CESifo WORKING PAPERS

7320
2018

October 2018

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

Eric W. Bond, Thomas A. Gresik

CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de
Editors: Clemens Fuest, Oliver Falck, Jasmin Gröschl
www.cesifo-group.org/wp

An electronic version of the paper may be downloaded
· from the SSRN website: www.SSRN.com
· from the RePEc website: www.RePEc.org
· from the CESifo website: www.CESifo-group.org/wp

CESifo *Working Paper No. 7320*
Category 1: Public Finance

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

Abstract

We study the economic effects of unilateral adoption of corporate tax policies that include destination-based taxes and/or cash ow taxes in a heterogeneous agent model in which multinational firms can endogenously shift income between countries using transfer prices. Standard pass through arguments no longer apply because of the income shifting behavior of multinationals. Over or under- pass through will affect domestic consumer prices charged by multinational firms and will distort the decision of international businesses to outsource intermediate goods or to produce them in a foreign subsidiary. The welfare of the adopting country can decrease both with the adoption of destination-based taxes and the adoption of cash ow taxes. For a country with sufficiently large export markets that can optimally adjust its corporate tax rate on domestic earnings, unilaterally adopting cash ow taxation with full destination-based rate adjustments will reduce welfare.

JEL-Codes: F230, H210, H250, H260.

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

Eric W. Bond
Vanderbilt University
Nashville / TN / USA
eric.w.bond@vanderbilt.edu

Thomas A. Gresik
University of Notre Dame
Notre Dame / Indiana / USA
tgresik@nd.edu

October 2018
We thank Andreas Haufler, Kai Konrad, Dirk Schindler, Guttorm Schjelderup, and Wolfgang Schön for their comments as well the comments from participants of the 2018 CESifo Public Sector Economics conference, the 2018 CESifo Summer Institute workshop on International Tax Reform, the 2018 North American Summer Econometric Meeting, and the 2018 IIPF Annual Congress.

1 Introduction

The Tax Cuts and Jobs Act (U.S. Congress, 2017) introduced a number of significant changes to U.S. corporate tax policy. These include lowering the main tax rate from 35% to 21%, new incentives to deter income shifting out of the United States (GILTI and BEAT)[1], a temporary provision for full expensing of intermediate duration capital expenses, and a provision to tax some foreign earnings at a lower rate (FDII).[2] The lower tax rate brought the main rate close to the worldwide median while the GILTI and BEAT provisions acknowledged the continuing need to address income shifting incentives. The full expensing provision represents a partial step towards more of a cash flow system instead of an income tax system, and FDII represents a type of partial border adjustment in which some foreign earnings are taxed at a different rate than domestic earnings. Precursors of the last two features were central to the reform plan developed by U.S. Congressional Republicans beginning in 2016 (Tax Reform Task Force, 2017). The Task Force proposed unilaterally changing 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). This significant change generated considerable resistance from U.S. businesses that under the existing SBT laws had located most of their supply chains outside the United States, and it generated significant discussions among tax practitioners and tax economists.[3]

To address these concerns, we provide the first 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. We believe this analysis more accurately reflects the circumstances faced by the U.S. Congress during its tax reform debates than does an analysis based on full multilateral adoption. When income shifting via transfer prices is a very real challenge to tax authorities, maintaining an income tax system with partial border adjustments is in fact a superior alternative to DBCFT for countries with significant export markets such as the United States.

DBCFT differs from SBT in two main ways: the use of border adjustments and the use of cash flow as opposed to income taxation. The border adjustment component exempts export income

[1]Global Intangible Low-Taxed Income and Base Erosion and Anti-Abuse Tax

[2]Foreign-Derived Intangible Income

[3]For example, see Benzell, Kotlikoff, and LaGarda (2017) and Feldstein (2017).

from taxation and denies a tax deduction for the cost of imported inputs. These border adjustments have been likened to those created by a value added tax (VAT). Grossman (1980) and Feldstein and Krugman (1990) have argued that the border adjustments under a VAT will be fully passed through to traded good prices, and that this pass through will be "neutral" in the sense that it will leave the allocation of resources unaffected. Proponents have used this similarity to argue that the border adjustments under DBCFT will not distort trade flows. It should be noted, however, that the results on the neutrality of VAT border adjustments were derived in models of international trade that did not consider multinational firm activity. In particular, we will show that the presence of cross border activity and the ability of firms to manipulate transfer prices can affect the pass through of tax rate changes as well as the allocation of resources.[4,5]

The cash flow component of DBCFT defines a firm's taxable income as its revenues minus all it expenditures (including capital expenses).[6] Economists view DBCFT positively because it eliminates tax-induced production distortions of international businesses. On the negative side, DBCFT shifts the incidence of corporate taxes entirely onto domestic residents.[7] The Tax Cuts and Job Act (U.S. Congress, 2017) reflects a partial step towards cash flow taxation by allowing for the full expensing of intermediate duration capital purchases. For countries with a sizable export market, a shift to cash flow taxation is not optimal.

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.[8] 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

[4]Costinot and Werning (2017) provide sufficient conditions for a proportional change in prices of all traded goods to leave the allocation of resources unaffected. These conditions require an independence of production sets across countries, no cross border ownership of firms, and no cross border consumption or employment by households. Their results suggest the potential for the failure of "neutrality" even in the presence of full pass through of taxes to traded goods prices when there is cross border activity by firms.

[5]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 Flaaen (2017) for U.S. multinationals, Cristea and Nguyen (2016) for Danish multinationals, and Chalendard (2016) for Ecuadorian firms.

[6]Cash flow taxation can also affect the taxation of debt and interest payments. We abstract from these issues in this paper.

[7]These implications have their origins in the foundational papers on cash flow taxes, e.g. Brown (1948) and Sandmo (1979), and more recently are demonstrated for open economies in Bond and Devereux (2002) and Auerbach and Devereux (2018).

[8]In addition to the papers listed in footnote 1, see also Auerbach and Holtz-Eakin (2016) and Auerbach et al (2017).

to lower-tax jurisdictions." A critical assumption in this literature under which these efficiency properties and the elimination of profit-shifting incentives arise, and one not always made explicit, is 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.

We are not the first to point out that income shifting incentives via transfer prices persist under the unilateral adoption of destination-based taxes. Schome 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. 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. Becker and Englisch (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. One defense that has been offered in the literature for setting aside transfer price issues is that the transfer price effects "would operate to the detriment of the rest of the world, not that of the adopting country." (Auerbach et al (2017, p. 42)) However, transfer pricing does not solely shift tax revenue between countries, it also influences the organizational decisions of international businesses. In our model, the effect of transfer price manipulation on firm organization choices implies that an intermediate degree of border adjustment between destination-based and source-based income taxation can be optimal. This observation is new to the tax literature and is consistent with the FDII provision of the 2017 U.S. tax reform.

To capture the role of DBCFT on the organizational choices of international businesses in which multiple organizational forms co-exist, we need a model with heterogeneous firms. To do so we will begin by introducing the specifics of corporate income taxation that can encompass source-based taxation, destination-based taxation, income taxation, and cash flow taxation into a model in which monopolistically competitive firms choose between buying intermediate inputs from unrelated foreign firms or engaging in vertical foreign direct investment to produce the inputs. 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. Because monopolistic competition is a standard feature in trade models, our approach helps better link the trade literature with the tax literature on corporate taxation.

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 representative firms 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 one country's incentives to unilaterally adopt DBCFT. 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.

In order to analyze the production and transfer pricing incentives created by unilateral adoption of border adjustments, we begin with a two-country economy in which both countries use SBT. To reflect the situation faced by U.S. businesses with their supply chains located outside the United States, one country (country 1) is home to a heterogeneous population of international businesses and a final good market. The other country (country 2) hosts intermediate good production as well as a final good market. Each firm must choose either to outsource the production of a required intermediate good to an independent country 2 producer or to produce the intermediate good in a subsidiary located in country 2 and thus operate as an integrated multinational firm. Firms differ in their marginal cost of producing the intermediate good through a subsidiary. As one would expect, more efficient country 1 firms will choose to integrate and less efficient country 1 firms will choose to outsource. All units of the intermediate good are shipped to the parent firm in country 1, where final good production takes place. The final goods can then be sold to consumers in country

1 and exported to consumers in country 2. We then analyze the case in which country 1 adopts destination-based and/or cash flow taxes. Because our model includes both import and export behavior, our analysis can capture both margins that can be influenced by border adjusted taxes. Cash flow taxation will also change the intensive and extensive choices of country 1 multinationals, but it will not eliminate the transfer pricing incentives that persist under income taxation.

The transfer price incentives are influenced by the corporate income tax rates of both countries, t_1 and t_2. Consistent with the typical pre-reform U.S. scenario, if $t_1 > t_2$ then an integrated country 1 parent under SBT has the incentive to shift income into country 2 by setting its transfer price below the arm's length price country 1 tax authorities would like it pay. Imperfect transfer price auditing results in a transfer price below the arm's length price as each country 1 parent will trade off its marginal tax savings of $t_1 - t_2$ against its marginal country 1 auditing penalties. Under destination-based income taxation (DBT), an integrated country 1 parent loses the tax deduction for what it pays its subsidiary for each unit of the intermediate good so it will set its transfer price to trade off marginal tax savings of $0 - t_2$ against marginal country 2 auditing penalties. In other words, the integrated country 1 parent now faces the incentive to set its transfer price above the arm's length price. The switch to DBT does not eliminate transfer price incentives but reverses them! Some authors have argued that a switch to DBT by a major country such as the United States would neutralize these new transfer price incentives through relative price adjustments. However, while relative price adjustments have the potential to change the arm's length price, they cannot neutralize tax differential effects across heterogeneous firms.

For outsourcing firms, it turns out that the traditional pass through logic persists. A change to DBT results in full pass through of tax changes to country 1 consumers and has no effect on country 2 final good prices. For integrated firms, the same price changes arise if, and only if, integrated firms do not manipulate their transfer prices. In fact, with endogenous transfer pricing, country 1 consumers can either experience incomplete or excessive pass through. Without transfer price manipulation, DBT will increase integrated firm profit. With transfer price manipulation, integrated firm profit can either increase or decrease, which means we can observe either selection into integration or into outsourcing. The reason for this ambiguity is that a change to DBT has both marginal cost and marginal revenue effects, the latter due in part to entry and exit patterns in the outsourcing and integrated firm sectors. While the net transfer price benefits under DBT can be smaller than under SBT, the net revenue effects can push the relative comparison of integrated firm profits in either direction. When we consider the impact of a change from a source-based cash flow tax (SBCFT) to DBCFT, similar transfer price trade-offs arise except that now the magnitude of fixed costs associated with operating a subsidiary shift the identity of the marginal integrated firm.

Since selection patterns going from SBT to DBT can result in more or fewer integrated firms, it is perhaps not surprising that country 1 welfare can increase or decrease. Moving from DBT to DBCFT also creates opposing country 1 welfare effects. First, welfare will increase due to an increase in aggregate consumption. Second, holding fixed the number of integrated firms, country 1 welfare will fall as aggregate production costs for outsourcing firms will increase. Third, there will be fewer integrated firms and a corresponding increase in outsourcing firms. This will generate an attendant decrease in welfare due to higher aggregate production costs from outsourcing firms. Even though the reversal of transfer price incentives associated with destination-based taxes encourages integrated firms to shift income into country 1, the change in the composition and intensity of international businesses can make country 1 worse off due to a change from SBT to DBT or DBCFT. These trade-offs explain why income taxation yields greater welfare when country 1 firms serve a sufficiently large export market relative to the domestic market as the efficiency benefits associated with exit of outsourcing firms under income taxation is increasing in the value of the export market.

The Tax Cuts and Jobs Act (U.S. Congress, 2017) made one especially important change. It lowered the corporate tax rate. The above results apply for a fixed tax rate. We also consider the effect of a change in a country's tax rate on domestic earnings, in addition to adopting destination-based and/or cash flow taxes. Because a change to cash flow taxation creates an incentive for firms to select into outsourcing, a country with a sufficiently large export market will earn more welfare with income taxation! This result suggests that the positive welfare benefits of DBCFT are unlikely to arise as the result of strategic tax policy competition. Furthermore, our analysis shows that the lower corporate tax rate, maintaining an income tax structure, and the partial border adjustment provisions of the Tax Act and Jobs Act are consistent with optimal corporate tax policy under unilateral adoption in the presence of transfer price manipulation.

In section 2, we describe our model and the optimal choices of outsourcing and integrated firms. In section 3, we then analyze the entry/exit incentives created by destination-based taxes. The effects of cash flow taxes are analyzed in section 4. In section 5, we present a welfare analysis. 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. Good X is produced by combining headquarter services in country 1 with an intermediate good produced in country 2, and we focus on the choice of the X firms in country 1 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 model country 1 as a high corporate tax country relative to country 2, and examine how tax policy affects the choice between outsourcing and integration. 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 $X_j = \left(\int_{i \in \Omega_j} x_i^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}$, Ω_j is the set of varieties of good X offered in country j, and $\sigma > 1$ is the elasticity of substitution. Larger values of σ imply a more competitive X sector. With these preferences, the demand for an individual variety in country j is given by

$$x_j = \frac{q_j \mu_j p_j^{-\sigma}}{P_j^{1-\sigma}}, \quad (1)$$

where q_j is the price of good Y, p_j is the price of the j^{th} variety of good X, and $P_j = \left(\int_{i \in \Omega_j} p_j^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$ is the price index for the X good in country j. Aggregate good X expenditures in country j equals

$q_j\mu_j$. There are no tariffs 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. 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 tax under a cash flow tax, but not under an income tax.[9]

A variety of good X is produced using headquarter services in country 1 and one unit of an intermediate good, M, per unit of output. We assume that the cost of production of the intermediate in country 1 is sufficiently high relative to that in country 2 that local production of the intermediate is not an option for X firms. Headquarter services require a fixed investment of c units of capital in country 1. If the firm chooses to outsource the intermediate good to the foreign country, it requires one unit of labor in the foreign country. If the firm produces the intermediate in a foreign subsidiary, it incurs a fixed cost of f_1 units of home country capital, a fixed cost of f_2 units of foreign capital, and a variable cost of a units of foreign country labor per unit of output. The fixed costs of forming a subsidiary are likely to include costs in both countries, since the firm must incur the cost of establishing relations in the host country as well as coordination and communication costs in the home country.

Firm heterogeneity is introduced by assuming that firms differ in their efficiency of producing in the foreign subsidiary. Specifically, we assume that the marginal cost in the foreign subsidiary is a random variable with distribution function $G(a)$ with $a \in [\underline{a}, \infty)$, so that a firm's choice between outsourcing and integration will depend on its value of a. Potential entrants are assumed to know their value of a prior to entry, so that they make their entry decision based on the relative costs of supplying the intermediate.

Good Y is produced using only labor in each country under conditions of constant returns to scale and perfect competition. We choose a unit of good Y in country 2 to be the numeraire, $q_2 \equiv 1$,

[9]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.

and assume for simplicity that the productivity of labor in producing good Y is the same in each country. We assume that the endowment good is sufficiently abundant that good Y is produced in both countries in equilibrium, so that the wage rate in each country will be determined by the return to labor in sector Y.

2.1.1 Tax Policy Parameters

Let t_j denote the rate at which corporate income is taxed in country j. We assume that country 2 is a low tax rate country relative to country 1, so that $t_2 < t_1$. Our goal is to analyze the effects of changes in country 1 tax policy that affect the rate at which foreign earnings are taxed and the determination of which input costs are deductible from taxable income. We will introduce tax policy parameters that allow us to consider tax policy changes along two dimensions. The first parameter, t_{12}, captures the difference between a tax system that taxes income at the source and one that taxes it at the destination. The source-based tax system taxes all income earned from a firm located in country 1 at the same rate, and does not discriminate between purchases of domestic and imported inputs. Letting t_{1j} denote the tax rate on income earned by a country 1 firm from sales in country j, we have $t_{11} = t_{12} = t_1$ under a source-based tax system. The destination-based system has a border adjustment whereby country 1 firms are not taxed on sales in country 2, but also cannot deduct purchases of inputs from country 2 from taxable income. In our notation, the destination-based system is captured by setting $t_{11} = t_1$ and $t_{12} = 0$. Values of t_{12} between 0 and t_1 correspond to a partial border adjustment policy.

The second tax parameter we consider is intended to capture the difference between a corporate income tax and a cash flow tax, where in practice a cash flow tax allows firms to immediately deduct expenses for capital investments. We capture this distinction by introducing the parameter $\lambda \epsilon [1 - t_1, 1]$, which represents the after-tax cost of capital used for the fixed component of costs for sector X firms. Thus, the after-tax capital cost incurred in country 1 by a sector X firm that outsources will be λc and that of an integrated firm will be $\lambda(c + f_1)$. The case where capital costs are not deductible is given by $\lambda = 1$, while full deductibility of capital costs, as under a cash flow tax, occurs when $\lambda = 1 - t_1$.

By introducing these two tax parameters, we can decompose the effect of a switch from a source-based income tax system to a destination-based cash flow system into the effects of border adjustments (reductions in t_{12} for a given value of λ) and the effect of reducing the after-tax fixed cost (reductions in λ for given t_{12}). In making these comparisons, we assume that country 1 follows a territorial system, so that sector X firms are not taxed on subsidiary income if they become multinational. We also assume that country 2 always maintains a source-based tax.

3 Firm Pricing and Pass-Through

In this section we derive the pricing and output decisions for firms. In particular, we show that the border adjustment associated with a change from a source-based tax to a destination-based tax will leave the relative price of X sector goods to Y sector goods unchanged for outsourcing firms. For integrated firms, in contrast, the existence of transfer price manipulation can result in either an increase or a decrease in the relative price of their output.

3.1 Y Sector Firms

We assume that all input costs for the Y sector firms in each country are deductible, and that trade costs are zero. Free entry of firms in country 2 will ensure that the after-tax price equals the after-tax unit cost. Since country 2 taxes sales at the same rate in all locations, we have $q_2 = w_2 = 1$ regardless of whether country 2 is an exporter or importer of good Y.

If country 1 adopts source-based taxation, commodity arbitrage and the zero profit condition ensure that $q_1 = w_1 = 1$. Under destination-based taxation, taxable income is revenue earned from country 1 less any tax deductible expenses incurred in country 1. The border adjustment then means that $q_1 = w_1 = \frac{1}{1-t_1}$. To see this, note that if a country 1 firm exports a unit of good Y, after-tax income is $1 - w_1(1 - t_1)$ per unit due to the exemption on export sales. In order to make the firm indifferent between exporting and selling domestically, the domestic wage must equal $\frac{1}{1-t_1}$. If a country 1 firm imports good Y, the importer must charge a price of $\frac{1}{1-t_1}$, because the revenues are deductible but the foreign labor cost of the good is not. Domestic producers will thus also charge a price of $\frac{1}{1-t_1}$, which with free entry will yield $w_1 = \frac{1}{1-t_1}$.

We can summarize the effect of tax policy on country 1 prices as

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

As with the case of a VAT (see Grossman (1980) and Feldstein and Krugman (1990)), implementation of DBT results in full pass through of corporate tax changes in the Y sector. Our assumption that all costs are deductible in the Y sector means that prices are independent of λ.

3.2 Payoffs for X Sector Outsourcing Firms

We first analyze the payoff if a country 1 firm chooses to outsource the production of the intermediate good to a firm in country 2. We assume that the intermediate input is produced at a constant marginal cost of one, and is sold to an outsourcing firm at a fixed price of $r \geq 1$. This formulation allows us to consider the perfectly competitive sector sector ($r = 1$) as well as allowing for double marginalization under outsourcing that arises from market power of intermediate producers in country 2 ($r > 1$).[10]

The after-tax profit of a good M supplier in country 2 will be

$$\Pi_S^O = (1 - t_2)(r - 1)m^O,$$

where r is the price paid by the multinational for each unit of the intermediate good and m^O is the quantity of the good produced by the intermediate producer. The after-tax profit of the X producer is the after-tax revenue from sales in the respective markets less after-tax costs of variable and fixed inputs. Given t_{1j}, the after-tax profits of the final goods producer will be

$$\Pi^O = (1 - t_{11})R_1^O + (1 - t_{12})\left(R_2^O - rm^O\right) - \lambda w_1 c \qquad (2)$$

where R_j^O is the revenue that the final goods producer earns from sales in market j. Since all firms

[10] One case of double marginalization arises in the Antràs and Helpman (2004) model of outsourcing firms, where each firm's intermediate good is specialized. The specialization creates a holdup problem associated with its production. Nash bargaining is used 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 (2204) with a holdup problem will not be one that maximizes the final goods producer's profits at r. We illustrate in an appendix how the pass through result applies in this case as well.

face the same payoffs from outsourcing, Π^O is independent of the firm's unit labor requirement, a.

If final good producer i purchases m^O units of the intermediate good, it will produce an output of $x^O = m^O$ and will allocate the output across markets to maximize after-tax revenue. The revenue of a representative final goods producer from selling x_j units in market j, given the output of all other firms in market j, will be

$$R_j = q_j \mu_j \left(\frac{x_j}{X_j} \right)^{\frac{\sigma-1}{\sigma}} \tag{3}$$

Letting $k_j = (1 - t_{1j}) q_j \mu_j X_j^{\frac{1-\sigma}{\sigma}}$, the maximum after-tax revenue from an output of x can be written as

$$\begin{aligned} \Psi(x) &= \max_{x_2} (1 - t_{11}) R_1(x - x_2) + (1 - t_{12}) R(x_2) \\ &= \kappa(t_{11}, t_{12}) x^{\frac{\sigma-1}{\sigma}} \end{aligned} \tag{4}$$

where $\kappa(t_{11}, t_{12}) \equiv (k_1^\sigma + k_2^\sigma)^{\frac{1}{\sigma}}$.

The parameter k_j captures the profitability of the j market, reflecting both the tax rate and intensity of competition in that market, and κ is a measure of the overall profitability of the two markets. The share of output allocated to market j is determined by its relative profitability,

$$x_j^O = \frac{k_j^\sigma m^O}{k_1^\sigma + k_2^\sigma}. \tag{5}$$

Observe that 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.

Choosing m^O to maximize (2) yields

$$m^O = \left[\frac{\kappa}{1 - t_{12}} \frac{\sigma - 1}{\sigma r} \right]^\sigma. \tag{6}$$

The quantity of the intermediate good will be increasing in the profitability of the markets for final goods, κ, and increasing in the country 1 tax rate on the final good producer's sales in market 2. The latter effect reflects the extent to which the imported inputs are deductible from taxes in country 1.

Using (1), (5), and (6) yields solutions for the prices of the intermediate and final goods when the firm outsources, which gives: (see Appendix: Proofs for all proofs)

Proposition 1 *The prices of the final goods under outsourcing will be*

$$p_j^O = \left(\frac{1 - t_{12}}{1 - t_{1j}} \right) \frac{\sigma r}{\sigma - 1}. \tag{7}$$

(a) A change to destination-based taxes results in full pass through to country 1 consumers and no change in country 2 good X prices.
(b) The relative price of good X from outsourcing firms in market j is $\frac{p_j^O}{q_j} = \frac{\sigma r}{\sigma - 1}$ for $j = 1, 2$ under either tax system.

The X sector prices of outsourcing firms reflect a double marginalization effect through the term $\sigma r/(\sigma - 1)$. Country 1's tax policy will be fully passed through in country 1 prices but have no effect on relative prices in either country.

3.3 Payoffs for X Sector Integrated Firms

We now turn to the case in which a country 1 firm chooses to produce the intermediate good in a wholly owned subsidiary. An integrated firm can produce the intermediate good at a lower resource cost than an outsourcing firm if it draws a unit labor requirement of $a < 1$ for producing the intermediate good in a subsidiary. We also assume that an integrated firm is able to avoid the double marginalization associated with outsourcing. However, producing in a subsidiary requires the firm to incur additional fixed costs of f_1 units of capital in country 1 and f_2 units of capital in country 2 to operate the subsidiary.

In addition to the potential to reduce unit labor costs, the integrated firm also has the potential to use transfer prices to reduce taxable income. With an integrated firm, the allocation of taxable income between the parent and the subsidiary will be determined by the transfer price, $\rho \geq 0$, that the firm chooses for intra-firm trade. 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

$\rho(1-t_{12})$. Global after-tax profits will be increasing in ρ if, and only if, $t_{12} > t_2$, so the firm will have an incentive to set the transfer price as high as possible if $t_{12} > t_2$ 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 transfer that the firm should charge on intra-firm transactions prices. We assume that the arm's length price is the subsidiary's marginal cost of producting the input, a.[11] However, due to the heterogeneity of marginal cost 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 $C_i(\rho, a) = \alpha_i(\rho - a)^2$ per unit of the intermediate good, where $\alpha_i > 0$. This function captures the notion that the firm faces increasing marginal costs of raising the transfer price, with the magnitude of α_i reflecting the ability of country i to identify the appropriate arm's length price for the firm. Since the high 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. The change in tax systems will affect which country is the high tax country, because country 1 will be the high tax country under source-based taxation ($t_{12} = t_1$) and country 2 will be the high tax country under destination-based taxation ($t_{12} = 0$).

Given a quantity m of intermediate inputs produced by the subsidiary, an integrated firm will have output $m = x_1 + x_2$ to allocate between markets in a profit maximizing way. After-tax revenue can be expressed as $\Psi(m)$ as in the case of the outsourcing firm. With these assumptions, the after-tax global profits of a representative firm with unit labor requirement a will be

$$\begin{aligned} \Pi^I(m, \rho; a) &= \Psi(m) - ((1-t_{11})\delta_1 w_1 C_1(\rho, \tilde{\rho}(a)) + (1-t_{12})\rho)\, m \\ &\quad + (1-t_2)(\rho - a - (1-\delta_1) C_2(\rho, \tilde{\rho}(a)))m - w_1\lambda(c + f_1) - f_2 \end{aligned} \tag{8}$$

where δ_1 is an indicator variable that is equal to 1 if country 1 is the high tax country and 0 otherwise. Using δ_1 implies that the transfer pricing costs are tax deductible in the country in which they are incurred and that only the high tax country monitors the transfer price.[12] The

[11] Our results can be extended to allow for arm's length prices that exceed a.
[12] The results for the case where both monitor is similar.

objective of the firm is to choose m and ρ to maximize (8).

Integrated firm profit is concave in ρ, so the necessary condition for the choice of ρ at an interior solution yields the optimal transfer pricing formula,

$$\rho^*(a) = a + \frac{t_{12} - t_2}{2(\alpha_1\delta_1(1 - t_{12}) + \alpha_2(1 - \delta_1)(1 - t_2))}. \tag{9}$$

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. $\alpha_i \to \infty$). 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.

The necessary first-order condition for the optimal level of imports requires that after-tax marginal revenue equal after-tax marginal cost,

$$\left(\frac{\sigma - 1}{\sigma}\right)\kappa m^{-\frac{1}{\sigma}} = \Delta(a, t_{12}, t_2), \tag{10}$$

where after-tax marginal cost can be written using (9) as

$$\Delta(a, t_{12}, t_2) = (1 - t_{12})a - \frac{(t_{12} - t_2)^2}{4(\alpha_1\delta_1(1 - t_{12}) + \alpha_2(1 - \delta_1)(1 - t_2))}. \tag{11}$$

The first term in (11) 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, $(\alpha_1\delta_1(1 - t_{12}) + \alpha_2(1 - \delta_1)(1 - t_2))$.

For outsourcing firms and Y sector firms, the effect of a switch from a source-based to a destination-based tax is to raise the after-tax cost of inputs by a factor of $\frac{1}{1-t_1}$. For integrated firms, defining $\Delta^S(a) = \Delta(a, t_1, t_2)$ to be marginal cost under a source-based system and $\Delta^D(a) = \Delta(a, 0, t_2)$ to be marginal cost under a destination-based system, $\Delta^S(a) \leq (1-t_1)a \leq \Delta^D(a) \leq a$ but full pass through requires $\Delta^D(a) = \Delta^S(a)/(1-t_1)$. According to (11), we have

$$\Delta^D(a) - \frac{\Delta^S(a)}{(1-t_1)} = \left[\frac{(t_1-t_2)^2}{4\alpha_1(1-t_1)^2} - \frac{t_2^2}{4\alpha_2(1-t_2)}\right]. \tag{12}$$

This comparison yields the following result:

Lemma 1 *Let $t_1 > t_2 > 0$.*

(i) A switch from a source-based to a destination-based tax will raise the cost of inputs to an integrated firm by a factor of $\frac{1}{1-t_1}$ if arms length transfer pricing is strictly enforced under both systems (ie. $\alpha_1, \alpha_2 \to \infty$).

(ii) If transfer prices differ from marginal cost, a switch from a source-based to a destination-based tax will raise the price of inputs by less than a factor of $\frac{1}{1-t_1}$ if and only if $\alpha_1(1-t_1)^2 t_2^2 > \alpha_2(1-t_2)(t_1-t_2)^2$.

Lemma 1 shows that there are two possible cases in which the change in the tax system results in a full pass through to the cost of the inputs to an integrated firm. One case arises when the tax authorities are able to perfectly enforce the use of marginal cost transfer pricing. The other case arises when the cost of transfer price manipulations and tax rate differences in the respective countries are such that the gains from transfer price manipulation are exactly the same under either system. Less than full pass through of a change from a source-based tax to a destination-based tax will occur when transfer price manipulation is more profitable under the destination-based system. Since country 2 is monitoring transfer prices under a destination-based system, less than full pass through is more likely to occur when the cost is lower when country 2 is monitoring, (i.e. α_1 is large relative to α_2). Transfer price manipulation is also likely to be more profitable under a destination-based system when t_2 is larger (given t_1), because a higher value of t_2 raises the gain from declaring profits in country 1. More than full pass through of tax rate under a destination-based system will occur in the opposite cases, α_1 relative small and t_2 low.

As an example, suppose $t_1 = 0.35$, $t_2 = 0.2$. All integrated firms earn larger transfer price profits under destination-based taxation if $\alpha_1 > 1.065\alpha_2$. That is, if transfer pricing is approximately 6.5% more expensive in country 1 than country 2, a shift to a destination-based tax will increase output prices for all integrated firms.

The optimal price and quantity for an integrated firm can be obtained using (10) and the firm's demand, which gives the following result:

Proposition 2 *For an integrated firm, the optimal quantity and price will be*

$$m^I(a, t_1, t_{12}, t_2) = \left(\frac{\kappa}{\Delta(a, t_{12}, t_2)} \frac{\sigma - 1}{\sigma}\right)^\sigma$$

and (13)

$$p_j^I(a, t_1, t_{12}, t_2) = \frac{\Delta(a, t_{12}, t_2)}{1 - t_{1j}} \frac{\sigma}{\sigma - 1}.$$

(a) Integrated firms will charge a higher price in the domestic market than in the foreign market under destination-based taxation, but will charge the same price in both markets under source-based taxation.

(b) 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, $\Delta^S < (1 - t_1)\Delta^D$.

The main difference between the optimal pricing formula for an outsourcing firm derived in Proposition 1 and that for an integrated firm in Proposition 2 is that the after-tax cost of the input in the case of the outsourcing firm, $(1 - t_{12})r$, differs from that of the integrated firm, $\Delta(a, t_{12}, t_2)$. The difference in input costs is due to differences in labor productivity of the subsidiary, the potential for tax avoidance due to transfer pricing, and the absence of double marginalization.

Part (a) shows that the price differential between the export market and home market under destination-based taxation reflects the fact that export sales are not subject to taxation. This is exactly the same result as was obtained for the case of an outsourcing firm in Proposition 1(a). However, part (b) shows that the extent of pass through to country 1 consumers of good X will depend on the comparison of marginal costs, $\Delta^S(a)$ and $(1-t_1)\Delta^D(a)$. As established in Lemma 1, the degree of pass through of price to marginal cost will depend on the relative gains from transfer price manipulation in the respective cases.

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.

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 $\Pi^I(a) \geq \Pi^O$. By the Envelope Theorem, $\frac{d\Pi^I(a)}{da} = -(1-t_{12})m^I(a) < 0$. Letting a^* denote the value of a at which $\Pi^I(a) = \max[0, \Pi^O]$, all potential firms with $a \in [\underline{a}, a^*]$ will enter as integrated firms. Entry will increase the outputs X_j until κ adusts sufficiently that the profit of a potential entrant is 0. We assume an interior equilibrium in which there are both outsourcing and integrated firms.[13]

Since outsourcing firms are the marginal firms in an interior equilibrium, (homogeneous) outsourcing firms will enter/exit until κ adjusts sufficiently that $\Pi^O = \kappa(m^O)^{\frac{\sigma-1}{\sigma}} - (1-t_{12})rm^O - \lambda w_1 c = (\kappa/\sigma)(m^O)^{\frac{\sigma-1}{\sigma}} - \lambda w_1 c = 0$. Solving the zero profit condition for outsourcing firms yields

$$\overline{\kappa} = (1-t_{12})\left(\frac{\lambda c\sigma}{1-t_1}\right)^{\frac{1}{\sigma}}\left(\frac{\sigma r}{\sigma-1}\right)^{\frac{\sigma-1}{\sigma}}. \qquad (14)$$

κ is an increasing function of the after-tax cost of capital, $\lambda w_1 c$, and the after-tax cost of the intermediate good, $(1-t_{12})r$. An increase in either cost requires an increase in $\overline{\kappa}$ through exit to

[13] 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.

restore zero profits for outsourcing firms.

Substituting (14) into (6) and (13), we obtain the equilibrium level of output for the respective types of final goods producers in a free entry equilibrium,

$$\bar{m}^O = \frac{\lambda c(\sigma - 1)}{(1 - t_1)r}$$

and (15)

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

Equation (15) can be used to assess the impact of changes in the two tax policy parameters, t_{12} and λ, on the equilibrium outputs of outsourcing and integrated firms. For outsourcing firms, the size of the firm in a zero profit equilibrium is an increasing function of the magnitude of the fixed (capital) costs relative to variable (labor) costs of the input, $\lambda c/r$. A switch from source-based to destination-based taxation will have no effect on equilibrium output, which reflects the result in Proposition 1 that the relative price of good X from outsourcing firms is independent of the tax system. The higher prices of the products under destination-based taxation are offset by the increase in the wage so the equilibrium output level of these firms is unchanged from a change in the tax system.

A reduction in λ, 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 κ yields a smaller equilibrium firm size due to the incentive to substitute capital for labor. Note in particular that in the case where capital costs are fully deductible, $\lambda = 1 - t_1$, the output of outsourcing firms will be independent of country 1's tax policy. This result is similar to that of Auerbach and Devereux (2018) for the case of a destination-based cash flow tax. Interestingly, a similar result holds here for SBCFT. An increase in t_1 with SBCFT will reduce the cost of imports, which would cause firms to increase output at a given value of κ. However, the increased profitability of outsourcing firms results in entry and a proportional reduction of κ that exactly offsets the reduction in the after-tax cost of capital.

The output of integrated firms relative to outsourcing firms will be an increasing function of the marginal cost of outsourcing firms relative to integrated firms, $r(1 - t_{12})/\Delta(t_2, t_{12}, a)$. In the case where a switch from a source-based to a destination-based tax is fully passed through in the marginal cost of integrated firms, $\Delta^D(1-t_1) = \Delta^S$, the output of integrated firms will be unaffected by the change. The output of integrated firms will rise (fall) with this switch if there is less (more) than full pass through of costs to integrated firms.

Equation (15) establishes the impact of tax policy changes on the intensive margin of trade for X sector firms. To obtain the effect on the extensive margin, we need to solve for the aggregate sales of X sector firms. It can be shown that 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 κ and using (14) yields the aggregate equilibrium output levels for each market,

$$X_j^D = X_j^S = \left(\frac{1-t_1}{\lambda c\sigma}\right)^{\frac{1}{\sigma-1}} \mu_j \left(\mu_1+\mu_2\right)^{\frac{1}{\sigma-1}} \left(\frac{\sigma-1}{\sigma r}\right). \tag{16}$$

Aggregate X sector consumption is unaffected by a change from source-based to destination-based taxation. Although the cost of inputs to the outsourcing firm increases due to the lack of deductibility of inputs, this effect is offset by the fact that the equilibrium value of the market demand parameter, κ, and the prices q_1 and w_1 increase under destination-based taxation. However, a reduction in λ increases X sector consumption through the effect on market profitability.

A reduction in λ can also affect the firm's decision as to whether to obtain inputs by outsourcing or integration. The extensive margin of integrated firms is determined by the condition that $\Pi^I(a^*) = 0$, which gives

$$\frac{\Delta(a, t_{12}, t_2)}{1-t_{12}} = r\left(\frac{c + f_1 + (1-t_1)f_2/\left(\lambda(1-t_{12})\right)}{c}\right)^{\frac{1}{1-\sigma}}. \tag{17}$$

A reduction in the capital costs of integration relative to headquarter costs, $\frac{f_1+f_2/(\lambda w_1)}{c}$, will make integration more attractive and result in an increase in a^*. Similarly, a reduction in Δ due to a reduction in the cost of transfer price manipulation will result in an increase in a^*. Lower costs of forming a subsidiary and an increase in the market power of country 2 suppliers will expand the extensive margin for integrated firms.

Whether the switch from source-based to destination-based taxation makes integration more profitable will depend on the relative values of $\Delta^S(a)$ and $\Delta^D(a)$. The greater is $\Delta^S(a)$ relative to

$\Delta^D(a)$, the greater is the profit of an integrated firm under destination-based taxation relative to that under source-based taxation. Comparing the profits of an integrated firm under source-based taxation with that under destination-based taxation yields the following sufficient conditions for integrated firm profits to be higher under the respective tax systems.

Proposition 3 *(a) If $\Delta^S(a) \geq (1-t_1)\Delta^D$, the switch from source-based to destination-based taxation will raise the profit of an integrated firm.*
(b) If $\Delta^S(a) \leq (1-t_1)^{\frac{\sigma}{\sigma-1}}\Delta^D(a)$, the switch from source-based to destination-based will reduce the profits of an integrated firm.

To provide intuition for part (a), recall that Proposition 2 and the equilibrium quantities in (15) established that the relative price and output of integrated firms will be unaffected by the change to destination-based taxation if $\Delta^S(a) = (1-t_1)\Delta^D$. This occurs because a change to destination-based taxation will increase revenues and fixed costs incurred in country 1 proportionally, while leaving the fixed costs incurred in country 2 unaffected. Changing to destination-based taxation will thus expand the profits of integrated firms if this condition is satisfied, and will expand the extensive margin of integrated firms if the condition holds at a^* with $f_2 > 0$. Since profits are decreasing in $\Delta(a)$, integration will also become more attractive under destination-based taxation for all a for which $\Delta^S(a) > (1-t_1)\Delta^D$. In contrast to the earlier pass-through results of Grossman (1980) and Feldstein and Krugman (1990) that do not allow for multinational activity, there can still be changes in real resource allocation through organizational choices even in the case of full pass through.

In order for integration to be more attractive under source-based taxation, the output must be sufficiently higher that it overcomes the reduction in $f_2/(\lambda w_1)$ from destination-based taxation. Part (b) provides a condition for the marginal cost of the input under source-based taxation to be sufficiently low relative to destination-based taxation that the switch to destination-based taxation reduces profits of an integrated firm.

We can also use (15), (16), and (17) to establish the effect of a change in λ on the extensive margins of integration and outsourcing.

Proposition 4 *An increase in the deductibility of capital costs in country 1 (lower λ) will reduce the profits of integrated firms and reduce integrated firm output at both the intensive and extensive margins. Overall output of X sector firms will increase as a result of an increase in the extensive margin of outsourcing firms.*

An increase in the deductibility of capital costs benefits outsourcing firms relative to integrated firms. This occurs because increased deductibility affects all of the capital costs of the outsourcing firms, but only affects the capital costs of integrated firms that are incurred in country 1. The decline in κ required to restore zero profits for outsourcing firms will thus result in a decline in profits of integrated firms, and a decrease in the threshold value of a required for firms to become integrated. Output of both integrated and outsourcing firms will decline from (15), but the overall output of sector X will increase. The increase in sector X output must be accomplished by an increase in the extensive margin of outsourcing firms.

To determine the impact of tax policy on the measure of outsourcing firms, we can solve for N^O to obtain [14]

$$N^O = \frac{1-t_1}{\lambda c \sigma}(\mu_1 + \mu_2) - \int_{\underline{a}}^{a^*} \left(\frac{(1-t_{12})r}{\Delta}\right)^{\sigma-1} g(a)da. \tag{18}$$

The first term in (18) equals the aggregate output of X relative to output per outsourcing firm and thus is the measure of outsourcing firms needed to entirely serve the X sector. The second term equals the aggregate output of integrated firms relative to output per outsourcing firm so the integrand is the replacement rate of integrated firms for outsourcing firms. The switch from source-based to destination-based taxation leaves the first term unaffected, because the change leaves both aggregate output and output per outsourcing firm unaffected. Whether the change to destination-based taxation increases the measure of outsourcing firms is determined by the impact on the intensive and extensive margins for integrated firms from (15) and Proposition 3. If $\Delta^S(a) \geq (1-t_1)\Delta^D$, N^O will decrease from the switch to destination-based taxation because

[14] Using the definition of X_i and the allocation of output across markets given by (5), we can sum across markets to obtain

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

Substituting for $X_1 + X_2$ and using $X_2 = \frac{\mu_2 X_1}{\mu_1}$ yields (18).

integrated firm output increases at both the intensive and extensive margin. A sufficient condition for N^O to increase is that the output of integrated firms decrease at both intensive and extensive margins, which occurs if $\Delta^S(a) \leq (1-t_1)^{\frac{\sigma}{\sigma-1}}\Delta^D(a)$.

A reduction in λ will unambiguously increase N^O because the greater deductibility of capital costs increases aggregate output, decreases output per outsourcing firms, and causes some firms to shift from integration to outsourcing. The first term in (18) increases because a reduction in λ increases aggregate output and decreases the output per outsourcing firm. The integral term decreases because the reduction in λ reduces the profits of integrated firms and causes the threshold for choosing integration over outsourcing to decrease by Proposition 4.

5 Country 1 Welfare

We now turn to an analysis of the effect of a change in the tax policy parameters, λ and t_{12}, on national welfare of country 1. Country 1 income, which we denote by Z_1, consists of endowment income, tax revenues, and X sector firm profit. The indirect utility function of country 1 can then be written as

$$W_1(t_{12}, \lambda) = \mu_1(lnX_1(\lambda) - 1) + Z_1/q_1 \tag{19}$$

where sector X consumption in country 1, $X_1(\lambda)$, is defined by (16), and country 1 consumption of good Y is $D_Y = Z_1/q_1 - \mu_1$.

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,

$$\begin{aligned} \frac{Z_1}{q_1} &= L_1 + \mu_1 + \mu_2 - (c + rm^O)N^O - (c + f_1 + f_2)G(a^*) \\ &- \int_{\underline{a}}^{a^*(t_{12},\lambda)} \hat{\Delta}(a, t_{12})m^I(a)g(a)da \end{aligned} \tag{20}$$

where N^O, the measure of outsourcing firms, is defined by (18), and

$$\hat{\Delta}(a, t_{12}) = (1 - t_2)(a + \delta_2 C_2) + t_2\rho^*(a) + \delta_1 C_1 = \Delta + t_{12}(\rho^* + \delta_1 C_1) \tag{21}$$

denotes the marginal social cost of integrated firm production. National income is equal to endowment income plus the difference between revenue from sale of good X and the social cost of inputs required to produce good X by integrated and outsourcing firms. Here the social cost of inputs is the pre-tax cost of country 1 labor and capital inputs and the net of country 2 tax cost of country 2 labor and capital inputs. Since the first three terms in the expression for real income are exogenously determined, the change in (20) from changes in the tax policy parameters (t_{12}, λ), will be equal to the change in the social cost of producing X sector goods.

Substituting for N^0 from (18) into (20) and using (15), we obtain

$$\begin{aligned} \frac{Z_1}{q_1} &= L_1 + \frac{\mu_1 + \mu_2}{\sigma}\left(1 - \frac{1-t_1}{\lambda}\right) + c\left[\int_{\underline{a}}^{a^*}\left(\left(\frac{\Delta(a)}{(1-t_{12})r}\right)^{1-\sigma} - \frac{c+f_1+f_2}{c}\right)g(a)da\right] \\ &+ \left[\int_{\underline{a}}^{a^*}\left(\frac{\Delta(a)}{1-t_{12}} - \hat{\Delta}(a)\right)m^I(a)g(a)da\right]. \end{aligned} \tag{22}$$

The first two terms in (22) 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 $[\underline{a}, a^*]$.

It can be seen from (19) and (22) that the decisions of X sector firms may differ from the socially optimal ones because of differences between the private costs and social costs of actions. Private costs differ from social costs due to the presence of income taxes and also due to the monopoly markup on X sector goods. We can identify distortions that arise from the extent of X sector production and from the allocation of output between integrated and outsourcing firms.

The second term in (22), which represents the cost of satisfying the demand for X using outsourcing firms, indicates that national income will be decreasing in λ. With a cash flow tax, $\lambda = 1-t_1$ and outsourcing firms earn zero profits and pay no tax since all factors are deductible, so the second term is 0. With an income tax, on the other hand, $\lambda = 1$ and the second term represents the contribution of outsourcing firms to tax revenues due to the tax on capital income. It should be noted that although an income tax will generate more tax revenue from outsourcing firms than a cash flow tax, this must be balanced against the fact that the cash flow tax provides a gain from additional product variety in (19) since the consumption of X is decreasing in λ.

The third and fourth terms show that there are distortions in the decisions of firms between integration and outsourcing at both the extensive and intensive margins. For the intensive margin decision of integrated firms, the relative private marginal cost of integrated firms to outsourcing firms is $\frac{\Delta(a)}{(1-t_{12})r}$ whereas the marginal social cost is $\frac{\hat{\Delta}(a)}{r}$. Referring to the last bracketed term in (22), it can be seen that output of integrated firms is below the income maximizing level when $\frac{\Delta(a)}{(1-t_{12})} > \hat{\Delta}(a)$ because income can be increased by raising $m^I(a)$. Similarly, integrated firm output is above the income maximizing level when the private cost of integrated firms is less than the social cost.

For the extensive margin between outsourcing and integration, represented by a^* and defined by (17), tax policy can generate a difference between the relative private capital costs of integrated firms, $[c + f + (1 - t_1)f_2/(\lambda(1 - t_{12})]/c$, and the relative social capital cost of integrated firms, $(c + f_1 + f_2)/c$. Private capital costs of integrated firms will be less than the social capital cost if $\frac{(1-t_1)}{\lambda(1-t_{12})} > 1$ when $f_2 > 0$.

A destination-based cash flow tax will equalize the relative private capital costs of integrated firms to the relative social cost, since $\lambda = 1 - t_1$ with a DBCFT. It will also equalize the private marginal cost of integrated firms to the social social marginal cost, since $t_{12} = 0$ implies $\frac{\Delta(a)}{1-t_{12}} = \tilde{\Delta}$. However, as we show below this will not necessarily result in maximization of domestic welfare due to the spillovers that result from policy changes.

The discussion above shows that changes in tax policy have the potential to affect welfare through their impact on the total production of good X and on the allocation of output between integrated and outourcing firms at both the extensive and intensive margins. To identify the impact of tax policies through each of these transmission channels, we will focus on three special cases that illustrate how tax policy changes affect welfare through the respective margins. The first case focuses on the effect of tax policy changes on the magnitude of output of good X by assuming that the relative private costs of integrated firms to outsourcing firms are equal to their relative social costs. This assumption eliminates any effects of tax policy on welfare through changes in the composition of production between outsourcing and integrated firms. The second case allows for the effects of tax policies on the selection of firms into integration by introducing a differential between the private and social relative fixed costs of integrated firms. The third case focuses on the effect of tax policies on the relative marginal cost of integrated firms when they are engaged in the manipulation of transfer prices to maximize world profits. We conclude with a discussion of the effects of a change in t_1.

5.1 Benchmark Case: Socially Efficient Allocation Between Integration and Outsourcing

For the first case, we assume that government enforcement of transfer prices is so effective that a firm's cost of misrepresenting the marginal cost is arbitrarily large, $\alpha_1, \alpha_2 \to \infty$, and the capital costs of integrated firms are incurred only in country 1, $f_2 = 0$. Under these assumptions, $\Delta(a) = a(1 - t_{12})$, $\tilde{\Delta}(a) = a$ and the labor requirement of the marginal firm will be $a^* = (1 + f_1/c)^{1/(1-\sigma)}$. These assumptions ensure that the marginal social costs and the marginal private costs of integrated firms are equalized as well as the private and social capital costs, so that the selection of firms into integration will maximize national income. A switch from source-based taxation to destination-based taxation will be fully passed through to consumers and have no effect on the the relative price of good X for integrated firms under either income or cash flow taxation by Proposition 2. Furthermore, a change from source-based taxation to destination-based tax will have no effect on the extensive margin of integrated firms or the aggregate output of good X. Thus, these assumptions ensure that a change from source-based taxation to destination-based taxation will have no welfare effect, so country 1 is indifferent between SBT and DBT and also indifferent between SBCFT and DBCFT.

An expansion of the tax base by switching from a cash flow tax to an income tax will have two effects under these assumptions. The first effect is to reduce the consumption of good X, since equilibrium consumption of X is decreasing in λ in each country. The reduced consumption of good X lowers welfare because of the presence of the monopoly mark-ups in the X sector. The second effect is to raise country 1 income due to the increase in tax revenue by taxing capital. 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 yields

$$\frac{W(t_1, 1) - W(t_1, 1 - t_1)}{\mu_1 + \mu_2} = \frac{\mu_1}{\mu_1 + \mu_2} \frac{\ln(1 - t_1)}{\sigma - 1} + \frac{t_1}{\sigma}. \tag{23}$$

The gain to country 1 from having an income tax is decreasing in the share of good X that is purchased in country 1. Country 1's welfare gain from an income tax is decreasing in its share of world consumption because it obtains all of the benefit of the gain in income from an income tax, but its loss, due to the decline in consumption, is proportional to its share of world consumption. In particular, country 1 must be better off under an income tax than under the cash flow tax when $\mu_1 = 0$, and must be better off under a cash flow tax than under an income tax when $\mu_2 = 0$.

Figure 1 shows 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. Note that the difference in welfare between the income and cash flow taxes goes to 0 as $\sigma \to \infty$. This occurs because the consumption distortion in the X sector goes to zero as the market becomes perfectly competitive, and the production distortion also goes to zero because the share of fixed costs in total costs goes to zero as $\sigma \to \infty$.

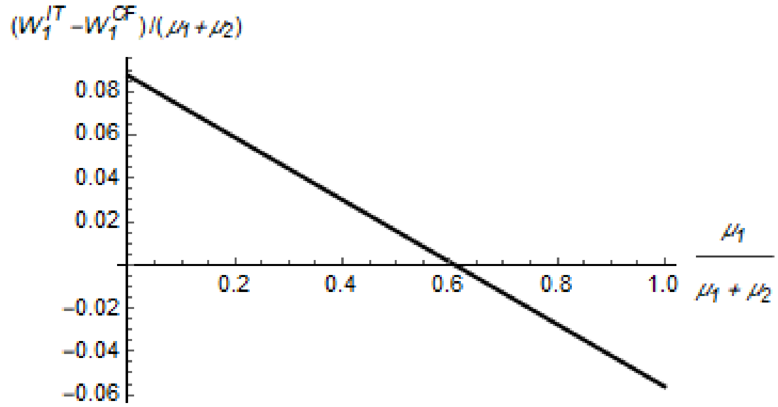

Figure 1: The change in country 1 welfare as a share of worldwide expenditures on good X as a function of country 1's share of good X consumption when $\sigma = 4$ and $t_1 = 0.35$.

Proposition 5 *(Baseline Case) Assume the costs of transfer pricing are prohibitive for X sector firms to engage in income shifting and that $f_2 = 0$. Country 1 will be indifferent between SBT and SBCFT and between DBT and DBCFT. It will prefer income taxation to cash flow taxation when the export market is sufficiently large relative to the domestic market.*

5.2 Selection Effects from Capital Costs

In the second case, we consider the effect of modifying the level of changes in f_2 while holding the overall level of capital costs associated with integration constant at $f_1 + f_2 = \bar{f}$. We maintain the assumptions that $\alpha_1, \alpha_2 \to \infty$ so that there is no transfer pricing distortion. However, the firm selection into integration will maximize national income if and only $(1 - t_1) = (1 - t_{12})\lambda$. In the case of an income tax, where $\lambda = 1$, the relative private capital cost will equal the social cost with SBT and will be less than the social cost under DBT. In contrast, under a cash flow tax where $\lambda = (1 - t_1)$, the relative private capital cost will equal the relative social cost with DBT and will be greater than the social cost under SBT.

From (17), the solution for the marginal integrated firm will be

$$a^* = r \left[\frac{c + \bar{f} + \left(\frac{(1-t_1)}{\lambda(1-t_{12})} - 1 \right) f_2}{c} \right]^{\frac{1}{1-\sigma}} . \tag{24}$$

Differentiating this expression yields the effect of a change in f_2 on the marginal integrated firm,

$$\frac{\partial a^*}{\partial f_2} = \frac{a^*}{1-\sigma} \frac{1}{c + \bar{f} - f_2 + \frac{(1-t_1)f_2}{\lambda(1-t_{12})}} \left(\frac{1-t_1}{\lambda(1-t_{12})} - 1 \right) . \tag{25}$$

An increase in f_2 will result in the selection of more firms into integration if $(1 - t_1) < \lambda(1 - t_{12})$, which can only occur with income taxation. The private cost of integration is less than the social cost in this case when $t_{12} < t_1$, leading to too many integrated firms relative to the social optimum. Since $(1 - t_1) = \lambda(1 - t_{12})$ under SBT, there is a socially optimal selection of firms into integration with SBT and a switch from SBT to DBT will lower welfare of country 1 when $f_2 > 0$ by inducing too many firms into integration. In contrast, an increase in f_2 will result in the selection of fewer firms into integration if $(1 - t_1) > \lambda(1 - t_{12})$, which can only occur with cash flow taxation. Now the private cost of integration is greater than the social cost when when $t_{12} > 0$, leading to too few integrated firms relative to the social optimum. Since $(1 - t_1) = \lambda(1 - t_{12})$ under DBCFT, there is a socially optimal selection of firms into integration under DBCFT and a switch from DBCFT to SBCFT will reduce the welfare of country 1 by reducing the number of integrated firms below the socially optimal level. Thus, incurring some capital costs of integration in country 2 means country

1 will no longer be indifferent between source-based and destination-based tax policies as in the benchmark result of Proposition. The next proposition summarizes these results.

Proposition 6 *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.*

(i) 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.

(ii) 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.

Results (i) and (ii) show that selection can break country 1's indifference between destination-based and sourced-based taxation. These results are illustrated in the two graphs in Figure 2. The optimal tax policy, either SBT or DBCFT, will be determined by the ranking in the baseline case.

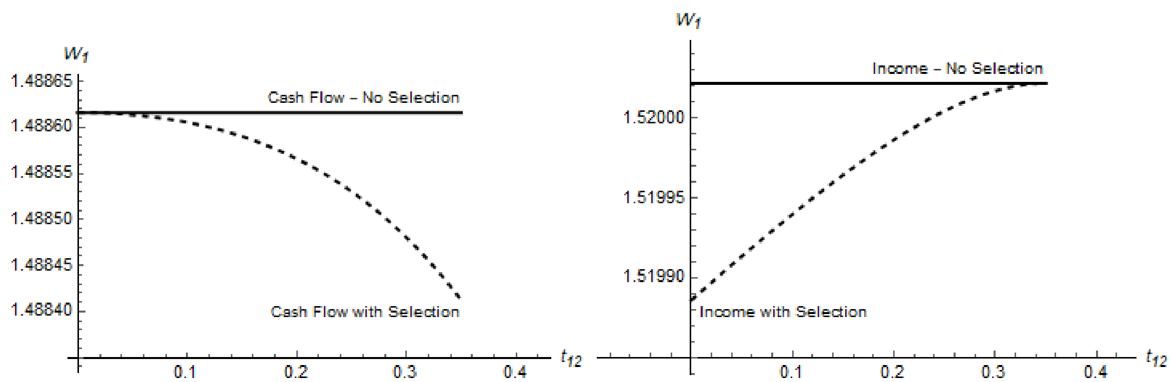

Figure 2: Country 1 welfare as a function of t_{12} under cash flow taxation and income taxation with no transfer pricing comparing $f_2 = 0$ (no selection) with $f_2 > 0$ (selection) when $r = 1$, $c = f_1 = 1$, $t_1 = 0.35$, $\sigma = 4$, and $\mu_1 = \mu_2 = 1$. Firm productivity, $1/a$, is distributed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

5.3 Transfer Pricing Effects

Our third case examines the effect of transfer pricing on the marginal and social costs of inputs for integrated firms. We allow for firms to manipulate transfer prices by assuming $\alpha_1, \alpha_2 < \infty$, but set $f_2 = 0$. The effect of transfer pricing on the efficiency of firm selection decisions will depend on the direction of the income shifitng. 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 social 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 social cost 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 α_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 7 *Assume $f_2 = 0$ and $\alpha_1, \alpha_2 < \infty$, so that transfer price manipulation is not prohibitively expensive for X sector firms.*
(i) Under income and cash flow taxation, a decrease in α_1 decreases country 1 welfare when $t_{12} > t_2$ and a decrease in α_2 increases country 1 welfare when $t_{12} < t_2$.
(ii)Under cash flow taxation, country 1 prefers full border adjustment to partial border adjustment with any $t_{12} > 0$.
(iii) Under income taxation, country 1 strictly prefers partial border adjustment to full border adjustment.

Part (i) shows that the ability of integrated firms to shift income with transfer prices 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. Part (ii) shows that transfer pricing does not alter country 1's preference for DBCFT over SBCFT due to selection effects. However, part (iii) implies that DBT is never preferred to income taxation with some or no border adjustment. It also implies that income taxation with a partial border adjustment can be the optimal policy for country 1 even if SBCFT is preferred to SBT and DBCFT is preferred to DBT. This incentive for $t_{12} > 0$ arises under income taxation because an increase in t_{12} just above zero collects some tax revenues from foreign-source income while having no first-order effect on the social marginal cost of integrated firm production. Figure 3 illustrates this effect. It is generated by setting the size of the export market, μ_2, so that at $t_{12} = 0$ welfare under cash flow taxation is slightly larger than under income taxation. The FDII provision of the Tax Cuts and Jobs Act effectively taxes income from foreign intangible income, such as royalties, at a lower rate than domestic income. Thus, it can be viewed as a partial border adjustment which Proposition 7(iii) indicates is optimal under an income tax regime and can be preferred to DBCFT.

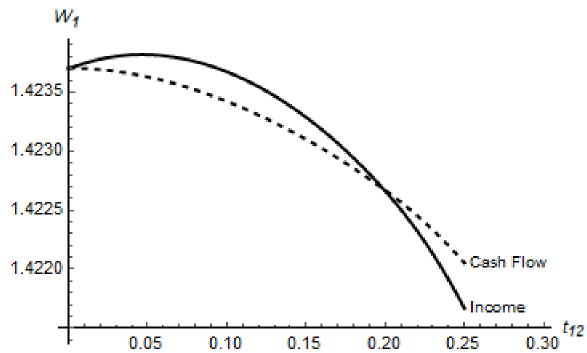

Figure 3: Country 1 welfare as a function of t_{12} under cash flow and income taxation with transfer pricing and $f_2 = 0$ when $c = f_1 = 1$, $t_1 = 0.35$, $\sigma = 4$, and $\mu_1 = 1$. μ_2 is set equal to 0.641 so that at $t_{12} = 0$ welfare under cash flow taxation is slightly larger than under income taxation. Firm productivity, $1/a$, is distributed according to a Type II Pareto distribution on $[0.2, 2]$.

5.4 Tax Reduction in Country 1

Finally, we note that the 2017 U.S. Tax Reform included a reduction in t_1, while the above analysis holds t_1 fixed. We illustrate the welfare effect of optimally adjusting t_1 under destination-based taxation with transfer pricing when $f_2 = 0$. First, note that for any $f_2 \geq 0$ and any t_{12}, country 1 welfare is independent of t_1 under cash flow taxation. With cash flow taxation, t_1 is a pure profit tax and thus induces no distortions. Advocates of cash flow taxation tout this efficiency property. However with unilateral tax policy choices, we are in a second-best environment in which distortions may benefit country 1. Second, note that country 1 welfare under income taxation and cash flow taxation are equal when $t_1 = 0$, again for any f_2 and any t_{12}. There is also no distinction between source-based and destination-based taxation. Third, with $f_2 = 0$,

$$\left.\frac{\partial W_1^{IT}}{\partial t_1}\right|_{t_1=0} = \frac{-\mu_1}{\sigma - 1} + \frac{\mu_1 + \mu_2}{\sigma}. \tag{26}$$

According to (26), an increase in t_1 under DBT, decreases country 1 welfare by decreasing X_1 but increases country 1 welfare by inducing exit by outsourcing firms and shifting production to more efficient integrated firms. Country 1 welfare under income taxation is increasing for t_1 just above zero if $\mu_2 > \mu_1/(\sigma - 1)$. Thus, with a sufficiently large export market, that can be a small fraction of the domestic market, DBT with a positive value of t_1 generates larger country 1 welfare than DBCFT. Thus, we have the following proposition.

Proposition 8 *If $f_2 = 0$, country 1 will strictly prefer DBT with the welfare-maximizing value of t_1 to DBCFT with any value of t_1 if the export market is sufficiently large relative to the domestic market.*

Note that the lower bound on the size of the export market needed for welfare to be larger under DBT is decreasing in σ. Thus, as the X sector becomes more competitive, income taxation will be preferred with smaller export markets. A similar result will also apply if $f_2 > 0$ and to the case of source-based taxation although the market size thresholds above which SBT is preferred to SBCFT are larger than the thresholds needed in Proposition 8. Note also that Proposition 8 is independent of the value of t_2. This means that the preference for DBT with a strictly positive value of t_1 over DBCFT will persist in a tax rate competition equilibrium.

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. retailers with extensive supply chains located outside the United States. They led the main opposition to the DBCFT proposals during the 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 analyze corporate tax policies with heterogeneous firms, selection effects, and transfer pricing.

The formal modelling of income shifting behavior by multinational firms shows that standard pass through arguments break down. Unilateral adoption of destination-based corporate income taxes does not eliminate this behavior. Rather it reverses the incentive for multinationals to use their transfer prices to shift income out of a high-tax adopting country, and instead creates the incentive to shift income into the adopting country. It also affects the extent of over- or under-pass through of tax rate changes. While this change to transfer price incentives benefits the adopting country, it does so under both income and cash flow taxation and includes an incentive towards partial border adjustments under income taxation that increases the relative welfare advantages of income taxation. This in turn will influence the decision of international businesses headquartered in the adopting country to outsource intermediate good production or to produce in a foreign subsidiary. This is why 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 also identifies the key economic characteristics under which a unilateral adopter would prefer income taxation over cash flow taxation. A primary characteristic is a sizable export market, which we believe is a characteristic of international businesses located in the United States. Optimally choosing the tax rate levied on domestic source earnings further enhances the relative welfare advantages of income taxation. In addition, our analysis shows that income taxation with a partial border adjustment can maximize the welfare of a unilateral adopter. These elements of an optimal tax policy, a lower primary corporate income tax rate coupled with a partial border adjustment for foreign source earnings, are represented in the 2017 Tax Cuts and Jobs Act when viewed from the perspective of a unilateral adopter. 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: Substituting (6) into (5) yields

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

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 (10). 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

$$\Pi^{IS}(a) = \lambda c \left(\frac{\Delta^S(a)}{1-t_1} \right)^{1-\sigma} r^{\sigma-1} - \lambda(c+f_1) - f_2$$

For destination-based taxation,

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

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

$$\Pi^{ID}(a) \geq \frac{1}{1-t_1} \left[\lambda c \left(\frac{\Delta^S(a)}{1-t_1} \right)^{1-\sigma} r^{\sigma-1} - \lambda(c+f_1) \right] - f_2 = \frac{\Pi^{IS}(a)}{1-t_1} + \frac{t_1 f_2}{1-t_1} > \Pi^{IS}.$$

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 $\Delta^D(a)(1-t_1)^{\frac{1}{\sigma-1}} \geq \frac{\Delta^S(a)}{(1-t_1)}$. Substituting into the expression for integrated firm profits under source-based taxation yields

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

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 6:

Differentiating (22) with respect to f_2 holding $\bar{f} = f_1 + f_2$ constant, and using (15) implies that

$$\left.\frac{\partial Z_1/q_1}{\partial f_2}\right|_{\bar{f}} = \left[c\left(\frac{r}{a^*}\right)^{\sigma-1} - (c+\bar{f})\right] g(a^*)\partial a^*/\partial f_2. \tag{27}$$

Using the formula for a^* from (24) to substitute for r/a^* implies that (27) simplifies to

$$\left.\frac{\partial Z_1/q_1}{\partial f_2}\right|_{\bar{f}} = -\left(\frac{a^*}{\sigma-1}\right)\frac{f_2}{c+\bar{f}+\left(\frac{(1-t_1)}{\lambda(1-t_{12})}-1\right)f_2}\left(\frac{1-t_1}{\lambda(1-t_{12})}-1\right)^2. \tag{28}$$

With cash flow taxation, (28) 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, (28) 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 $f_2 > 0$ while holding $f_1 + f_2$ constant, country 1 will prefer SBT over DBT.

Proof of Proposition 7:

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 α will be understood to denote a derivative with respect to either α_1 or α_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 α. Fourth, given (22) and using the definition of a^* from (17) to substitute out $c + f_1$, with transfer pricing but $f_2 = 0$ yields

$$\begin{aligned} W_1 &= \mu_1(\ln X_1 - 1) + L_1 + \frac{\mu_1+\mu_2}{\sigma}\left(1 - \frac{1-t_1}{\lambda}\right) \\ &+ c\int_{\underline{a}}^{a^*}\left[\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-1} - \left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma-1}\right]g(a)da \\ &+ \frac{\lambda c(\sigma-1)}{1-t_1}\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-1}\left[1 - \frac{(1-t_{12})\hat{\Delta}(a)}{\Delta(a)}\right]g(a)da. \end{aligned} \tag{29}$$

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

$$
\begin{aligned}
\frac{\partial W_1}{\partial \alpha} &= c\int_{\underline{a}}^{a^*}(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\
&+ \frac{\lambda(\sigma-1)c}{1-t_1}\int_{\underline{a}}^{a^*}(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)\left[1-\frac{(1-t_{12})\hat{\Delta}(a)}{\Delta(a)}\right]g(a)da \\
&- \frac{\lambda(\sigma-1)c}{1-t_1}\int_{\underline{a}}^{a^*}\left[\left(\frac{(1-t_{12})}{\Delta(a)}\right)^{\sigma-2}\frac{(1-t_{12})\hat{\Delta}(a)}{\Delta(a)}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)+\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma}\frac{\partial\hat{\Delta}(a)}{\partial\alpha}\frac{1}{r}\right] \\
&\qquad \cdot g(a)da \\
&+ \frac{\lambda(\sigma-1)c}{1-t_1}\left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma-1}\left[1-\frac{(1-t_{12})\hat{\Delta}(a^*)}{\Delta(a^*)}\right]g(a^*)\frac{\partial a^*}{\partial\alpha}. \qquad (30)
\end{aligned}
$$

Because $\hat{\Delta}(a) > \Delta(a)/(1-t_{12})$ for $t_{12} > t_2$,

$$
\begin{aligned}
\frac{\partial W_1}{\partial \alpha} &> c(\sigma-1)\left(1-\frac{\lambda}{1-t_1}\right)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\
&+ \frac{\lambda(\sigma-1)c}{1-t_1}\int_{\underline{a}}^{a^*}(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)\left[1-\frac{(1-t_{12})\hat{\Delta}(a)}{\Delta(a)}\right]g(a)da \\
&- \frac{\lambda(\sigma-1)c}{(1-t_1)r}\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma}\frac{\partial\hat{\Delta}(a)}{\partial\alpha}g(a)da \qquad (31) \\
&+ \frac{\lambda(\sigma-1)c}{1-t_1}\left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma-1}\left[1-\frac{(1-t_{12})\hat{\Delta}(a^*)}{\Delta(a^*)}\right]g(a^*)\frac{\partial a^*}{\partial\alpha} > 0.
\end{aligned}
$$

Line 1 in (31) between the inequalities is non-negative and the other lines are strictly positive because $\Delta(a)$ is increasing in α, $\hat{\Delta}(a)$ is decreasing in α (with $t_{12} > t_2$), and a^* is decreasing in α. 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-negtaive and independent of a, one can write (29) as

$$
\begin{aligned}
W_1 &= \mu_1(\ln X_1 - 1) + L_1 + \frac{\mu_1+\mu_2}{\sigma}\left(1-\frac{1-t_1}{\lambda}\right) \\
&+ c\int_{\underline{a}}^{a^*}\left[\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-1}-\left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma-1}\right]g(a)da \qquad (32) \\
&+ \frac{\lambda c(\sigma-1)}{1-t_1}\left(\frac{\Delta(a)-\hat{\Delta}(a)(1-t_{12})}{(1-t_{12})r}\right)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma}g(a)da.
\end{aligned}
$$

Differentiating (32) with respect to α then implies that

$$\begin{aligned} \frac{\partial W_1}{\partial \alpha} &= c\int_{\underline{a}}^{a^*}(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\ &+ \frac{\lambda(\sigma-1)c}{1-t_1}\frac{\partial}{\partial\alpha}\left(\frac{\Delta(a)-\hat{\Delta}(a)(1-t_{12})}{(1-t_{12})r}\right)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma}g(a)da \\ &+ \frac{\lambda(\sigma-1)c}{1-t_1}\left(\frac{\Delta(a)-\hat{\Delta}(a)(1-t_{12})}{(1-t_{12})r}\right)\int_{\underline{a}}^{a^*}\sigma\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-1}\frac{\partial}{\partial\alpha}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\ &+ \frac{\lambda(\sigma-1)c}{1-t_1}\left(\frac{\Delta(a^*)-\hat{\Delta}(a^*)(1-t_{12})}{(1-t_{12})r}\right)\left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma}g(a^*)\frac{\partial a^*}{\partial\alpha}. \end{aligned} \tag{33}$$

The first line in(33) is negative because $\Delta(a)$ is increasing in α and the second is negative because $\Delta(a)-\hat{\Delta}(a)(1-t_{12})$ is strictly decreasing in α. The remaining lines are non-positive because $\Delta(a)\geq\hat{\Delta}(a)(1-t_{12})$ and a^* is strictly decreasing in α. Thus, a lower cost of transfer pricing increases country 1 welfare.

Proof of parts (ii) and (iii). 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

$$\begin{aligned} \frac{\partial W_1}{\partial t_{12}} &= c\int_{\underline{a}}^{a^*}(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\ &+ \frac{\lambda c(\sigma-1)}{1-t_1}\int_{\underline{a}}^{a^*}\left((\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)\left[1-\frac{\hat{\Delta}(a)(1-t_{12})}{\Delta(a)}\right]\right. \\ &- \left.\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-1}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})\hat{\Delta}(a)}{\Delta(a)}\right)\right)g(a)da \\ &+ \frac{\lambda c(\sigma-1)}{1-t_1}\left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma-1}\left[1-\frac{\hat{\Delta}(a^*)(1-t_{12})}{\Delta(a^*)}\right]g(a^*)\frac{\partial a^*}{\partial t_{12}}. \end{aligned} \tag{34}$$

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

$$\left.\frac{\partial W_1}{\partial t_{12}}\right|_{t_{12}=0} = c(\sigma-1)\left(1-\frac{\lambda}{1-t_1}\right)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da. \tag{35}$$

To evaluate the sign of (35), note that for $t_{12}<t_2$,

$$\frac{\partial}{\partial t_{12}}\left(\frac{\Delta(a)}{1-t_{12}}\right) = \frac{-(t_{12}-t_2)(2-t_{12}-t_2)}{4\alpha_2(1-t_2)(1-t_{12})^2} > 0 \tag{36}$$

so

$$\frac{\partial}{\partial t_{12}}\left(\frac{1-t_{12}}{\Delta}\right)<0. \tag{37}$$

With income taxation, (35) is strictly positive and the optimal value of $t_{12}>0$.

With cash flow taxation, (35) is equal to zero. However, by expanding line 3 of (34),

$$\begin{aligned}
\frac{\partial W_1}{\partial t_{12}} &= c(\sigma-1)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\
&+ c(\sigma-1)\int_{\underline{a}}^{a^*}(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)\left[1-\frac{\hat{\Delta}(a)(1-t_{12})}{\Delta(a)}\right]g(a)da \\
&- c(\sigma-1)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma-2}\frac{\hat{\Delta}(a)(1-t_{12})}{\Delta(a)}\frac{\partial}{\partial t_{12}}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)g(a)da \\
&- c(\sigma-1)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_{12})r}{\Delta(a)}\right)^{\sigma}\frac{\partial}{\partial t_{12}}\frac{\hat{\Delta}(a)}{r}g(a)da \\
&+ c(\sigma-1)\left(\frac{(1-t_{12})r}{\Delta(a^*)}\right)^{\sigma-1}\left[1-\frac{\hat{\Delta}(a^*)(1-t_{12})}{\Delta(a^*)}\right]g(a^*)\frac{\partial a^*}{\partial t_{12}}.
\end{aligned} \tag{38}$$

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 (38) is negative while lines 2, 4, and 5 are each negative. Thus, (34) 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 (38) is still negative and lines 2, 4, and 5 also remain negative. Thus, (34) is also strictly negative for all $t_{12}\geq t_2$.

Proof of Proposition 8

With DBT and $f_2=0$,

$$\begin{aligned}
W_1 &= \mu_1(\ln X_1-1)+L_1+\frac{t_1(\mu_1+\mu_2)}{\sigma}+c\left(1+\frac{\sigma-1}{1-t_1}\right)\int_{\underline{a}}^{a^*}\left(\frac{(1-t_1)r}{\Delta(a)}\right)^{\sigma-1}g(a)da \\
&- (c+f_1)G(a^*)-\frac{(\sigma-1)c}{r(1-t_1)}\int_{\underline{a}}^{a^*}\hat{\Delta}(a)\left(\frac{(1-t_1)r}{\Delta(a)}\right)^{\sigma}g(a)da.
\end{aligned} \tag{39}$$

At $t_1 = 0$, $\hat{\Delta}(a) = \Delta(a)$ and $\partial\hat{\Delta}(a)/\partial t_1 = 0$ so

$$\left.\frac{\partial W_1}{\partial t_1}\right|_{t_1=0} = \frac{-\mu_1}{\sigma - 1} + \frac{\mu_1 + \mu_2}{\sigma} + g(a^*) \left.\frac{\partial a^*}{\partial t_1}\right|_{t_1=0} \left[c\left(\frac{r}{\Delta(a^*)}\right)^{\sigma-1} - (c + f_1)\right]. \tag{40}$$

The bracketed term in (40) is equal to zero given the definition of a^*.

Appendix: The effect of a hold up problem

Antràs and Helpman (2004) assume there is no outside market for any firm's specific version of the intermediate good. In the absence of an agreement, the country 2 seller can hold up the country 1 firm. In this case, the seller in country 2 loses its wage costs, m^O, and the buyer in country 1 loses the fixed cost, $w_1 c$, net of tax deductions. Antràs and Helpman address this hold up problem by assuming that each firm and its country 2 supplier solve a Nash Bargaining Problem. Letting β denote the relative bargaining power of the firm in country 1, we can express the solution to the Nash bargaining problem as choosing r to maximize $\left(\Pi^O + \lambda w_1 c\right)^{\beta} \left(\Pi_S^O + (1 - t_2)m^O\right)^{1-\beta}$, which yields

$$r = \left(\frac{1 - \beta}{1 - t_{12}}\right) \frac{\Psi(m^O)}{m^O}. \tag{41}$$

With SBT, where the tax rate on revenue is t_1 across both markets, the supplier earns a share $(1 - \beta)$ of the final good producer's pre-tax revenue. In the case of DBT where $t_{12} = 0$, the supplier earns a share $(1 - \beta)$ of the post-tax revenue.

Substituting (41) into (2), the profits of the firm will be a share $\beta\Psi(m)$ in either case. The value of m^0 will be determined by the supplier to maximize its after-tax profits. The necessary condition for maximizing after-tax profits is $\partial(rm)/\partial m^O = 1$, which yields

$$m^O = \left[\frac{(1 - \beta)\kappa}{1 - t_{12}} \frac{\sigma - 1}{\sigma}\right]^{\sigma}. \tag{42}$$

Combining (41)–(43) implies that $r = \sigma/(\sigma - 1)$. Thus, our simplifying assumption that r is a constant is consistent with the equilibrium value of r with Nash Bargaining.

While an increase in β improves the bargaining power of each outsourcing firm, it also reduces the output of each outsourcing firm. If $\beta > 1/\sigma$ the latter effect dominates thereby reducing the equilibrium number of outsourcing firms. The zero profit condition for outsourcing firms still determines the equilibrium value of κ but now

$$\bar{\kappa} = (1 - t_{12}) \left(\frac{\lambda c}{(1-t_1)\beta} \right)^{\frac{1}{\sigma}} \left(\frac{1}{1-\beta} \frac{\sigma}{\sigma - 1} \right)^{\frac{\sigma-1}{\sigma}}. \tag{43}$$

The levels of m^O and m^I will now depend on this new expression for κ but m^I/m^O remains unchanged. The introduction of β will also affect aggregate X-sector consumption, the measure of outsourcing firms, and national income so that

$$X_j^D = X_j^S = \left(\frac{c}{\beta(1-t_1)} \right)^{\frac{1}{1-\sigma}} \frac{\mu_j (1-\beta)}{(\mu_1 + \mu_2)^{\frac{1}{1-\sigma}}} \left(\frac{\sigma - 1}{\sigma} \right). \tag{44}$$

$$N^O = \frac{(1-t_1)\beta}{\lambda c}(\mu_1 + \mu_2) - \int_{\underline{a}}^{a^*} \left(\frac{1 - t_{12}}{(1-\beta)\Delta} \right)^{\sigma-1} g(a)da. \tag{45}$$

and

$$\begin{aligned} \frac{Z_1}{q_1} &= L_1 + \left(\frac{\beta(\lambda - (1-t_1))}{\lambda} \right)(\mu_1 + \mu_2) + c\left(1 + \frac{\lambda(1-\beta)}{(1-t_1)\beta}\right) \int_{\underline{a}}^{a^*} \left(\frac{1-t_{12}}{(1-\beta)\Delta} \right)^{\sigma-1} g(a)da \\ &- (c + f_1 + f_2)G(a^*) - \int_{\underline{a}}^{a^*} \left[(1-t_2)(a + \delta_2 C_2) + t_2 \rho^*(a) + \delta_1 C_1 \right] m^I(a) g(a) da. \end{aligned} \tag{46}$$

One can recover the analogous expressions to (42)–(46) found in the main text by setting $\beta = 1 - 1/r$ in all $1 - \beta$ terms, that creates the equivalent distortions via m^O, and setting $\beta = 1/\sigma$ in all β terms, that eliminates distortions in X-sector market value. All of the results expressed in Propositions 1 - 8 continue to hold. One difference is that if β is too large, only integrated firms may exist in equilibrium.

References

Antràs, P. and E. Helpman, 2004, Global sourcing. *Journal of Political Economy* 112:552 – 580.

Auerbach, A. and M. Devereux, 2018, Cash-flow taxes in an international setting. *American Economic Journal: Economic Policy* 10:69 – 94.

Auerbach, A., M. Devereux, M. Keen, and J. Vella, 2017, Destination-based cash flow taxation. Oxford University Centre for Business Taxation WP 17/01.

Auerbach, A. and D. Holtz-Eakin, 2016, The role of border adjustments in international taxation. American Action Forum.

Bauer, C. and D. Langenmayr, 2013, Sorting into outsourcing: Are profits taxed at a gorilla's arm's length? *Journal of International Economics* 90:326 – 336.

Baumann, U., A. Dieppe, and A. Dizioli, 2017, Why should the world care? Analysis, mechanisms and spillovers of the destination based border adjusted tax. ECB Working Paper No. 2093.

Becker, J., 2013, Taxation of foreign profits with heterogeneous multinational firms, *The World Economy* 36:76 - 92.

Becker, J. and J. Englisch, 2017, A European perspective on the US plans for a destination based cash flow tax. Oxford University Centre for Taxation WP 17/03.

Benzell, S., L. Kotlikoff, and G. LaGarda, 2017, Simulating business cash flow taxation: An illustration based on the "Better Way" corporate tax reform. NBER Working Paper No. 23675.

Bond, S. and M. Devereux, 2002, Cash flow taxes in an open economy, CEPR Discussion Paper 3401.

Brown, E. , 1948, Business-Income Taxation and Investment Incentives, in Income, Employment and Public Policy: Essay in Honor of Alvin H. Hansen (New York: Norton),300 – 316.

Chalendard, C., 2016, Shifting profits through tax loopholes: Evidence from Ecuador, CESifo wp no. 6240.

Costinot, A. and I. Werning, 2017, The Lerner Symmetry Theorem and Implications for Border Tax Adjustment, manuscript.

Cristea, A. and D. Nguyen, 2016, Transfer pricing by multinational firms: New evidence from foreign firm ownerships, *AEJ: Economic Policy* 8: 170 – 202.

Dowd, T., P. Landefeld, and A. Moore, 2017, Profit shifting of U.S. multinationals, *Journal of Public Economics* 148:1 – 13.

Feldstein, M., 2017, "The Shape of US Tax Reform," https://www.project-syndicate.org/commentary/congress-republican-tax-reform-by-martin-feldstein-2017-01.

Feldstein, M. and P. Krugman, 1990, International Trade Effects of Value Added Taxation, in *Taxation in the Global Economy ,* A. Razin and J Slemrod (eds), University of Chicago Press, p. 263-282.

Flaaen, A., 2017, The role of transfer prices in profit-shifting by U.S. multinational firms: Evidence from the 2004 Homeland Investment Act, Finance and Economics Discussion Series 2017-055, Washington, Board of Governors of the Federal Reserve System.

Genser, B. and G. Schulze, 1997, Transfer pricing under an origin-based VAT, *FinanzArchiv* 54: 51 – 67.

Grossman, G., 1980, Border Tax Adjustments: Do They Distort Trade?, *Journal of Internaitonal Economics*, 10, 117-128.

Grossman, G. and E. Helpman, 2002, Integration vs. outsourcing in industry equilibrium. *Quarterly Journal of Economics* 117:85 120.

Guvenen, F., R. Mataloni Jr., D Rassier, and K. Ruhl, 2017, Offshore Profit Shifting and Domestic Productivity Measurement, working paper.

Helpman, E., M. Melitz and S. Yeaple, 2004, Export versus FDI with Heterogeneous Firms, *American Economic Review, 94 (1), 300-316.*

Melitz, M., 2003, The Impact of Trade in Intra-Industry Reallocations and Aggregate Industry Productivity, *Econometrica*, 71 (6), pp. 1695-1725.

Sandmo, A., 1979, A Note on the Neutrality of the Cash Flow Corporation Tax, *Economics Letters* 4, 173 – 76.

Shome, P. and C. Schutte, 1993, Cash-flow tax, Staff Papers, International Monetary Fund, 40: 638 - 662.

Tax Reform Task Force, 2017, A Better Way: Our Vision for a Confident America. http://abetterway.speaker.gov/assets/pdf/ABetterWay-Tax-PolicyPaper.pdf.

U.S. Congress, 2017, An Act to provide for the reconciliation pursuant to titles II and V of the concurrent resolution of the budget for fiscal year 2018. 115th Congress (2017-2018). Congress.gov 25 April 2018.