rate $t_2$ and not to allow the deduction of capital costs from taxable income. We hold country 2 tax policy constant through most of our analysis, since these features characterize the existing tax system in most countries and our primary focus is on a unilateral tax policy change by country 1. We also assume that country 1 taxes income on a territorial basis, and that taxes in each country are assumed to be rebated to domestic households in a lump sum fashion.

For country 1, we define $t_{1j}$ as the tax rate imposed on sales in market $j$. Under a source-based tax system, income produced from firms located in country 1 will be taxed at a common rate $t_{11} = t_{12} = t_1$. Under a destination-based tax system, income produced from export sales will not be taxed, so $t_{11} = t_1$ and $t_{12} = 0$. In addition, a destination-based tax does not allow the deductibility of purchases of imported inputs. Changes in the parameter $t_{12}$ between $t_1$ and 0 will be used to capture the border adjustments associated with a change by country 1 from a source-based tax to either a partial or full destination-based tax.

The difference between a corporate income tax and a cash flow tax is captured by the parameter $\lambda$, which is the after-tax cost of capital in country 1. A cash flow tax is reflected by $\lambda = 1 - t_1$, 

$\lambda$
since the cash flow tax allows full deductibility of capital costs. Under a capital income tax, capital expenses are not deductible and $\lambda = 1$. Changes in $\lambda$ between 1 and $1 - t_1$ can be used to determine the effect of a change by country 1 from a capital income tax towards a cash flow tax. Finally, we will also examine the role of changes in $t_1$ under the respective systems.\textsuperscript{10}

3 Firm Pricing and Pass-Through of Border Adjustments

In this section we focus on the effects of tax policy changes on resource allocation, and derive conditions for the neutrality of border adjustments and changes in country 1’s tax rate. We show that border adjustments are fully passed through to domestic prices for $Y$ sector firms and $X$ sector firms that outsource. For integrated firms, we identify two factors that will lead to departures from complete pass through: the potential for manipulation of transfer prices on intra-firm trade and the existence of fixed capital costs in the host country. We also examine the effect of changes in tax parameters on the choice of organizational form.

3.1 $Y$ Sector Firms

As noted above, the zero profit conditions and deductibility of labor costs means that the price of good $Y$ will equal unit labor costs in each country, $q_i = w_i$. The linkage between wage rates in the two countries will be determined by the tax system adopted by country 1 when both countries are producing good $Y$. A producer in country 1 receives an after-tax return of $q_1 (1 - t_1)$ per unit sold in country 1 and an after-tax return of $q_2 (1 - t_{12})$ per unit sold in country 2. In order to make domestic firms indifferent between exporting and selling in the domestic market, we must have

$$q_1 = w_1 = \frac{1 - t_{12}}{1 - t_1},$$

in equilibrium. Observe that (2) also makes country 1 firms indifferent between importing and domestic production. Good $Y$ prices and wages will be equalized between countries with a source-
based tax, but they will be higher in country 1 by a factor of $\frac{1}{1-t_1}$ in the case of a destination-based tax.

Condition (2) establishes that border adjustments of the capital tax policy will be fully passed through to consumers of good $Y$ in country 1. Since a unit of the capital good has the same labor requirement as good $Y$, the price of a unit of capital in country $j$ will equal $q_j$ as well.

### 3.2 $X$ Sector Outsourcing Firms

For $X$ sector firms that outsource production to unrelated foreign firms, after-tax profits will be

$$\Pi^O = (1 - t_{11})R^O_1 + (1 - t_{12}) (R^O_2 - r m^O) - \lambda w_1 f^O$$  \hfill (3)

where $R^O_j = q_j \mu_j \left( \frac{x_j}{X_j} \right)^{\frac{\sigma - 1}{\sigma}}$ is the revenue a final goods producer earns from sales in market $j$.

If a final good producer purchases $m^O$ units of the intermediate good, it will produce an output of $x^O = m^O$. Under our assumption that there are no trade costs, marginal costs will be the same for sales in each market and the firm’s profit maximizing policy will allocate output across markets to maximize revenue. The maximum after-tax revenue from selling $x$ units is

$$\Psi(x) = \max_{x_2} (1 - t_{11})R_1 (x - x_2) + (1 - t_{12})R(x_2)$$  \hfill (4)

$$= \kappa(t_{11}, t_{12}) x^{\frac{\sigma - 1}{\sigma}}$$

where $\kappa(t_{11}, t_{12}) \equiv (k_1^\sigma + k_2^\sigma)^{\frac{1}{\sigma}}$ and $k_j = (1 - t_{1j})q_j \mu_j X_j^{\frac{1-\sigma}{\sigma}}$. The share of output allocated to market $j$ is determined by its relative profitability,

$$x^O_j = \frac{k_j^\sigma m^O}{k_1^\sigma + k_2^\sigma}.$$  \hfill (5)

The parameter $k_j$ captures the profitability of the $j$ market, reflecting both the tax rate and intensity of competition in that market, and $\kappa$ is a measure of the overall profitability of the two markets. Each firm will treat the parameters $k_j$ as exogenously given when making sales decisions. However, the $k_j$ will be endogenously determined in a free entry equilibrium because the measure and composition of entrants will determine the $X_j$. 

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Solving for the profit-maximizing output level and then solving for the corresponding prices yields the following result for pass-through for outsourcing firms. (See Appendix for proofs of all results.)

**Proposition 1** For an outsourcing firm,
(a) the switch from a source-based capital tax to a destination-based capital tax raises the cost of the intermediate input and capital costs by a factor of \( \frac{1}{1-t_1} \), and
(b) the prices of the final goods in market \( j \) will be

\[
p^O_j = \left( \frac{1 - t_{12}}{1 - t_{1j}} \right) \frac{\sigma r}{\sigma - 1}. \tag{6}\]

Under a source-based tax, prices in each country will be equalized and will reflect a markup of \( \frac{\sigma}{\sigma - 1} \) over marginal cost. If a switch is made to a destination-based tax, all costs for an outsourcing firm rise by a factor of \( \frac{1}{1-t_1} \) reflecting the inability to deduct the input cost and the rise in the domestic cost of the capital good. The final good price in country 1 will rise by the same proportion as the increase in marginal cost, while the price in country 2 is unaffected due to the exemption of the export sales from North taxation. The effect on the country 1 price is identical to that obtained for sector \( Y \) firms, which means that \( p^O_1 q_1 = \frac{\sigma r}{\sigma - 1} \) under either tax system.\(^{11}\)

### 3.3 Payoffs for \( X \) Sector Integrated Firms

We now turn to the case in which a country 1 firm has chosen to produce the intermediate good in a wholly owned subsidiary. For the integrated firm, the division of taxable income between the subsidiary and the parent firm will be determined by the transfer price on intra-firm trade, \( \rho \geq 0 \).

The after-tax contribution to revenue in country 2 of a unit of the intermediate will be \( \rho(1 - t_2) \), while the after-tax cost of the input in country 1 of a unit is \( \rho(1 - t_{12}) \). We assume that country 1 exempts foreign source income from taxation, and that the firm chooses policies to maximize global

\(^{11}\)Our analysis abstracts from a potential holdup problem where the intermediate goods are specialized to the final good producers, as analyzed by Antràs and Helpman (2004). They use Nash bargaining to determine the price of the intermediate good, \( r = \frac{\sigma}{\sigma - 1} \), which is consistent with our assumption of a constant fixed price. The outcome under the holdup problem differs from the one we consider in that the output decision in Antràs and Helpman (2004) with a holdup problem will not be one that maximizes the final goods producer’s profits at \( r \). It can be shown that the full pass through result applies in this case as well.
profits. Global after-tax profits will be increasing in $\rho$ if, and only if, $t_{12} > t_2$, so the firm will have an incentive to set the transfer price as high as possible when $t_{12} > t_2$ and as low as possible if $t_{12} < t_2$.

In order to limit firms from manipulating transfer prices to reduce taxable income, tax authorities define an arm’s length price a firm should charge on intra-firm transactions. We assume that the arm’s length price is the subsidiary’s marginal cost of producing the input, $a$.\textsuperscript{12} Due to the heterogeneity of marginal costs across firm types, it will be difficult for tax authorities to identify the appropriate arm’s length price for a particular firm. Therefore, we assume that the firm can deviate from the appropriate arm’s length price by incurring a labor requirement of $C_j(\rho, a) = \alpha_j(\rho - a)^2$ per unit of the intermediate good, where $\alpha_j > 0$. This function captures the notion that the firm faces increasing marginal costs of raising the transfer price, with the magnitude of $\alpha_j$ reflecting the ability of country $j$ to identify the appropriate arm’s length price for the firm. Since the higher tax country will have the strongest incentive to monitor transfer prices to avoid the loss of revenue, we allow for country specific transfer pricing costs.

An output of $m^I(a)$ units of the intermediate good by a firm with unit labor requirement $a$ in the subsidiary will result in an output $x^I(a) = m^I(a)$ of the final good. As in the case of the outsourcing firm, this output will be allocated across markets to maximize revenue. Using (4) and (5), the after-tax global profits of an integrated firm with unit labor requirement $a$ will be

$$
\Pi^I(m, \rho; a) = \Psi(m) - ((1 - t_{11})\delta_1 w_1 C_1(\rho, a) + (1 - t_{12})\rho) m \\
+ (1 - t_2)(\rho - a - (1 - \delta_1)C_2(\rho, a))m - w_1 \lambda f_1 - f_2
$$

where $\delta_1$ is an indicator variable that is equal to 1 if country 1 is the higher tax country ($t_{12} > t_2$) and 0 otherwise. Using $\delta_1$ implies that the transfer pricing costs are tax deductible in the country in which they are incurred and that only the higher tax country monitors the transfer price.\textsuperscript{13} The objective of the firm is to choose $m$ and $\rho$ to maximize (7).

Integrated firm profit is concave in $\rho$, so the necessary condition for the choice of $\rho$ at an interior

\textsuperscript{12}Our results can be extended to allow for an arm’s length price that adds a markup above marginal cost by choosing the arm’s length price to be $\theta a$, where $\theta \geq 1$. This formulation substantially complicates the analysis, but does not alter the basic results.

\textsuperscript{13}The results for the case where both monitor is similar.
solution yields the optimal transfer pricing formula,

$$\rho^*(a) = a + \frac{t_{12} - t_2}{2(\alpha_1 \delta_1 (1 - t_{12}) + \alpha_2 (1 - \delta_1)(1 - t_2))}. \quad (8)$$

The firm will have an incentive to transfer income to the low tax location, with the magnitude of the deviation from the arm’s length price positively related to the magnitude of the tax differential and inversely related to the effectiveness of the monitoring by the tax authority. The arm’s length case is obtained when tax authorities have perfect monitoring, so evasion becomes arbitrarily costly (i.e. $\alpha_j \to \infty$). With imperfect monitoring, the transfer price will exceed the arms length price under source-based taxation and will be less than the arm’s length price under destination-based taxation.

Using (8), the after-tax marginal cost of an integrated firm will be

$$\Delta(a, t_{12}, t_2) = (1 - t_{12})a - \frac{(t_{12} - t_2)^2}{4(\alpha_1 \delta_1 (1 - t_{12}) + \alpha_2 (1 - \delta_1)(1 - t_2))}. \quad (9)$$

The first term in (9) is the after-tax cost of the input when the transfer price is evaluated at marginal cost, the arm’s length transfer price. The second term reflects the reduction in marginal cost resulting from the transfer pricing policy of the firm. The ability to use transfer pricing to reduce tax liabilities reduces the marginal cost of output below what it would be otherwise. The gain from transfer price manipulation is increasing in the difference at which profits would be taxed in the two locations, $t_{12} - t_2$, and decreasing in the after-tax cost of transfer price manipulation, $\alpha_1 \delta_1 (1 - t_{12}) + \alpha_2 (1 - \delta_1)(1 - t_2)$.

Letting $\Delta^S(a) = \Delta(a, t_1, t_2)$ be marginal cost under a source-based system and $\Delta^D(a) = \Delta(a, 0, t_2)$ be the marginal cost under a destination-based system, it can be shown that $\Delta^D(a) > \Delta^S(a)$ for $t_1 > t_2$.$^{14}$ The fact that the imported inputs are not deductible under a destination-based system means that the after-tax marginal cost of inputs rises under a destination-based system. However, we have established that for $Y$ sector firms and outsourcing firms a switch to a destination-based system raises the cost of variable and fixed inputs by a factor of $\frac{1}{1-t_i}$. Therefore,

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$^{14}$It follows from (9) that $\Delta^D(a) - \Delta^S(a)$ is an increasing function of $t_1$. The zero lower bound on the transfer price ensures that the difference is non-negative at $t_1 = t_2$. 

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full pass through of the border adjustment to the costs of integrated firms requires that fixed and variable costs by a factor of $\frac{1}{1-t_1}$.

Using (7) and (9), we obtain the following conditions on pass through for integrated firms:

**Lemma 1** For an integrated firm, the switch from a source-based tax to a destination-based tax will

(a) raise the after-tax cost of inputs by more than a factor of $\frac{1}{1-t_1}$ if, and only if,

$$\Gamma(a) \equiv \Delta^D(a) - \Delta^S(a) = \left[ \frac{(t_1 - t_2)^2}{4\alpha_1(1-t_1)^2} - \frac{t_2^2}{4\alpha_2(1-t_2)} \right] > 0,$$

and

(b) raise the fixed costs of an integrated firm by a factor of $\frac{1}{1-t_1} \left( \frac{\lambda f_1 + f_2(1-t_1)}{\lambda f_1 + f_2} \right) \leq \frac{1}{1-t_1}$.

$\Gamma(a)$ reflects the difference in the gains from transfer price manipulation between the source-based and destination-based tax systems. If the transfer price equals marginal cost under each tax regime (i.e. $\alpha_j \to \infty$ for $i = 1, 2$), then $\Gamma(a) = 0$ and there is full pass through of the change to a destination-based tax for an integrated firm. $\Gamma(a) > 0$ occurs when transfer price manipulation yields greater gains to the firm under source-based taxation than under destination-based taxation. Since country 1 is the one losing revenue from transfer price manipulation under a source-based tax, $\Gamma(a) > 0$ is more likely to arise when country 2 is more effective at monitoring transfer prices, $\alpha_1 < \alpha_2$ and when the tax differential from transfer pricing under a source-based tax, $t_1 - t_2$, is large relative to that under a destination-based tax, $t_2$. Similarly, we say that transfer price manipulation yields greater gains under a destination-based tax when $\Gamma(a) < 0$.

Part (b) shows that the fixed capital cost of the integrated firm will rise by a factor of less than $\frac{1}{1-t_1}$ if $f_2 > 0$. The fixed capital costs incurred by an integrated firm in country 1 rise by a factor of $\frac{1}{1-t_1}$, but the fixed capital costs in country 2 are unaffected. The ability of integrated firms to purchase inputs in the host country, combined with the fact that foreign income is exempted from source country taxes on capital income, means that the border adjustment is not neutral with respect to an $X$ sector firm’s incentive to become integrated. It is the cross-border nature of the purchase of capital inputs by integrated firms that gives rise to the less than full pass through of
capital costs to the integrated firm under a destination-based tax.\textsuperscript{15}

Solving the integrated firm’s optimization problem yields the following result:

**Proposition 2** For an integrated firm, the price in market $j$ will be

$$p^I_j(a, t_{12}, t_2) = \frac{\Delta(a, t_{12}, t_2)}{1 - t_{1j}} \frac{\sigma}{\sigma - 1}. \quad (11)$$

Consumers in country 1 will face more than full pass through of the change from source-based to destination-based taxation and the price to consumers in country 2 will increase if, and only if, $\Gamma(a) > 0$.

The switch to a destination-based tax will raise (lower) the price of integrated firm output relative to that of other goods in cases where transfer price manipulation is more (less) profitable under a source-based tax than under a destination-based tax. The switch to a destination-based tax will have no effect on relative prices in countries 1 or 2 when there is arm’s length pricing by integrated firms, $\Gamma(a) = 0$.

### 3.4 Equilibrium Entry and Selection

The previous section examined the extent to which a change from a source-based to a destination-based tax is passed through to consumers for a given organizational form. In this section we solve for the equilibrium firm outputs and selection of organizational form in a free entry equilibrium. The goal is to show how tax rate changes and changes in the tax base affect both the intensive and extensive margins for sector $X$ firms. In particular, we show that changes in the selection between integration and outsourcing will occur even in the case where there is complete pass through of tax rate changes to prices in country 1 when $f_2 > 0$.

Since firms are assumed to know their value of $a$ prior to entry, a firm with productivity $a$ will enter the industry if $\max[\Pi^O, \Pi^I(a)] \geq 0$. If this condition is satisfied, the firm will enter as an integrated firm if $\Pi^I(a) \geq \Pi^O$. Profits of an integrated firm are decreasing in $a$, \( \frac{d\Pi^I(a)}{da} = -(1 - t_{12})m^I(a) < 0 \). Letting $a^*$ denote the value of $a$ at which $\Pi^I(a) = \max[0, \Pi^O]$, all potential

\footnote{This is an example of Costinot and Werning’s (2019) result that the neutrality of border adjustments can break down in the presence of cross border transactions.}
firms with \( a \in [\underline{a}, a^*] \) will enter as integrated firms. Entry will increase the outputs \( X_j \) until \( \kappa \) adjusts sufficiently that the profit of a potential entrant is 0. We assume an interior equilibrium in which there are both outsourcing and integrated firms.\(^\text{16}\)

Outsourcing firms are the marginal firms in an interior equilibrium, so the homogeneous outsourcing firms will enter/exit until \( \kappa \) adjusts so that \( \Pi^O = \kappa(m^O)^{\frac{\sigma-1}{\sigma}} - (1 - t_{12})rm^O - \lambda w_1 f^O = 0 \).

Solving the zero profit condition for outsourcing firms yields

\[
\kappa = (1 - t_{12}) \left( \frac{\lambda f^O \sigma}{1 - \lambda w_1 f^O} \right)^{\frac{\sigma}{\sigma-1}} \left( \frac{\sigma - 1}{\sigma - 1} r \right)^{\frac{\sigma-1}{\sigma}}.
\]

(12)

\( \kappa \) is an increasing function of the after-tax cost of capital, \( \lambda w_1 f^O \), and the after-tax cost of the intermediate good, \((1 - t_{12})r\). An increase in either cost requires an increase in \( \kappa \) through exit to restore zero profits for outsourcing firms.

Solving for the output levels of the respective firm types when evaluated at \( \kappa \) yields

\[
\bar{m}^O = \frac{\lambda w_1 f^O (\sigma - 1)}{(1 - t_{12})r} = \frac{\lambda f^O (\sigma - 1)}{(1 - t_1)r},
\]

and

\[
\bar{m}^I(a) = \bar{m}^O \left( \frac{\Delta(a, t_{12}, t_2)}{(1 - t_{12})r} \right)^{-\sigma}.
\]

(13)

The size of outsourcing firms in a zero profit equilibrium is an increasing function of the magnitude of the after-tax fixed (capital) cost, \( \lambda f^O w_1 \) relative to variable (labor) costs of the input, \((1 - t_{12})r\).

The size of integrated firms relative to outsourcing firms is determined by the relative after-tax marginal costs of their inputs.

Equations (13) can be used to illustrate the effect of changes in the tax policy parameters on the output levels of \( X \) sector firms. A change in \( t_{12} \) will have no effect on equilibrium output of outsourcing firms, which reflects the full pass through of border adjustments to the costs of outsourcing firms. The higher prices of the products under destination-based taxation are offset by

\(^{16}\)There are three types of possible equilibria. If the fixed costs of forming a subsidiary are sufficiently high that \( \Pi^O = 0 > \Pi^I(\underline{a}) \), then all firms will outsource in a free entry equilibrium. If high productivity firms are sufficiently abundant that \( \Pi^I(a^*) > \Pi^O \), then all firms will be vertically integrated in equilibrium. Finally, there will be a mixed equilibrium with both outsourcing and integration if \( \Pi^I(a^*) = \Pi^O = 0 \) for \( a^* > \underline{a} \). Since outsourcing and integration typically coexist in manufacturing industries, we will focus on parameter values for which there is an interior equilibrium with both outsourcing and integration.
the increase in the wage so the equilibrium output level of these firms is unchanged from a change in the tax system. For integrated firms, the change from a source-based to a destination-based tax will raise (reduce) output if $\Gamma(a) < 0 (> 0)$. Thus, the output of integrated firms will rise if, and only if, transfer pricing is more profitable under a destination-based tax system. A reduction in $\lambda$, which allows firms to deduct more of their capital costs, will induce entry of outsourcing firms while having no effect on their output price. The resulting decline in $\kappa$ yields a smaller equilibrium firm size due to the incentive to substitute capital for labor in both outsourcing and integrated firms. We now turn to the effect of the tax policy parameters on the choice of an $X$ sector firm between integration and outsourcing. Substituting (12) and (13) into the expression for integrated firm profits yields

$$\Pi^I(a) = \frac{\lambda(1 - t_{12})}{1 - t_1} \left[ \frac{\Delta(a, t_{12}, t_2)}{(1 - t_{12})r} \right]^{1-\sigma} f^O - f_1 - f_2. \quad (14)$$

Evaluating the effect of the effect of a change in $t_{12}$ on profits yields the following result:

**Proposition 3** (a) If transfer price manipulation is not more profitable under source-based taxation than under destination-based taxation (i.e. $\Gamma(a) \leq 0$), the switch from source-based to destination-based taxation will raise the profit of an integrated firm.

(b) A necessary, but not sufficient, condition for the switch from a source-based to destination-based tax system to reduce the profit of an integrated firm is that transfer price manipulation be more profitable under the source-based system, $\Gamma(a) > 0$.

Proposition 3 shows that the effect of border adjustments on the profits of an integrated firm depend on the magnitude of the two pass through effects on costs identified in Lemma 1. Consider first the case in which transfer prices are equal to marginal costs, $\Gamma(a) = 0$, which results in full pass of the tax rate change to costs and prices in country 1 and no change in output levels. Firm revenues and variable cost will rise by a factor of $\frac{1}{1-t_1}$, but fixed costs will rise less than proportionally by Lemma 1 (b) if $f_2 > 0$. If $\Gamma(a) < 0$, the fixed cost advantage under a destination-based tax is reinforced by the fact that transfer price manipulation also leads to higher revenues under the destination-based tax (i.e. the bracketed term in (14) increases). Thus, $\Gamma(a) \leq 0$ is sufficient for profits to increase from the switch to a destination-based tax.
If $\Gamma(a) > 0$, there are two conflicting effects on profits from the switch to a destination-based tax. The reduction in $t_{12}$ will raise the after-tax marginal cost of the inputs from the subsidiary by Lemma 1, but will also reduce after-tax fixed costs in country 2 relative to those in country 1. Profits from integration will decrease if the former effect is sufficiently large, which requires $\Delta S(a) \leq (1 - t_1)^{\frac{\sigma}{\sigma - 1}} \Delta D(a)$.

Using (14), the identity of the marginal integrated firm is the solution to

$$\frac{\Delta(a, t_{12}, t_2)}{1 - t_{12}} = r \left( \frac{f_1 + f_2/(\lambda w_1)}{f^O} \right)^{\frac{1}{1 - \sigma}}. \quad (15)$$

The condition for the marginal integrated firm, (15), equates the relative saving in profits from the reduction in variable costs to the increase in fixed costs associated with organizing production in country 2. A reduction in the capital costs of integration relative to headquarter costs, $\frac{f_1 + f_2/(\lambda w_1)}{f^O}$, will make integration more attractive and result in an increase in $a^*$. Similarly, a reduction in $\frac{\Delta(a, t_{12}, t_2)}{1 - t_{12}}$ due to a reduction in the cost of transfer price manipulation will result in an increase in $a^*$.

Proposition 3 and the results on pass-through illustrate how the effect of a change in $t_{12}$ on resource allocation is affected by the existence of multinational activity. If all $X$ sector firms engage in outsourcing, then changes in $t_{12}$ will have no effect on resource allocation because relative prices will be unaffected in each country. When $X$ sector firms can invest in foreign countries, changes in $t_{12}$ can affect both relative prices of $X$ sector goods and the extent of integration activity. The resource allocation effects of a switch from a source-based to a destination-based tax results from differences in the profitability of transfer price manipulation under the two regimes, $\Gamma(a) \neq 0$, and from the presence of fixed costs of subsidiaries in country 2, $f_2 > 0$. We then have:

**Corollary 1** The only case in which the switch to a destination-based tax will have no impact on resource allocation with multinational activity is if there is no differential benefit from transfer price manipulation, $\Gamma(a) = 0$, and $f_2 = 0$.

We can also examine the impact of a switch from an income tax to a cash flow tax, which is captured by a reduction in $\lambda$. A reduction in $\lambda$ reduces the after-tax cost of capital to the firm,
which will result in a decline in the importance of fixed costs relative to variable costs. The following proposition summarizes the effect of a reduction in $\lambda$ on the aggregate output and composition of output in the $X$ sector.

**Proposition 4** A reduction in $\lambda$ will

(a) increase the consumption of $X$ in each country, where

$$X_j = \left(\frac{1-t_1}{\lambda f^O \sigma}\right)^{\frac{1}{\sigma-1}} \mu_j (\mu_1 + \mu_2)^{\frac{1}{\sigma-1}} \left(\frac{\sigma-1}{\sigma r}\right)^{\frac{1}{\sigma-1}} j = 1, 2,$$

(b) reduce the profits of integrated firms and reduce integrated firm output at both the intensive and extensive margins, and

(c) raise the measure of outsourcing firms, $N^O$, and reduce the output of outsourcing firms, where

$$N^O = \left(\frac{1-t_1}{\lambda f^O \sigma}\right) (\mu_1 + \mu_2) - \int_2^{\alpha^*} \left(\frac{(1-t_1) r}{\Delta}\right)^{\frac{1}{\sigma-1}} g(a) da.$$  

An increase in the deductibility of capital costs in country 1 reduces the cost of capital in country 1, which results in an expansion of the capital intensive $X$ sector output. A reduction in country 1 capital costs benefits outsourcing firms at the expense of integrated firms, because outsourcing firms incur a larger fraction of their capital costs in country 1 than do integrated firms. As a result, there is a shift in the composition of $X$ sector firms toward outsourcing firms. Part (b) shows that the reduction in fixed costs relative to variable costs from a reduction in $\lambda$ leads to a substitution of variety for output among outsourcing and integrated firms.

### 3.5 Changes in $t_1$

We conclude the comparative statics analysis of tax policy changes by establishing conditions under which a change in country 1’s tax rate, $t_1$, will be neutral. In the equilibrium solutions derived previously, country 1’s tax rate affects the equilibrium through its effect on the relative price of capital to labor, $\frac{\lambda}{1-t_1}$, the relative marginal cost of inputs to an integrated firm, $\frac{\Delta(a,t_1,t_12,t_2)}{1-t_12}$, and the cost of country 1 capital, $w_1 \lambda$. Since all of these margins are unaffected by a change in $t_1$ under DBCFT, we have the following result:
Proposition 5 A change in $t_1$ will have no effect on resource allocation if country 1 adopts DBCFT.

Since DBCFT has no effect on resource allocation, it will be a tax on pure profits. This result for unilateral adoption of DBCFT is similar to that obtained by Auerbach and Devereux (2018) for the case of multilateral adoption.

The neutrality result for $t_1$ does not extend to the case of SBCFT if transfer pricing is not prohibitively expensive, since $\frac{\Delta(a, t_1, t_2)}{1-t_1}$ is decreasing in $t_1$ due to the greater gain from transfer price manipulation. Under capital income taxes, neither DBT or SBT will be neutral because in both cases changes in $t_1$ will affect the relative cost of capital to labor, $\frac{\lambda}{1-t_1} = \frac{1}{1-t}$.

4 Country 1 Welfare

We now turn to an analysis of the effect of a change in the tax policy parameters, $\lambda$ and $t_{12}$, on national welfare of country 1. The indirect utility function of country 1 can then be written as

$$W_1(t_{12}, \lambda) = \mu_1 (\ln X_1(\lambda) - 1) + Z_1/q_1$$

(18)

where sector $X$ consumption in country 1, $X_1(\lambda)$, is defined by (16), and $Z_1$ is country 1 income.

Country 1 income consists of endowment income, tax revenues, and $X$ sector firm profit. Substituting the endowment market clearing condition into the expression for national income yields the following expression for real income of country 1 in terms of good $Y$,

$$\frac{Z_1}{q_1} = \frac{L_1 + \mu_1 + \mu_2 - (f^O + rm^O)N^O - (f_1 + f_2)G(a^*)}{\frac{a^*(t_{12}, \lambda)}{2}}$$

(19)

$$- \int_2^{a^*(t_{12}, \lambda)} \lambda(a, t_{12}) m^I(a) g(a) da$$

where $N^O$, the measure of outsourcing firms, is defined by (17), and $\hat{\Delta}(a, t_{12}) = (1-t_2)(a + \delta_2 C_2) + t_2 \rho^*(a) + \delta_1 C_1 = \Delta + t_{12}(\rho^* + \delta_1 C_1)$

(20)
denotes the pre-tax cost of inputs for integrated firm production. National income is equal to endowment income plus the difference between revenue from the sale of good $X$ and the pre-tax cost of inputs required to produce good $X$. We define the pre-tax cost of inputs to be the cost to country 1 as a whole of inputs, which is the cost of inputs before country 1 taxes but after any taxes paid to country 2.

Substituting for $N^0$ from (17) into (19) and using (13), we obtain

$$\frac{Z_1}{q_1} = L_1 + \frac{\mu_1 + \mu_2}{\sigma} \left( 1 - \frac{1 - t_1}{\lambda} \right) + f^O \left[ \int_{a^*}^{a^*} \left( \left( \frac{\Delta(a)}{(1 - t_{12})^r} \right)^{1-\sigma} - \frac{f_1 + f_2}{f^O} \right) g(a) da \right] + \left[ \int_{a}^{a^*} \left( \frac{\Delta(a)}{1 - t_{12}} - \hat{\Delta}(a) \right) m^I(a) g(a) da \right].$$

(21)

The first two terms in (21) represent the income that would be earned if all the output in sector $X$ was produced by outsourcing firms. The remaining two terms capture the cost savings realized by replacing some outsourcing firms with integrated firms whose productivity lies in the interval $[a, a^*]$.

The expression for national income in (21) can be used to identify three margins for firm decision making at which the difference between the firm’s cost of inputs and the pre-country 1 tax cost of inputs may affect resource allocation. Labor can be converted to capital at a physical cost of 1 labor per unit capital, but the after-tax cost of capital to the firms is $\lambda - t_1$ units of labor per unit capital. This differential is relevant to the equilibrium size of outsourcing firms, since the relative price of capital to labor affects the equilibrium output per firm, $m^O$. If $\frac{\lambda}{1 - t_1} > 1$, outsourcing firms will be too large because the relative private cost of capital exceeds the pre-tax cost. A second comparison is between the after-tax cost of capital in country 1, $\lambda w_1 = \lambda \frac{1 - t_{12}}{1 - t_1}$, compared with the after-tax cost of capital in country 2 to the firm, which is 1. The integration decision for the marginal firm in (15) depends on the after-tax fixed capital costs in the two countries, $f_1 + \frac{f_2}{\lambda w_1}$, whereas the pre-tax cost is $f_1 + f_2$. If $\lambda w_1 < 1$, the firm’s cost of integration is too low relative to the pre-tax costs which will lead to more than the income maximizing number of subsidiaries. Finally, the difference between the pre-tax cost of inputs to the integrated firm, $\hat{\Delta}(a)$, and the private cost, $\frac{\Delta(a)}{1 - t_{12}}$, affects both the intensive and extensive margin of production for the integrated firm.
firm. There will be more than the income-maximizing number of integrated firms and more than the income-maximizing output by each integrated firm when \( \frac{\Delta(a)}{1-t_1} < \hat{\Delta}(a) \).

DBCFT aligns the private cost of firms with the pre-tax cost at each of these margins, since \( \frac{\lambda}{1-t_1} = \frac{\lambda(1-t_{12})}{1-t_1} = 1 \) and \( \hat{\Delta}(a) = \frac{\Delta(a)}{1-t_{12}} \). This observation is related to the result of Proposition 5 that resource allocation is independent of \( t_1 \), because both indicate that firm decisions are not influenced by country 1’s tax rate. However, the fact that DBCFT gets each of these margins “right” does not necessarily mean that unilateral adoption of DBCFT will maximize national welfare. The reason is that tax policy also affects the variety of goods that are provided by the \( X \) sector and the terms at which country 1 trades the intermediate good and the final good with the foreign country. Since the aggregate output of the capital intensive \( X \) sector and the degree of product variety is affected by the relative price of labor to capital, tax policies that result in departures of the firm’s cost of inputs from their pre-tax values could be welfare improving for country 1.

To illustrate the role of the aggregate output of sector \( X \) on national welfare, we first examine the case where there are no integrated firms. This case eliminates substitution between integrated and outsourcing firms, so the welfare effects of tax policy changes result from changes in the aggregate output of \( X \). We then introduce integrated firms with simplifying assumptions that allow us to study the welfare effect of tax price changes operating through the fixed cost channels and transfer pricing channels. This approach allows us to identify how the role of transfer price manipulation and the importance of fixed capital costs of integrated firms in the host country affect the attractiveness of the various tax systems to country 1.

If all output is produced in outsourcing firms, it follows from Proposition 1 that changes in \( t_{12} \) will be be fully passed through to consumers and thus have no effect on resource allocation. Whether country 1 adopts a destination-based or sourced-based tax system would make no difference in this case. Using the equilibrium output of \( X \) from (16), national welfare of country 1 can be written as

\[
W_1 = \mu_1 \ln \frac{\lambda}{\sigma - 1} - \frac{\mu_1 + \mu_2}{\sigma} \left( 1 - \frac{1-t_1}{\lambda} \right) + A,
\]

(22)

where \( A \) consists of terms independent of \( \lambda \). Increases in \( \lambda \) results in a trade-off between price and product variety: the higher cost of capital results in a smaller measure of firms that produce at a
lower unit cost.

Solving for the optimal tax treatment of capital yields

\[
\frac{1 - t_1}{\lambda} = \left( \frac{\mu_1}{\mu_1 + \mu_2} \right) \left( \frac{\sigma}{\sigma - 1} \right)
\]

Welfare in (22) is quasi-concave in \( \lambda \), so the solution for \( \lambda \) in (23) will be unique and decreasing in the relative size of the domestic market, \( \frac{\mu_1}{\mu_1 + \mu_2} \). In a closed economy, which occurs with \( \mu_2 = 0 \), the optimal policy sets \( \frac{\lambda}{1 - t_1} = \frac{\sigma - 1}{\sigma} < 1 \). Since the pre-tax cost of capital is unity, the optimal policy requires a choice of \( \lambda \) that reduces the private cost of capital below its pre-tax cost. The monopoly markup in the \( X \) sector leads to less than the socially optimal output of good \( X \). A cash flow tax would be preferred to an income tax in this case, because the cash flow tax provides greater product variety and a value of \( \frac{1 - t_1}{\lambda} \) closer to the optimal value, \( \frac{\sigma}{\sigma - 1} \). Specifically, under an income tax we have \( \frac{1 - t_1}{\lambda} = 1 - t_1 < 1 < \frac{\sigma}{\sigma - 1} \). However, the cash flow tax would be dominated by a subsidy to capital that satisfies \( \frac{1 - t_1}{\lambda} = \frac{\sigma}{\sigma - 1} \).

In an open economy, increases in product variety spill over to benefit country 2. This is analogous to a deterioration in the terms of trade of country 1 when capital is subsidized, since the expanded product variety is a benefit to country 2. Note however that since goods prices are unaffected in country 2 by Proposition 1, the terms of trade effect operates through an increase in product variety rather than through a reduction in the price of exports. Whether a cash flow tax is preferred to an income tax in the open economy will depend on the relative size of the export market.

Note also that by constraining \( \frac{1 - t_1}{\lambda} = 1 \), a cash flow tax takes away the use of \( t_1 \) to influence the price of capital. However, in general, both \( \lambda \) and \( t_1 \) can be used to satisfy the optimal policy condition in (23).

Figure 1 illustrates the relationship between country 1’s share of world consumption of good \( X \) and its welfare gain from switching from a cash flow tax to an income tax under the assumption that \( \sigma = 4 \) and \( t_1 = 0.35 \). Country 1’s welfare gain is equal to 8.5% of the world consumption of good \( X \) from switching to an income tax if it does not consume any of good \( X \), while it loses 5.6% if it consumes all of good \( X \). For these parameter values, country 1 will prefer the cash flow tax if
its share of good X consumption exceeds 0.61.\footnote{Note that the difference in welfare between the income and cash flow taxes goes to 0 as $\sigma \to \infty$. This occurs because the share of capital costs in total costs is $\frac{\lambda w_1 f^{O}}{\lambda w_1 f^{O} + \gamma (1-t_1) m} = \frac{1}{\sigma}$, so that capital costs become irrelevant as $\sigma \to \infty$.}

Figure 1: The change in country 1 welfare as a share of worldwide expenditures on good X as a function of country 1’s share of good X consumption when $\sigma = 4$ and $t_1 = 0.35$.

We now turn to the question of how the presence of integrated firms affects the welfare of tax policy changes for country 1. We begin by assuming that transfer price manipulation is prohibitively costly, which occurs if $\alpha_1, \alpha_2 \to \infty$, and there are no fixed capital costs incurred in country 2 for integrated firms, $f_2 = 0$. These parameter values satisfy the conditions of Corollary 1, so that there is full pass through of costs to integrated firms. We refer to this as the benchmark case, and show that the outcome is the same as obtained in the case with no integrated firms.

**Proposition 6** (Benchmark Case) If transfer price manipulation is prohibitively costly and $f_2 = 0$, border adjustments will have no effect on resource allocation. Country 1 will be indifferent between SBT and SBCFT, and also between DBT and DBCFT. Country 1 will prefer income taxation to cash flow taxation when the export market is sufficiently large relative to the domestic market.

Under the benchmark assumptions, either DBCFT or SBCFT will be a tax on pure profits, and thus will not affect the firm’s choice of capital. Since $\frac{\lambda}{1-t_1} = 1$ under the cash flow tax, it results in the optimal capital tax policy only in the case where $\frac{\mu_1}{\mu_1+\mu_2} = \frac{\sigma-1}{\sigma}$. The cash flow tax prevents country 1 from using its domestic tax rate, $t_1$, to influence the output of good 1. In general, country 1 could do better than the cash flow tax by having the flexibility to choose values of $\lambda$ and $t_1$ to satisfy (23).
Border adjustments are neutral in the benchmark case, so the only issue is whether to adopt an income tax or a cash flow tax. The benchmark case shuts off the two channels by which tax policy affects the choice between integration and outsourcing, transfer price manipulation and fixed costs in country 2. We now consider how introducing each of these channels in turn affects the ranking of unilateral country 1 tax policies.

4.1 Selection Effects from Capital Costs

To illustrate the role of fixed capital costs in country 2, we consider the effect of modifying the level of changes in $f_2$ while holding the pre-tax cost the firm’s fixed investments required for integration constant at $f_1 + f_2 = \bar{f}$. We hold the total fixed costs of integration constant so that the effect of increasing $f_2$ has the effect of increasing the share of fixed costs that are incurred in country 2. We maintain the assumptions that $\alpha_1, \alpha_2 \to \infty$ so that transfer price manipulation is prohibitively expensive and $\Gamma(a) = 0$.

The after-tax fixed cost of an integrated firm can be written as $w_1 \lambda (\bar{f} - f_2) + f_2$, so that increases in $f_2$ will make integration more attractive to an $X$ sector firm if the after-tax cost of capital is lower in country 2, $w_1 \lambda > 1$. Differentiating condition (15) for the marginal integrated firm yields

$$\frac{\partial a^*}{\partial f_2} = \frac{a^*}{\sigma - 1} \frac{1}{\bar{f} - f_2} + \frac{(1-t_1)\lambda}{\lambda(1-t_{12})} \left( \frac{1}{\lambda w_1} - 1 \right).$$

An increase in the share of fixed costs of integration that are incurred in country 2 reduces $a^*$ if, and only if, $\lambda w_1 < 1$.

How does the change in the extensive margin of integrated firms affect the welfare of country 1? First consider the case of a cash flow tax. Under DBCFT, the after-tax cost of capital at home is $w_1 \lambda = 1$, which is equal to the pre-tax cost. A switch to SBCFT will result in $\lambda w_1 = \frac{1}{1-t_1} > 1$, which causes an increase in $a^*$ by (24). This increase in the extensive margin of integrated firms reduces $Z_1/q_1$ because firms are making a choice of organizational form based on a cost of country 1 capital that is below the pre-tax cost. Proposition 1 established that DBCFT and SBCFT provide...
equal welfare with \( f_2 = 0 \), so with \( f_2 > 0 \) DBCFT must be preferred to SBCFT.

For an income tax, on the other hand, we have \( \lambda w_1 = 1 \) in the case of SBT. A switch to DBT will result in \( \lambda w_1 = 1 - t_1 < 1 \) and a reduction in \( a^* \) by (24). This reduction in \( a^* \) reduces \( Z_1/q_1 \) because the cost of country 1 capital to the firm is below the pre-tax cost, so \( X \) sector firms over-invest in country 1 relative to the welfare maximizing level. Proposition 1 established that DBT and SBT provide equal welfare with \( f_2 = 0 \), so with \( f_2 > 0 \) SBT must be preferred to DBT.

The next proposition summarizes these results.

**Proposition 7** Assume the costs of transfer pricing are prohibitive for \( X \) sector firms to engage in income shifting and consider an increase in \( f_2 \) holding \( f_1 + f_2 \) constant.

(a) Under cash flow taxation, country 1 welfare is unchanged if \( t_{12} = 0 \) and it decreases for all \( t_{12} > 0 \). Country 1 strictly prefers DBCFT to SBCFT.

(b) Under income taxation, country 1 welfare is unchanged if \( t_{12} = t_1 \) and it decreases for all \( t_{12} < t_1 \). Country 1 strictly prefers SBT to DBT.

These results are illustrated in the two graphs in Figure 2. Whether the optimal tax policy is SBT or DBCFT will be determined by the ranking in the benchmark case.

![Figure 2](image)

Figure 2: Country 1 welfare as a function of \( t_{12} \) under cash flow taxation and income taxation with no transfer pricing comparing \( f_2 = 0 \) (no selection) with \( f_2 > 0 \) (selection) when \( r = 1, c = f_1 = 1, t_1 = 0.35, \sigma = 4, \) and \( \mu_1 = \mu_2 = 1 \). Firm productivity, \( 1/a \), is distributed according to a Type II Pareto distribution on \([0.2, 2]\).
4.2 Transfer Pricing Effects

We now examine how transfer price manipulation influences the welfare effects of tax policy changes. We allow for firms to manipulate transfer prices by assuming $\alpha_1, \alpha_2 < \infty$, but set $f_2 = 0$ to neutralize the fixed capital cost effect analyzed in the previous section. The effect of transfer pricing on the efficiency of firm selection decisions will depend on the direction of the income shifting. When $t_{12} > t_2$, the firm uses transfer pricing to shift income out of country 1, resulting in $\frac{\Delta(a)}{1-t_{12}} < \hat{\Delta}$. If $t_{12} < t_2$, the firm uses transfer pricing to shift income into country 1, yielding $\frac{\Delta(a)}{1-t_{12}} \geq \hat{\Delta}$ with strict equality for $t_{12} = 0$. When $t_{12} = 0$, the firm’s cost of inputs coincides with the pre-tax cost because the firm cannot deduct imports from taxable income. If $t_2 > t_{12} > 0$, the integrated firm’s cost of inputs is less than the cost to country 1 because it does not take into account the government’s loss of tax revenue from the partial deductibility of imported inputs.

Under these assumptions, we can use the comparative static effect of a change in $\alpha_i$ to capture the effect of transfer pricing by integrated firms on national welfare. We can also examine the optimal choice of $t_{12}$ under income taxation and cash flow taxation.

Proposition 8 Assume $f_2 = 0$ and $\alpha_1, \alpha_2 < \infty$, so that transfer price manipulation is not prohibitively expensive for X sector firms.

(a) Under income and cash flow taxation, a decrease in $\alpha_1$ decreases country 1 welfare when $t_{12} > t_2$ and a decrease in $\alpha_2$ increases country 1 welfare when $t_{12} < t_2$.

(b) Under cash flow taxation, country 1 prefers full border adjustment to partial border adjustment with any $t_{12} > 0$.

(c) Under income taxation, country 1 strictly prefers partial border adjustment to full border adjustment.

Part (a) establishes the intuitive result that lowering the cost to an integrated firm of using transfer pricing to shift income between countries is welfare reducing for country 1 when income is being shifted out of the country, but is welfare increasing when transfer pricing is being used to shift income into country 1. A similar line of reasoning applies to (b), which shows that country 1 prefers destination-based taxation to source-based taxation when it adopts cash flow taxation.
Source-based taxation is costly to country 1 because integrated firms use costly methods to transfer income to country 2 in order to reduce their tax burden.

In contrast, part (c) shows that if country 1 adopts an income tax on capital it is not optimal to use a full border adjustment. This incentive to choose a $t_{12} > 0$ arises under income taxation because an increase in $t_{12}$ just above zero collects some tax revenues from export income while having no first-order effect on the pre-tax marginal cost of integrated firm production. It also raises the possibility that income taxation with a partial border adjustment can be the optimal policy for country 1 even if the cash flow tax is preferred to the income tax when there is full border adjustment. Figure 3 illustrates a case in which the optimal policy is an income tax with partial border adjustment, with the further observation that the cash flow tax yields higher welfare at both $t_{12} = 0$ and $t_{12} = 1$. This case illustrates the importance of considering partial border adjustments.

Combining this result with Proposition 7 (b), we see that both the transfer pricing effect and the capital cost effect make the use of a destination-based tax system more attractive when country 1 chooses a cash flow tax. DBCFT has the advantage over SBCFT in that it equates the private and pre-tax costs for both the transfer pricing and fixed cost channels. In particular, the welfare of country 1 is decreasing in $t_{12}$ for both channels. For the case of an income tax, DBT is dominated by SBT for the fixed cost channel because SBT equates private and pre-tax costs. The full border adjustment of DBT is also dominated by partial border adjustment for the transfer pricing channel. However, DBT could still be preferred to SBT when the resource loss from transfer pricing is large at $t_{12} = t_1$. Thus, for the income tax, whether SBT is preferred to DBT will depend on the relative importance of the transfer price effect to the fixed capital cost effect.

5 Country 2 Welfare

We conclude our analysis with a brief discussion of how changes in country 1 tax policy will affect country 2. National welfare of country 2 is $W_2 = \mu_2 (\ln X_2 - 1) + Z_2$, where $Z_2$ is country 2 income measured in terms of the numeraire (labor in 2). Assuming that the producers of good $M$ in country 2 are competitive firms selling at marginal cost, country 2’s income is the sum of labor income and
Figure 3: Country 1 welfare as a function of $t_{12}$ under cash flow and income taxation with transfer pricing and $f_2 = 0$ when $c = f_1 = 1$, $t_1 = 0.35$, $\sigma = 4$, and $\mu_1 = 1$. $\mu_2$ is set equal to 0.641 so that at $t_{12} = 0$ welfare under cash flow taxation is slightly larger than under income taxation. Firm productivity, $1/a$, is distributed according to a Type II Pareto distribution on $[0, 2]$. Tax revenues from outsourcing firms,

$$Z_2 = L_2 + t_2 \int_{a}^{a^*} (\rho^* - a - \delta_2 C_2)m^I(a)g(a)da.$$ (25)

Changes in country 1 tax policy affect country 2 welfare through two channels: a consumption effect and a tax revenue effect.$^{19}$ In any case where transfer price manipulation is prohibitively costly, tax revenue will be zero and country 2 welfare depends only on the consumption effect. Therefore, we divide the analysis of the spillover effect of country 1 tax policy on country 2 into 2 cases, depending on whether integrated firms engage in transfer price manipulation.

**Proposition 9**

(a) If transfer price manipulation is prohibitively costly, country 2 welfare is decreasing in $\lambda$ and independent of $t_{12}$.

(b) If firms engage in transfer price manipulation, country 2 welfare is increasing in $t_{12}$. Increases in $\lambda$ will harm country 2 if $t_{12} \leq t_2$, but will have an ambiguous effect on welfare for $t_{12} > t_2$.

Part (a) of Proposition 9 shows that if transfer price manipulation is prohibitively expensive, then country 2 is indifferent between country 1 adopting DBCFT and SBCFT and between DBT and SBT. Country 2 prefers the cash flow tax to the income tax in country 1 because of the favorable

$^{19}$If the producers of $M$ in country 2 have some market power so that price exceeds marginal cost, there will also be a profit-shifting effect. Increases in the output of $M$ by integrated firms will reduce profits of unrelated country 2 firms, which has a negative effect on country 2 welfare. We abstract from that result to simplify the welfare discussion.
effect of the cash flow tax on the output of $X$.\footnote{The welfare expression in (25) implies that for $t_{12} < t_2$, the tax revenue of the government from subsidiaries of integrated firms is negative. It can be shown that if we define an arm’s length price that includes a markup above marginal cost to ensure positive tax payments, part (a) of Proposition 9 continues to hold. Part (b) is modified to reflect the fact that the reduction in the number of integrated firms resulting from an increase in $\lambda$ will raise, rather than reduce, tax revenue.}

Part (b) establishes that when integrated firms find it profitable to manipulate transfer prices, country 2 prefers country 1 adopt SBCFT to DBCFT and prefers SBT to DBT because of the favorable tax revenue effects that arise when country 1 raises $t_{12}$. An increase in $\lambda$ will have the effect of expanding the number of integrated firms and raising their output, which harms country 2 when the transfer price is below marginal cost but helps it when the transfer price is above marginal cost. Thus, country 2 prefers that country 1 use DBCFT to DBT. Whether the best country 1 policy for country 2 is SBT or SBCFT depends on the relative magnitude of consumption effects and the tax revenue effects.

One question that has been raised is whether the unilateral adoption of DBCFT by country 1 would induce country 2 to respond by also changing its tax policy to DBCFT. A full treatment of this question requires analysis of the equilibrium of a non-cooperative game, which is beyond the scope of this paper. However, we can address a simpler question. Suppose that country 1 adopts DBCFT. What would be the best choice of tax policy (destination- vs. source-based and cash flow vs. income tax) for country 2?

To address this question, we let country 2 choose the tax rate on export sales of the integrated firm, $t_{21}$ and the after-tax cost of capital to the subsidiary of integrated firms, $\lambda_2$. The income of country 2 in this case will be

$$Z_2 = L_2 + \int_{a_2}^{a^*} \left( t_{21}(\rho^* - a - \delta_2 C_2)m^I(a) - (1 - \lambda_2)f_2 \right) g(a) da. \quad (26)$$

The key difference between (25) and (26) is that the reduction of $\lambda_2$ below 1 results in a loss of tax revenue on the capital invested by subsidiaries of integrated firms in country 2.

We obtain the following result from differentiation of (26):

**Proposition 10** Suppose that country 1 adopts DBCFT, so that $t_{12} = 0$ and $\lambda = 1 - t_1$.

(a) Welfare of country 2 is decreasing in $t_{21}$. 

\footnote{The welfare expression in (25) implies that for $t_{12} < t_2$, the tax revenue of the government from subsidiaries of integrated firms is negative. It can be shown that if we define an arm’s length price that includes a markup above marginal cost to ensure positive tax payments, part (a) of Proposition 9 continues to hold. Part (b) is modified to reflect the fact that the reduction in the number of integrated firms resulting from an increase in $\lambda$ will raise, rather than reduce, tax revenue.}
If country 1 adopts DBCFT, country 2 has an incentive to adopt a destination-based tax to avoid the loss of tax revenue resulting from the underpricing of export sales that exists under a source-based tax. However, country 2 does not have an incentive to adopt a cash flow tax because it will lose revenue that it collects from the capital invested in North subsidiaries.

6 Conclusion

In this paper, we have focused on the economic effects that arise when a country unilaterally adopts destination-based and/or cash flow taxes in an economy in which intermediate goods are sourced from a country that employs a traditional source-based income tax. We have analyzed a North-South type model because we think it captures the concerns of U.S. firms with extensive supply chains located outside the United States, who led the main opposition to the DBCFT proposals during the 2017 tax reform debates. Our model also uses a well-known trade model, which allows us to embed an analysis of tax policy into a model that permits selection and transfer price effects. To the best of our knowledge, our paper is the first to add to the analysis of corporate tax policies the role of heterogeneous firms, selection effects on organization form, and transfer pricing.

In the absence of multinational firms, border adjustments are neutral. When multinational activity exists, we have highlighted two channels through which the border adjustments can affect the firm’s integration decision: the potential for income shifting through manipulation of transfer prices and the change in relative price of fixed investments in the host country market. We showed that the change in the relative price of fixed capital investments under a border adjustment induces more integration, while net gains from manipulating transfer prices may either rise or fall under a destination-based tax. Unilateral adoption of destination-based corporate income taxes does not eliminate transfer price manipulation, but rather reverses the direction of transfer price manipulation. Whether this reversal leads to higher profits under a destination-based tax depends on the level of tax rates and the strictness of enforcement of transfer pricing in the respective countries.

We have also examined how the resource reallocation resulting from a unilateral tax rate change affects welfare through its impact on the country’s terms of trade as well as on the efficiency of
internal resource allocation. Because DBCFT aligns the firm’s cost of inputs with the pre-tax cost of inputs, it leads to higher welfare than SBCFT on the effects rising both from transfer price manipulation and fixed capital costs. Under SBCFT, the firm has an incentive to transfer income to the low tax country, which is costly to the higher tax country due to the loss of tax revenue and the use of resources to avoid taxation.

While DBCFT leads to an efficient allocation of resources internally, it may be dominated by a regime with a tax or subsidy on capital income in order to influence the output of the X sector. An increase in the output of the X sector benefits consumers in country 1 by expanding output of the imperfectly competitive X sector, but it also worsens the terms of trade on exports of X. If the volume of exports is sufficiently large, the latter effect will dominate and a tax on capital income will be desirable. In the absence of transfer price manipulation, a source-based tax is the preferred method for a capital income tax. SBT aligns the private costs of capital investments in country 1 with the cost in country 2 for integrated firms, resulting in a more efficient selection of firms into integration than under DBT. However, SBT will be unattractive if the losses from transfer price manipulation are significant, and a partial border adjustment may be the preferred option in that case.

We have also shown that unilateral adoption of DBCFT by the high tax country will not lead to an incentive for the low tax country to adopt DBCFT. The low tax country will want to use a destination-based policy to avoid the loss of tax revenue, but it will prefer an income tax over a cash flow tax in order to tax the economic rents of the foreign subsidiaries.

Our results have shown that the net effect of unilateral adoption of destination-based taxes can result in either higher or lower country welfare, which means the welfare benefits attributed in the literature to destination-based cash flow taxation under multilateral adoption need not extend to the case of unilateral adoption. Our analysis has focused on the effect of tax policy on the choice of organizational form where firms can engage in vertical foreign direct investment. In subsequent work, we plan on examining the general equilibrium and welfare effects of corporate tax policy in a North-North model in which the location of intermediate good production is also endogenous.
Appendix: Proofs

Proof of Proposition 1: Choosing \( m^O \) to maximize (3) yields

\[
m^O = \left[ \frac{\kappa}{1 - t_{12}} \frac{\sigma - 1}{\sigma r} \right]^\sigma.
\] (27)

Substituting (27) into (5) yields

\[
x_j^O = (1 - t_{1j})^\sigma (q_j \mu_j)^\sigma X_j^{1-\sigma} \left[ \frac{\sigma - 1}{(1 - t_{12}) \sigma r} \right]^\sigma.
\]

Using the fact that \( P_j X_j = q_j \mu_j \) in the demand function (1), we have

\[
x_j^O = \left( \frac{q_j \mu_j}{p_j^O} \right)^\sigma X_j^{1-\sigma}.
\]

Combining these two results yields the profit-maximizing prices in the respective markets.

Proof of Proposition 2: The solution for \( m^I \) is obtained by inverting the necessary condition for choice of \( m \) from (7). The argument then proceeds as in Proposition 1. To obtain \( x_j^I \) substitute \( m^I \) into (5). Combining this with \( x_j^I = \left( \frac{\mu_j}{p_j^I} \right)^\sigma X_j^{1-\sigma} \) from the expenditure relationship yields the solution for \( p_j^I \).

Proof of Proposition 3: For source-based taxation (with either income or cash flow taxation), integrated firm profit becomes

\[
\Pi^{IS}(a) = \lambda f^O \left( \frac{\Delta^S(a)}{1 - t_1} \right)^{1-\sigma} r^{\sigma-1} - \lambda f_1 - f_2.
\]

For destination-based taxation,

\[
\Pi^{ID}(a) = \frac{1}{1 - t_1} \left[ \lambda f^O \Delta^D(a)^{1-\sigma} r^{\sigma-1} - \lambda f_1 \right] - f_2.
\]

(a) Suppose \( \Delta^D(a) \leq \frac{\Delta^S(a)}{1 - t_1} \). Since integrated firm profit is decreasing in \( \Delta(a) \), we have

\[
\Pi^{ID}(a) \geq \frac{1}{1 - t_1} \left[ \lambda f^O \left( \frac{\Delta^S(a)}{1 - t_1} \right)^{1-\sigma} r^{\sigma-1} - \lambda f_1 \right] - f_2 = \frac{\Pi^{IS}(a)}{1 - t_1} + \frac{t_1 f_2}{1 - t_1} > \Pi^{IS}.
\]
This is a sufficient condition for integration to be more attractive under destination-based taxation, and for the extensive margin of integration to be expanded when it holds at $a^* S$.

(b) Next suppose $\Delta D(a) \geq \Delta S(a) (1 - t_1)^{\frac{\sigma}{1 - \sigma}}$, which is equivalent to $\Delta D(a)(1 - t_1)^{\frac{1}{1 - t_1}} \geq \Delta S(a)$. Substituting into the expression for integrated firm profits under source-based taxation yields

$$\Pi^{IS}(a) \geq \frac{\lambda f^O}{1 - t_1} \Delta D(a)^{1 - \sigma} r^{\sigma - 1} - \lambda f_1 - f_2 = \Pi^{ID}(a) + \frac{t_1 \lambda(c + f_1)}{1 - t_1}.$$

This is a sufficient condition for integration to be more attractive under source-based taxation, and for the extensive margin of integration to be reduced when it applies at $a^* D$.

**Proof of Proposition 4:**

(a) The share of output allocated to the respective markets will be the same for all $X$ sector firms, so $X_2 = \frac{\mu_2 X_1}{\mu_1}$. Substituting this result into the definition of $\kappa$ and using (12) yields the aggregate equilibrium output levels for each market in (16).

(b) We have from (13) that $m^I(a)$ is homogeneous of degree 1 in $\lambda$. The right hand side of (15) is increasing in $\lambda$, so an increase in $\lambda$ requires an increase in $a^*$ to restore equality. Therefore, both the extensive and intensive margins of integrated firms will be decline when $\lambda$ decreases.

(c) The output of outsourcing firms is homogeneous of degree 1 in $\lambda$ from (13). To solve for the measure of outsourcing firms, observe that we can use (16) and the allocation of output across markets given by (5) to obtain

$$X_1 + X_2 = \left[N^O(m^O)^{(\sigma - 1)/\sigma} + \int_{2}^{a^*} (m^I(a))^{(\sigma - 1)/\sigma} g(a) da\right]^{\sigma/(\sigma - 1)}.$$

Substituting for $X_1 + X_2$ and using $X_2 = \frac{\mu_2 X_1}{\mu_1}$ yields (17). $N^O$ will be decreasing in $\lambda$ because the first term in (17) is decreasing in $\lambda$ and $a^*$ is increasing in $\lambda$ by (b).

**Proof of Proposition 5:**

Neutrality of changes in $t_1$ requires that $a^*, m^I(a), m^O$ and $X_j$ be unaffected by changes in $t_1$, since it ensures the intensive and extensive margins of outsourcing and integration are unaffected. By (13) and (16), $m^O$ and $X_j$ will be independent of $t_1$ if, and only if, $\lambda = 1 - t_1$. For $m^I(a)$ to be independent of $t_1$ also requires $\frac{\Delta(a,t_1,t_2)}{1 - t_{12}}$ to be independent of $t_1$, which will be satisfied for
Finally, for $a^*$ to be independent of $t_1$ also requires $\lambda w_1$ to be independent of $t_1$ from (15). These 3 conditions will be satisfied if, and only if, $\lambda = 1 - t_1$ and $t_{12} = 0$.

**Proof of Proposition 6:**

The assumption that $\alpha_1, \alpha_2 \to \infty$ ensures that $\Delta(a) = a(1 - t_{12})$ and hence $\Gamma(a) = 0$ for all $a$. It then follows from Proposition 2 and (13) that relative prices and outputs of integrated firms are unaffected by changes in $t_{12}$. From (15), the condition for the marginal integrated firm in this case will be $a^* = \frac{f_1}{f_1 \alpha}$. Since the solution for $a^*$ is independent of $t_{12}$ and $\lambda$, tax policy changes will not affect the intensive margin or extensive margin of integrated firms. The optimal choice of $\lambda$ will be given by (23).

Evaluating the change in welfare as a share of expenditure on good $X$ due to the switch from a cash flow tax to an income tax in the benchmark case yields

$$
\frac{W(t_1, 1) - W(t_1, 1 - t_1)}{\mu_1 + \mu_2} = \frac{\mu_1 \ln(1 - t_1)}{\mu_1 + \mu_2} + \frac{t_1}{\sigma},
$$

which is equivalent to that use for Figure 1.

**Proof of Proposition 7:**

Differentiating (21) with respect to $f_2$ holding $\bar{f} = f_1 + f_2$ constant, and using (13) implies that

$$
\frac{\partial Z_1/q_1}{\partial f_2} \bigg|_{\bar{f}} = \left[ f_2 \left( \frac{r}{a^*} \right)^{\sigma - 1} - \bar{f} \right] g(a^*) \frac{\partial a^*}{\partial f_2}.
$$

Using the formula for $a^*$ from (15) to substitute for $r/a^*$ implies that (29) simplifies to

$$
\frac{\partial Z_1/q_1}{\partial f_2} \bigg|_{\bar{f}} = - \left( \frac{a^*}{\sigma - 1} \right) \frac{f_2}{\bar{f} + \left( \frac{1 - t_1}{\lambda(1 - t_{12})} - 1 \right)} \left( \frac{1 - t_1}{\lambda(1 - t_{12})} - 1 \right)^2.
$$

With cash flow taxation, (30) is negative for all $f_2 > 0$ and all $t_{12} > 0$. It is zero if $f_2 = 0$ or if $t_{12} = 0$. This means country 1 welfare under DBCFT is unchanged by shifting some fixed costs to country 2 while it declines for any positive value of $t_{12}$. Thus, with $f_2 > 0$ while holding $f_1 + f_2$ constant, country 1 will prefer DBCFT over SBCFT. With income taxation, (30) is negative for all $f_2 > 0$ and all $t_{12} < t_1$. It is zero if $f_2 = 0$ or $t_{12} = t_1$. This means country 1 welfare under SBT is unchanged by shifting some fixed costs to country 2 while it declines for any $t_{12} < t_1$. Thus, with
Proof of Proposition 8:

Preliminaries. First, to simplify some of the expressions, define $\alpha = \alpha_1$ when $t_{12} > t_2$ and define $\alpha = \alpha_2$ when $t_{12} < t_2$. Any derivative with respect to $\alpha$ will be understood to denote a derivative with respect to either $\alpha_1$ or $\alpha_2$, depending on which transfer price cost parameter is operative given $t_{12}$ and $t_2$. Second, direct calculation shows that $\hat{\Delta}(a) > \Delta(a)/(1 - t_{12})$ for $t_{12} > t_2$ and $\hat{\Delta}(a) \leq \Delta(a)/(1 - t_{12})$ for $t_{12} < t_2$ with equality for $t_{12} = 0$. Third, when $t_{12} = t_2$, $W_1$ is unaffected by a change in $\alpha$. Fourth, given (21) and using the definition of $a^*$ from (15) to substitute out $c + f_1$, with transfer pricing but $f_2 = 0$ yields

$$W_1 = \mu_1 \ln X_1 - 1 + L_1 + \frac{\mu_1 + \mu_2}{\sigma} \left(1 - \frac{1 - t_1}{\lambda}\right)$$

$$+ f^O \int_a^{a^*} \left[\left(\frac{1 - t_{12}}{\Delta(a)}\right)^{\sigma - 1} - \left(\frac{1 - t_{12}}{\hat{\Delta}(a)}\right)^{\sigma - 1}\right] g(a) da$$

$$+ \frac{\lambda f^O (\sigma - 1)}{1 - t_1} \int_a^{a^*} \left(\frac{1 - t_{12}}{\Delta(a)}\right)^{\sigma - 1} \left[1 - \frac{(1 - t_{12})\hat{\Delta}(a)}{\Delta(a)}\right] g(a) da. \quad (31)$$

Proof of part (a). We need to consider separately the cases of $t_{12} > t_2$ and $t_{12} < t_2$. For $t_{12} > t_2$,

$$\frac{\partial W_1}{\partial \alpha} = f^O \int_a^{a^*} (\sigma - 1) \left(\frac{1 - t_{12}}{\Delta(a)}\right)^{\sigma - 2} \frac{\partial}{\partial \alpha} \left(\frac{1 - t_{12}}{\Delta(a)}\right) g(a) da$$

$$+ \frac{\lambda (\sigma - 1) f^O}{1 - t_1} \int_a^{a^*} (\sigma - 1) \left(\frac{1 - t_{12}}{\Delta(a)}\right)^{\sigma - 2} \frac{\partial}{\partial \alpha} \left(\frac{1 - t_{12}}{\Delta(a)}\right) \left[1 - \frac{(1 - t_{12})\hat{\Delta}(a)}{\Delta(a)}\right] g(a) da$$

$$- \frac{\lambda (\sigma - 1) f^O}{1 - t_1} \int_a^{a^*} \left[\left(\frac{1 - t_{12}}{\Delta(a)}\right)^{\sigma - 2} \frac{(1 - t_{12})\hat{\Delta}(a)}{\Delta(a)} \frac{\partial}{\partial \alpha} \left(\frac{1 - t_{12}}{\Delta(a)}\right) + \left(\frac{1 - t_{12}}{\Delta(a)}\right)^{\sigma - 1} \frac{\partial}{\partial \alpha} \frac{\Delta(a)}{r}\right] g(a) da$$

$$+ \frac{\lambda (\sigma - 1) f^O}{1 - t_1} \left(\frac{1 - t_{12}}{\Delta(a^*)}\right)^{\sigma - 1} \left[1 - \frac{(1 - t_{12})\hat{\Delta}(a^*)}{\Delta(a^*)}\right] g(a^*) \frac{\partial a^*}{\partial \alpha} \quad (32)$$
Because $\hat{\Delta}(a) > \Delta(a)/(1 - t_{12})$ for $t_{12} > t_2$,

\[
\frac{\partial W_1}{\partial \alpha} > f^O(\sigma - 1) \left( 1 - \frac{\lambda}{1 - t_1} \right) \int_a^{a^*} \left( \frac{1 - t_{12}}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial \alpha} \left( \frac{1 - t_{12}}{\Delta(a)} \right) g(a) da + \frac{\lambda(\sigma - 1)f^O}{1 - t_1} \int_a^{a^*} (\sigma - 1) \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial \alpha} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right) \left[ 1 - \frac{(1 - t_{12})\hat{\Delta}(a)}{\Delta(a)} \right] g(a) da
\]

\[
- \frac{\lambda(\sigma - 1)f^O}{1 - t_1} \int_a^{a^*} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 1} \left[ 1 - \frac{(1 - t_{12})\hat{\Delta}(a^*)}{\Delta(a)} \right] g(a^*) \frac{\partial a^*}{\partial \alpha} > 0.
\]

Line 1 in (33) between the inequalities is non-negative and the other lines are strictly positive because $\Delta(a)$ is increasing in $\alpha$, $\hat{\Delta}(a)$ is decreasing in $\alpha$ (with $t_{12} > t_2$), and $a^*$ is decreasing in $\alpha$. Thus, the entire expression is strictly positive for $t_{12} > t_2$ so a lower cost of transfer pricing lowers country 1 welfare.

Next, we analyze the case in which $t_{12} < t_2$. Because $\hat{\Delta}(a) \leq \Delta(a)/(1 - t_{12})$ for $t_{12} < t_2$ and $\Delta(a) - \hat{\Delta}(a)(1 - t_{12})$ is non-negative and independent of $a$, one can write (31) as

\[
W_1 = \mu_1(\ln X_1 - 1) + L_1 + \frac{\mu_1 + \mu_2}{\sigma} \left( 1 - \frac{1 - t_1}{\lambda} \right)
\]

\[
+ f^O \int_a^{a^*} \left[ \left( \frac{1 - t_{12}}{\Delta(a)} \right)^{\sigma - 1} - \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 1} \right] g(a) da + \frac{\lambda f^O(\sigma - 1)}{1 - t_1} \left( \frac{\Delta(a) - \hat{\Delta}(a)(1 - t_{12})}{(1 - t_{12})r} \right) \int_a^{a^*} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma} g(a) da.
\]

Differentiating (34) with respect to $\alpha$ then implies that

\[
\frac{\partial W_1}{\partial \alpha} = f^O \int_a^{a^*} (\sigma - 1) \left( \frac{1 - t_{12}}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial \alpha} \left( \frac{1 - t_{12}}{\Delta(a)} \right) g(a) da
\]

\[
+ \frac{\lambda(\sigma - 1)f^O}{1 - t_1} \frac{\partial}{\partial \alpha} \left( \frac{\Delta(a) - \hat{\Delta}(a)(1 - t_{12})}{(1 - t_{12})r} \right) \int_a^{a^*} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma} g(a) da
\]

\[
+ \lambda(\sigma - 1)f^O \int_a^{a^*} \sigma \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 1} \frac{\partial}{\partial \alpha} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right) g(a) da
\]

\[
+ \frac{\lambda(\sigma - 1)f^O}{1 - t_1} \left( \frac{(1 - t_{12})r}{\Delta(a^*)} \right)^{\sigma} g(a^*) \frac{\partial a^*}{\partial \alpha}.
\]

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The first line in (35) is negative because $\Delta(a)$ is increasing in $\alpha$ and the second is negative because $\Delta(a) - \hat{\Delta}(a)(1 - t_{12})$ is strictly decreasing in $\alpha$. The remaining lines are non-positive because $\Delta(a) \geq \hat{\Delta}(a)(1 - t_{12})$ and $a^*$ is strictly decreasing in $\alpha$. Thus, a lower cost of transfer pricing increases country 1 welfare.

Proof of parts (b) and (c). Differentiating $W_1$ with respect to $t_{12}$ and noting that $d((1 - t_{12})/\Delta(a^*))/dt_{12} = 0$ when $f_2 = 0$ yields

$$\frac{\partial W_1}{\partial t_{12}} = f^O \int_a^{a^*} (\sigma - 1) \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial t_{12}} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right) g(a) da$$

$$+ \frac{\lambda f^O(\sigma - 1)}{1 - t_1} \int_a^{a^*} (\sigma - 1) \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial t_{12}} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right) \left[ 1 - \frac{\hat{\Delta}(a)(1 - t_{12})}{\Delta(a)} \right]$$

$$- \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 1} \frac{\partial}{\partial t_{12}} \left( \frac{(1 - t_{12})\hat{\Delta}(a)}{\Delta(a)} \right) g(a) da$$

$$+ \frac{\lambda f^O(\sigma - 1)}{1 - t_1} \left( \frac{(1 - t_{12})r}{\Delta(a^*)} \right)^{\sigma - 1} \left[ 1 - \frac{\hat{\Delta}(a^*)(1 - t_{12})}{\Delta(a^*)} \right] g(a^*) \frac{\partial a^*}{\partial t_{12}}.$$  

(36)

At $t_{12} = 0$, $\hat{\Delta}(a) = \Delta(a)/(1 - t_{12})$ and $\partial \hat{\Delta}(a)/\partial t_{12} = 0$ for all $a$ so

$$\frac{\partial W_1}{\partial t_{12}} \bigg|_{t_{12}=0} = f^O(\sigma - 1) \left( 1 - \frac{\lambda}{1 - t_1} \right) \int_a^{a^*} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial t_{12}} \left( \frac{(1 - t_{12})r}{\Delta(a)} \right) g(a) da. \quad (37)$$

To evaluate the sign of (37), note that for $t_{12} < t_2$,

$$\frac{\partial}{\partial t_{12}} \left( \frac{\Delta(a)}{1 - t_{12}} \right) = -\frac{(t_{12} - t_2)(2 - t_{12} - t_2)}{4 \alpha_2 (1 - t_2)(1 - t_{12})^2} > 0 \quad (38)$$

so

$$\frac{\partial}{\partial t_{12}} \left( \frac{1 - t_{12}}{\Delta} \right) < 0. \quad (39)$$

With income taxation, (37) is strictly positive and the optimal value of $t_{12} > 0$.
With cash flow taxation, (37) is equal to zero. However, by expanding line 3 of (36),

\[
\frac{\partial W_1}{\partial t_{12}} = f^O(\sigma - 1) \int_2^a \left( \frac{1 - t_{12}}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial t_{12}} \left( \frac{1 - t_{12}}{\Delta(a)} \right) g(a) da \\
+ f^O(\sigma - 1) \int_2^a (\sigma - 1) \left( \frac{1 - t_{12}}{\Delta(a)} \right)^{\sigma - 2} \frac{\partial}{\partial t_{12}} \left( \frac{1 - t_{12}}{\Delta(a)} \right) \left[ 1 - \frac{\hat{\Delta}(a)(1 - t_{12})}{\Delta(a)} \right] g(a) da \\
- f^O(\sigma - 1) \int_2^a \left( \frac{1 - t_{12}}{\Delta(a)} \right) \frac{\partial}{\partial t_{12}} \frac{\hat{\Delta}(a)}{\Delta(a)} g(a) da \\
+ f^O(\sigma - 1) \left( \frac{1 - t_{12}}{\Delta(a^*)} \right)^{\sigma - 1} \left[ 1 - \frac{\hat{\Delta}(a^*)(1 - t_{12})}{\Delta(a^*)} \right] g(a^*) \frac{\partial a^*}{\partial t_{12}}.
\]

For \(0 < t_{12} < t_2\), \((1 - t_{12})r/\Delta(a)\) and \(a^*\) are decreasing in \(t_{12}\), \(\Delta(a) > (1 - t_{12})\hat{\Delta}(a)\), and \(\hat{\Delta}(a)\) is increasing in \(t_{12}\). Because \(\Delta(a) > (1 - t_{12})\hat{\Delta}(a)\), the sum of lines 1 and 3 in (40) is negative while lines 2, 4, and 5 are each negative. Thus, (36) is strictly negative for all \(0 < t_{12} < t_2\). For \(t_{12} > t_2\), \((1 - t_{12})r/\Delta(a)\), \(a^*\), and \(\hat{\Delta}(a)\) are all increasing in \(t_{12}\) while \(\Delta(a) < (1 - t_{12})\hat{\Delta}(a)\). At \(t_{12} = t_2\), \(\hat{\Delta}(a)\) is strictly increasing. Now because \(\Delta(a) < (1 - t_{12})\hat{\Delta}(a)\), the sum of lines 1 and 3 in (40) is still negative and lines 2, 4, and 5 also remain negative. Thus, (36) is also strictly negative for all \(t_{12} \geq t_2\).

**Proof of Proposition 9:** (a) \(X_2\) is decreasing in \(\lambda\) and independent of \(t_{12}\). Since \(Z_2\) is independent of \(\lambda\) and \(t_{12}\), the welfare of country 2 depends only on consumption effects.

(b) The change in country 2 income from an increase in \(t_{12}\) is given by

\[
\frac{dZ_2}{dt_{12}} = t_2 \int_2^a \left[ \frac{\partial (\rho - a - \delta_2 C_2)}{\partial t_{12}} m^I(a) + (\rho - a - \delta_2 C_2) \frac{\partial m^I(a)}{\partial t_{12}} \right] g(a) da \\
+ t_2(\rho - a - \delta_2 C_2) m^I(a^*) g(a^*) \frac{\partial a^*}{\partial t_{12}}
\]

We consider two cases, depending on whether \(t_{12}\) is greater or less than \(t_2\). For \(t_{12} > t_2\), the first term is positive since \(\frac{\partial (\rho - a - \delta_2 C_2)}{\partial t_{12}} = \frac{1 - t_2}{2a(1 - t_{12})^2} > 0\). The fact that \(\frac{\partial \Delta(a,t_{12},t_2)/(1 - t_{12})}{\partial t_{12}} = \frac{(t_2 - t_{12})(1 - t_2)}{2a(1 - t_{12})^2} < 0\) ensures that \(\frac{\partial m^I(a)}{\partial t_{12}} > 0\) and \(\frac{\partial a^*}{\partial t_{12}} > 0\). Since \((\rho - a - \delta_2 C_2) > 0\), the second and third terms will also be positive.
For $t_{12} < t_2$, the first term is positive because $\frac{\partial(\rho - a - \delta_2 C_2)}{\partial t_{12}} = \frac{1-t_{12}}{2\alpha(1-t_{12})^{\alpha}} > 0$. The fact that $\frac{\partial \Delta(a, t_{12}, t_2)/(1-t_{12})}{\partial t_{12}} = \frac{(t_2-t_{12})(2-t_2-t_{12})}{2\alpha(1-t_{12})^{\alpha}(1-t_2)} > 0$ ensures that $\frac{\partial m^I(a)}{\partial t_{12}} < 0$ and $\frac{\partial a^*}{\partial t_{12}} < 0$. We also have $(\rho - a - \delta_2 C_2) < 0$, so the second and third terms will also be positive.

The change in income from an increase in $\lambda$ is given by

$$\frac{dZ_2}{d\lambda} = t_2 \left( \int_a^a (\rho - a - \delta_2 C_2) \frac{\partial m^I(a)}{\partial \lambda} + (\rho - a - \delta_2 C_2)m^I(a^*)g(a^*) \frac{\partial a^*}{\partial \lambda} \right). \tag{42}$$

We have $\frac{\partial m^I(a)}{\partial \lambda} > 0$ from (13) and $\frac{\partial a^*}{\partial \lambda} > 0$ from (15). For $t_{12} < t_2$, we have $(\rho - a - \delta_2 C_2) < 0$, $\frac{dZ_2}{d\lambda} < 0$, and $\frac{\partial W_2}{\partial \lambda} < 0$. For $t_{12} > t_2$, $(\rho - a - \delta_2 C_2) > 0$ and $\frac{dZ_2}{d\lambda} > 0$. Since the effect of an increase in $\lambda$ on consumption is negative, the sign of $\frac{\partial W_2}{\partial \lambda}$ is ambiguous for $t_{12} > t_2$.

**Proof of Proposition 10:**

The analysis for this case is obtained by replacing $t_2$ by $t_{21}$ in the equilibrium conditions and setting the after-tax of capital in country 2 for integrated firms to $\lambda f_2$ in (14). The condition for the marginal integrated firm becomes

$$\frac{\Delta(a, t_{12}, t_2)}{1-t_{12}} = r \left( \frac{f_1 + \lambda f_2/(\lambda w_1)}{f_0} \right)^{1-\sigma}, \tag{43}$$

where $\frac{\partial a^*}{\partial \lambda} < 0$ and $\frac{\partial a^*}{\partial t_{21}} = \frac{(t_{21}-t_{21})(2-t_{21}-t_{12})}{4\alpha(1-t_{21})^{\alpha}} > 0$ for $t_{12} > t_{21}$.

The effect of an increase in $t_{21}$ on country 2 income is given by

$$\frac{dZ_2}{dt_{21}} = t_{21} \int_a^a \left[ \frac{\partial(\rho - a - \delta_2 C_2)}{\partial t_{21}} m^I(a) + (\rho - a - \delta_2 C_2) \frac{\partial m^I(a)}{\partial t_{21}} \right] g(a)da \tag{44}$$

$$+ \left( t_{21}(\rho - a - \delta_2 C_2)m^I(a^*) - (1-\lambda_2)f_2 \right) g(a^*) \frac{\partial a^*}{\partial t_{21}} + \int_a^a (\rho - a - \delta_2 C_2)m^I(a)g(a)da.$$

If $t_{12} = 0$, then $(\rho - a - \delta_2 C_2) < 0$ for all $a$ because $\rho(a) < a$. The fact that the transfer pricing profits of an integrated firm are increasing in $t_{21}$ means that $\frac{\partial m^I(a)}{\partial t_{21}} > 0$ and $\frac{\partial a^*}{\partial t_{21}} > 0$. All terms will be negative when $t_{12} = 0$.  

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The effect of an increase in $\lambda_2$ on country 2 income is

$$\frac{dZ_2}{d\lambda_2} = \left( t_{21}(\rho - a - \delta_2 C_2) m^I(a^*) g(a^*) - (1 - \lambda_2)f_2g(a^*) \right) \frac{da^*}{d\lambda_2} + f_2G(a^*).$$

The second term will be positive for $f_2 > 0$. We have $\frac{da^*}{d\lambda_2} < 0$ because an increase in $\lambda_2$ raises the cost of capital for integrated firms. The first term will also be positive for $t_{12} = 0$. 

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