

Inconsistent Transfer Prices and the Location of Mobile Capital

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Abstract-We investigate the effects of inconsistent transfer prices on the location of capital investments made by multinational firms in a competitive equilibrium.

Investment location depends on the tax rates that domestic and foreign investments face. We show how transfer price inconsistency and repatriation taxes affect the combined foreign and domestic tax rate on foreign production. The tax rate on foreign investment depends on up to five factors: the domestic and foreign statutory tax rates, the domestic and foreign transfer pricing rules, and the after-tax discount rate shareholders use to value riskless cash flows of the firm. We then examine the effects of inconsistent transfer prices on production decisions and productive efficiency in a model in which productive efficiency and capital export neutrality are equivalent. Eliminating the difference between domestic and foreign transfer pricing rules makes foreign investment weakly more attractive, but could either increase or decrease productive efficiency. The efficiency effects of changes in either the domestic or foreign corporate tax rate, or in the shareholder after-tax discount rate, depend on the degree of transfer price inconsistency.

1 Introduction

The allocation of income between a parent corporation and its subsidiary depends on the price at which goods and services are transferred between the two entities. When the entities operate in different countries, the transfer price determines how much of the income earned by the joint efforts of the two entities is taxed in each country. The determination of the transfer price used for tax purposes is difficult in principle and contentious in practice. Income earned by a multinational enterprise is subject to double taxation to the extent that governments use inconsistent transfer prices to allocate income between countries.

Using a model of competitive equilibrium in which all after-tax economic profits are driven to zero, we investigate how taxes affect the location and efficiency of capital investments in the presence of transfer price inconsistency. First, we examine a benchmark case that features a system of worldwide taxation, deferral of domestic taxation of foreign source income until repatriation, and inconsistent transfer prices, which reflects how the U.S. currently taxes international income. Second, we investigate the effects of harmonizing transfer prices on investment location and efficiency. Third, we explore how transfer price inconsistency changes the effects on production location and productive efficiency of reductions in the domestic and foreign corporate tax rates, and of changes in the shareholder after-tax discount rate.

In our model, both countries adhere to the "arm's-length standard" when determining transfer prices used by related parties. Under the arm's-length standard,

the transfer price should be the price at which two unrelated parties engaging in a comparable transaction under comparable circumstances would trade. There are various methods that can be used when applying this principle in practice, including the comparable uncontrolled transaction method, the resale price method, the cost-plus method, the comparable profit method, and the profit-split method. Furthermore, how these methods are applied in practice depends in part on which transactions between unrelated parties are considered to be most comparable to the related party transaction. If when faced with these various methods the two countries would derive the same transfer price, we consider the transfer price rules to be consistent. If the two countries would derive different prices, we consider the transfer price rules to be inconsistent.

Inconsistent application of the arm's-length standard can cause the aggregate taxable income in the two countries to exceed the worldwide accounting income from the transaction, but cannot cause aggregate taxable income to be less than worldwide pretax accounting income. This asymmetry in outcomes reflects the asymmetric position of the taxpayer and the tax authorities. The taxpayer must choose a single transfer price that it uses when filing both its domestic and foreign tax returns. Both the domestic and foreign tax authorities can challenge this transfer price; a successful challenge does not require the other tax authority to accept the new transfer price. A consequence of the asymmetry in the positions of the taxpayer and the tax authorities is that aggregate taxable income (after audit) from the transaction can exceed

worldwide pretax economic income from the transaction, but cannot be less.

Mechanisms such as mutual agreement procedures (MAPs) exist to make it possible for a taxpayer to get relief from double taxation. However, in practice the MAP system often fails to provide such relief because governments are not required to resolve the conflict in a manner that eliminates double taxation (Mortier 2002). In the 1997, 1999, and 2001 Ernst & Young LLP Transfer Pricing Global surveys, over 80% of multinationals identified "double tax relief" as an important international tax issue because transfer pricing adjustments typically result in double taxation (Ackerman and Hobster 2001). Transfer pricing continues to be the top international tax issue to multinationals in the most recent survey, conducted in 2007 (Ernst and Young 2008).

In this paper, we investigate the effect of transfer price inconsistency on production location and productive efficiency. In our model, productive efficiency is achieved if domestic and foreign investment face the same tax rate, i.e., if capital export neutrality holds. Although efficiency and capital export neutrality are not equivalent in general [Horst 1980; Desai and Hines 2004], our focus is not on capital export neutrality *per se* but rather on how transfer price inconsistency and repatriation taxes affect the location and efficiency of production.

We first examine a benchmark case that corresponds to the way that the U.S. taxes foreign income, in which worldwide income is subject to tax by the U.S. government, a credit for foreign taxes paid (subject to limitations) is available, domestic taxation of foreign source income is deferred until repatriation, and double

taxation due to inconsistent transfer prices is possible. We find that the current tax system can induce the efficient level of investment, excessive domestic investment, or excessive foreign investment, depending on the tax rates and the extent of transfer price inconsistency. Eliminating double taxation by harmonizing transfer prices either has no effect on investment or increases foreign investment; in the latter case, the shift towards foreign investment could either increase or decrease efficiency. The effects of reductions in either the domestic or foreign corporate tax rate, or changes in the shareholder after-tax discount rate, depend in part on the extent of transfer price inconsistency.

In Section 2 we review the relevant theoretical and empirical literature. We present our model in Section 3. In Section 4, we examine a benchmark case that reflects the current U.S. tax law. In Section 5 we investigate the effects of harmonizing transfer pricing rules on the location and efficiency of investment. Section 6 investigates the effect of lowering domestic and foreign corporate tax rates, and of a change in the shareholder after-tax discount rate, on investment location and efficiency. Section 7 concludes.

2 Prior literature

The model we use to investigate the effects of inconsistent transfer pricing rules was developed by Anand and Sansing (2000) in their study of formulary apportionment,

the system used by U.S. states and Canadian provinces to allocate taxable income among political jurisdictions. De Waegenaere and Sansing (2008b) also use this model to compare separate accounting to formulary apportionment.

Most papers that examine tax transfer pricing rules assume that all political jurisdictions use the same transfer price; however, there are several exceptions. De Waegenaere, Sansing, and Wielhouwer (2006, 2007) examine inconsistent transfer pricing rules in the context of strategic tax compliance models. In those papers, however, the production decisions preceding the tax compliance decision are taken as fixed. Halperin and Srinidhi (1987) and Elitzur and Mintz (1996) study the effect of inconsistent tax transfer pricing rules on production decisions under conditions of imperfect competition. As in this paper, De Waegenaere and Sansing (2008b) focus on the production decisions that inconsistent transfer pricing rules induce. That paper focuses on the effects of changing from a system of separate accounting to formulary apportionment; this paper focuses on the effects of harmonizing transfer prices, and on how the effects of changes in corporate tax rates and in the shareholder after-tax discount rate depend on the level of transfer price inconsistency.

Our paper also relates to the literature on the effect of taxes on repatriation decisions. Hartman (1985) was the first to examine the effect of the U.S. tax system on foreign investment and repatriation decisions. He showed that the U.S. repatriation tax does not distort the decision by the foreign subsidiary whether to reinvest its earnings in a new project or pay a dividend, because all earnings are reduced by the

same repatriation tax rate sooner or later. Hines and Rice (1994), Weichenrieder (1996), and Altshuler and Grubert (2002) extend Hartman's model to consider the role of investment in financial assets by a foreign subsidiary. These papers show that investing in risk-free financial assets costlessly defers the repatriation tax when the parent corporation discounts riskless after-tax cash flows using the after-domestic corporate tax risk-free rate. Therefore, in these models, the subsidiary should reinvest earnings on operating assets in the risk-free asset instead of repatriating them to the parent as a dividend. Using Brennan's (1970) after-tax capital asset pricing model, De Waegenaere and Sansing (2008a) argue that the appropriate discount rate should reflect the average shareholder tax rate and not the domestic corporate tax rate. In their model, investing in the risk-free asset to avoid the repatriation tax involves an opportunity cost to the extent the after-domestic corporate tax interest rate is less than the after-tax discount rate.

3 Model

We study an economy with one good and two countries. Demand for this good is perfectly inelastic. Domestic demand for the good is δ ; foreign demand for the good is zero. Because the focus of our study is on how inconsistent transfer prices and tax rates affect the location of production, it is convenient to assume that total demand for (and thus the aggregate equilibrium supply of) the good is fixed, and focus on

where production takes place.

Production can occur in either country, employing a constant returns to scale production technology with a single non-depreciable input that we call capital. One unit of physical capital is needed to produce one unit of output. We assume that some inputs are immobile (it may be useful to think of land or natural resources as being an important component of capital), which implies that each country has its own supply curve. The price per unit of physical capital associated with production in each country is determined by aggregate production in that country (denoted q_i), according to

$$C_i(q_i) = \alpha_i q_i. \tag{1}$$

The supply curve in each country is upward-sloping, and $C_i(0) = 0$. The upward-sloping supply curves imply that the competing use for physical capital varies within each country; the assumption that $C_i(0) = 0$ ensures that some production occurs in each country.

All sales occur in the domestic country. One unit of non-depreciable physical capital is needed to sell one unit. The price per unit of capital associated with sales is K . A firm that produces domestically and sells one unit incurs a cost of capital of $r[C_D(q_D) + K]$, where r denotes the cost of equity capital. A foreign subsidiary that produces one unit incurs a cost of capital of $rC_F(q_F)$, whereas its domestic parent incurs a cost of capital of rK .

There are many small private firms incorporated in the domestic country

engaged in production under conditions of perfect competition, in the sense that each firm takes input costs and output prices as given. Each firm can produce domestically or in the foreign country. We let p denote the equilibrium price of the good.

Taxes

Domestic production is taxed by the domestic government at a rate of $\tau_D < 50\%$ on its pretax accounting income each period, i.e., exclusive of its cost of capital, so a firm that produces domestically and sells one unit has after-tax accounting income of $p(1 - \tau_D)$. The income of p from foreign production is subject to tax by both the foreign and domestic governments. The allocation of income for tax purposes between the two countries depends on the transfer price. We let λ_F (λ_D) denote the fraction of income associated with foreign production that according to the transfer price used for tax purposes by the foreign government (domestic government) should be taxed by the foreign government, where

$$0 \leq \lambda_D \leq \lambda_F \leq 1.$$

The upper and lower bounds ensure that taxable income in each country is weakly positive. We let

$$I = \frac{\lambda_F}{\lambda_D} \geq 1$$

represent the degree of transfer price inconsistency between the two countries. When $I = 1$, the transfer prices are consistent and so the taxable income in the foreign

country is equal to the tax deduction permitted by the domestic government; when $I > 1$, the taxable income in the foreign country exceeds the tax deduction allowed in the domestic country, causing more than 100 percent of the income from the transaction to be taxed.

We let τ_F denote the foreign country's corporate tax rate, and assume that $\tau_F < 50\%$. Producing one unit in the foreign country generates after-tax domestic accounting income of $p(1 - \tau_D)(1 - \lambda_D)$, and after-foreign tax foreign earnings and profits of $p(\lambda_D - \tau_F\lambda_F)$. The domestic government uses a worldwide tax system, in which income earned in the foreign country is subject to tax by the domestic government when after-foreign tax earnings are repatriated to the domestic parent via a dividend. The domestic government allows a credit for foreign taxes, but not to exceed the domestic tax on foreign source income. Three cases are possible. In the first case, $I\tau_F \geq \tau_D$, so no repatriation tax is due because the foreign tax exceeds the domestic tax on foreign source income ($\tau_F\lambda_F \geq \tau_D\lambda_D$). Note that this occurs either when $\tau_D \leq \tau_F$, so that the foreign tax exceeds the domestic tax on foreign source income, regardless of the transfer pricing rules, or when $\tau_F < \tau_D$ and $I \geq \frac{\tau_D}{\tau_F}$, in which case the inconsistent transfer prices cause the foreign tax to exceed the domestic tax, even though the domestic tax rate exceeds the foreign tax rate. The after-tax accounting profit from producing one unit in the foreign country is then given by

$$p(1 - \tau_D)(1 - \lambda_D) + p[\lambda_D - \tau_F\lambda_F] = p[1 - \tau_D(1 - \lambda_D) - \tau_F\lambda_F]. \quad (2)$$

In the second and third cases, $I\tau_F < \tau_D$, and the foreign tax is lower than the

domestic tax on foreign source income ($\tau_F \lambda_F < \tau_D \lambda_D$), so that the repatriation of after-foreign tax earnings would trigger a repatriation tax of $\tau_D \lambda_D - \tau_F \lambda_F$. The repatriation tax transforms the after-foreign tax earnings of $\lambda_D - \tau_F \lambda_F$ into an after-repatriation tax amount of $\lambda_D(1 - \tau_D)$. If the foreign subsidiary repatriates its after-foreign tax earnings, the firm's after-tax income equals

$$p(1 - \tau_D). \tag{3}$$

However, the foreign subsidiary can instead invest the after-foreign tax earnings in bonds that earn the risk-free rate of R , thereby indefinitely deferring the repatriation tax. The interest is taxed at the domestic rate τ_D , of which τ_F is collected by the foreign government and $\tau_D - \tau_F$ is collected by the domestic government. Because the interest is taxed immediately under Subpart F, there is no reason to defer repatriating the interest income. De Waegenaere and Sansing (2008a) show that Brennan's (1970) after-tax capital asset pricing model implies that the appropriate discount rate to use when determining the present value of the future interest income earned on the after-foreign tax earnings is $R(1 - \tau_S)$, where τ_S reflects the average shareholder tax rate on interest; we present their argument for the use of $R(1 - \tau_S)$ to discount riskless after-tax cash flows in Appendix A. We assume that $\tau_S \leq \tau_D$. Thus the present value to the domestic parent of the after-foreign tax earnings is $\frac{(\lambda_D - \tau_F \lambda_F)R(1 - \tau_D)}{R(1 - \tau_S)}$, and the present value of the future after-tax cash flows associated with current sale of one unit

equals

$$\begin{aligned}
& p \left[(1 - \lambda_D)(1 - \tau_D) + \frac{(\lambda_D - \tau_F \lambda_F)(1 - \tau_D)}{1 - \tau_S} \right] \\
= & p \left[1 - \tau_D + \frac{(\tau_S \lambda_D - \tau_F \lambda_F)(1 - \tau_D)}{1 - \tau_S} \right]. \tag{4}
\end{aligned}$$

Comparing the after-tax payoffs to the domestic parent from (3) and (4) shows that the foreign subsidiary will immediately repatriate earnings if $\tau_F \lambda_F \geq \tau_S \lambda_D$, i.e. if $I\tau_F \geq \tau_S$, and invest in financial assets otherwise. The intuition is as follows. When $\tau_F \lambda_F \leq \tau_D \lambda_D$, a domestic tax is due upon repatriation. The repatriation tax can be avoided by having the foreign subsidiary invest its after-foreign tax earnings in financial assets. However, there is an opportunity cost associated with investing in financial assets, because $\tau_S \leq \tau_D$ implies that the after-tax return on the bond is weakly lower than the after-tax discount rate for riskless cash flows. As long as $\tau_F \lambda_F \leq \tau_S \lambda_D$, the benefit of avoiding the repatriation tax exceeds the opportunity cost of investing in financial assets.

The above analysis shows that, in each case, the after-tax profit from foreign production is of the form $p(1 - T)$, where T reflects the combined effect of foreign and domestic taxes imposed on income generated by foreign production, plus the opportunity cost associated with investment in financial assets. The following proposition summarizes the effect of the tax system, tax rates, and transfer prices on the combined tax rate T imposed on foreign production.

Proposition 1 (a) *If $I\tau_F > \tau_D$, then there is no repatriation tax, and*

$$T = \tau_D + \lambda_F\tau_F - \lambda_D\tau_D > \tau_D;$$

(b) *if $\tau_S \leq I\tau_F \leq \tau_D$, then the repatriation tax causes all income to be taxed at the domestic country's tax rate, so $T = \tau_D$;*

(c) *if $I\tau_F < \tau_S$, then the repatriation tax is avoided via investment in financial assets, and $T = \tau_D - \frac{(\tau_S\lambda_D - \tau_F\lambda_F)(1 - \tau_D)}{1 - \tau_S} < \tau_D$.*

Three effects determine T : the relation between the corporate tax rates τ_D and τ_F ; the relation between the foreign tax rate and the shareholder tax parameter τ_S ; and the degree of transfer price inconsistency, I . First, suppose there is no transfer price inconsistency, i.e. $\lambda_F = \lambda_D$, and so $I = 1$. Then $T > \tau_D$ if $\tau_F > \tau_D$ because the foreign tax on foreign income exceeds the domestic tax on foreign income; there is no repatriation tax in that case. $T < \tau_D$ if $\tau_F < \tau_S$ because then the cost of avoiding the repatriation tax by investing foreign earnings in financial assets is sufficiently low. The critical comparison is between τ_F and τ_S , and does not involve τ_D , because repatriating one dollar of after-foreign tax earnings yields an after-repatriation tax cash flow of $\frac{1 - \tau_D}{1 - \tau_F}$, whereas reinvesting that same dollar in financial assets and repatriating the interest yields an after-repatriation tax perpetual cash flow of $R(1 - \tau_D)$ dollars that has a present value of $\frac{1 - \tau_D}{1 - \tau_S}$ dollars. Finally, $T = \tau_D$ if $\tau_S \leq \tau_F \leq \tau_D$ because then the cost of avoiding the repatriation tax is too high. To illustrate the effect of transfer price inconsistency, consider the case in which $\tau_F < \tau_S < \tau_D$. Then transfer

price inconsistency can imply that T is greater than, equal to, or less than τ_D .

Specifically, $T > \tau_D$ if transfer price inconsistency is sufficiently high ($I > \frac{\tau_D}{\tau_F}$); $T < \tau_D$

if transfer price inconsistency is sufficiently low ($I < \frac{\tau_S}{\tau_F}$); and $T = \tau_D$ if $\frac{\tau_S}{\tau_F} \leq I \leq \frac{\tau_D}{\tau_F}$.

Equilibrium

We define a competitive equilibrium to be an output price p and aggregate output quantities q_D and q_F at which both domestic and foreign production earns zero after-tax economic profits. In every case, this requires for domestic production

$$p(1 - \tau_D) = rC_D(q_D) = r(\alpha_D q_D + K). \quad (5)$$

The equilibrium condition for foreign production is given by

$$p(1 - T) = rC_F(q_F) = r(\alpha_F q_F + K), \quad (6)$$

where T depends on the subsidiary's repatriation tax and repatriation strategy, as given in Proposition 1. In addition, total output must equal demand, so

$$q_D + q_F = \delta. \quad (7)$$

The equilibrium price and quantities follow from solving the set of equations (5)-(7).

Without taxes, equilibrium production is efficient and given by $q_D = \frac{\delta \alpha_F}{\alpha_D + \alpha_F}$ and

$q_F = \frac{\delta \alpha_D}{\alpha_D + \alpha_F}$. With taxes, the equilibrium price is given by

$$p = \frac{r[\delta \alpha_D \alpha_F + K(\alpha_D + \alpha_F)]}{\alpha_D(1 - T) + \alpha_F(1 - \tau_D)},$$

and the equilibrium production quantities q_D and q_F are given by

$$q_D = \frac{\delta\alpha_F + K \left(1 - \frac{1-T}{1-\tau_D}\right)}{\alpha_D \left(\frac{1-T}{1-\tau_D}\right) + \alpha_F}, \quad q_F = \frac{\delta\alpha_D + K \left(1 - \frac{1-\tau_D}{1-T}\right)}{\alpha_D + \alpha_F \left(\frac{1-\tau_D}{1-T}\right)}. \quad (8)$$

We assume that δ is sufficiently large to ensure that all prices and quantities are positive.¹ It follows from (8) that the effects of the tax system, tax rates, and transfer prices on equilibrium production decisions are determined by

$$\Pi = \frac{1-T}{1-\tau_D},$$

the ratio of the after-tax accounting profit from foreign production to the after-tax accounting profit from domestic production. The fraction of demand satisfied by domestic production is strictly decreasing in Π .

Productive efficiency

The efficient outcome is the pair (q_D, q_F) that minimizes the cost of producing δ units of output; the cost of selling δ units is $r\delta K$, and does not depend on where production occurs. To find this pair, we first use (1) to show that the social cost of producing q_i units in country i is

$$\int_0^{q_i} r\alpha_i q_i dq_i = \frac{r\alpha_i q_i^2}{2}, \quad \text{for } i \in \{D, F\}. \quad (9)$$

Next, we solve the following cost minimization problem:

$$\begin{aligned} \min_{q_D, q_F} & \left\{ \frac{r\alpha_D q_D^2 + r\alpha_F q_F^2}{2} \right\} \\ \text{s.t.} & \quad q_D + q_F = \delta, \end{aligned} \quad (10)$$

¹Our assumptions that $\tau_F < 50\%$ and $\tau_D < 50\%$ jointly ensure that $T < 1$, so that such a δ exists.

the solution to which is

$$q_D = \frac{\delta\alpha_F}{\alpha_D + \alpha_F}, \quad q_F = \frac{\delta\alpha_D}{\alpha_D + \alpha_F}. \quad (11)$$

It follows from (8) and (11) that production is efficient if $T = \tau_D$, inefficient with excess production in the domestic country if $T > \tau_D$, and inefficient with excess production in the foreign country if $T < \tau_D$. Therefore, this model reflects capital export neutrality in that productive efficiency is achieved if and only if domestic and foreign investment face the same tax rate.

4 Production decisions under the status quo

In this section, we use Proposition 1 to investigate the equilibrium production decisions under the current U.S. tax rules that feature worldwide taxation, deferral of domestic taxation of foreign earnings until repatriation, and inconsistent transfer prices. This provides a benchmark case with which we then will consider possible tax changes in transfer prices or tax rates.

Proposition 1 implies that the combined tax rate imposed on foreign production depends on the degree of transfer price inconsistency I . Depending on tax rates and transfer prices, the after-tax accounting profit from foreign production can be either higher or lower than the after-tax accounting profit from domestic production under both systems.

When transfer price inconsistency is high, $I\tau_F > \tau_D$, Proposition 1(a) shows that

$T > \tau_D$. Therefore, production is inefficient with excessive domestic investment. When transfer price inconsistency is moderate, $\tau_S \leq I\tau_F \leq \tau_D$, Proposition 1(b) shows that $T = \tau_D$, and so production is efficient. When transfer price inconsistency is low, $I\tau_F < \tau_S$, Proposition 1(c) shows that $T < \tau_D$. Therefore, production is inefficient with excessive foreign investment. We summarize these results in Table 1.

[INSERT TABLE 1 ABOUT HERE]

5 Harmonizing transfer prices

In this section, we investigate the effects of harmonizing transfer pricing rules on production decisions and productive efficiency. We consider a setting in which transfer price inconsistencies are eliminated. Specifically, both countries agree that the fraction of a foreign producer's income taxed by the foreign country is given by λ_H , where

$$\lambda_D \leq \lambda_H \leq \lambda_F.$$

We let $T_H(T)$ denote the combined tax rate imposed on foreign production in case of consistent (inconsistent) transfer prices. We use Proposition 1 to determine T and T_H , and then compare (8) to (11) to investigate the effect of harmonizing transfer prices on production location and productive efficiency.

Harmonization of transfer prices implies that the domestic tax on domestic income from foreign production decreases from $(1 - \lambda_D)\tau_D$ to $(1 - \lambda_H)\tau_D$, and the foreign tax on foreign income decreases from $\lambda_F\tau_F$ to $\lambda_H\tau_F$. The effect on T_H ,

however, depends also on how harmonization affects the repatriation tax and repatriation decisions.

It follows from Proposition 1 that with harmonized transfer prices (i.e. $I = 1$), the combined tax rate imposed on foreign production depends on the tax rates τ_F , τ_D , and τ_S . With inconsistent transfer prices, production decisions also depend on the degree of transfer price inconsistency. Because $I \geq 1$, six cases are possible.

Case 1: $\tau_F \geq \tau_D$. Then, both with consistent and inconsistent transfer prices, the foreign tax on foreign income exceeds the domestic tax on foreign income. Proposition 1 shows that

$$T_H = \tau_D + \lambda_H (\tau_F - \tau_D) \geq \tau_D. \quad (12)$$

$$T = \tau_D + \lambda_F \tau_F - \lambda_D \tau_D \geq \tau_D. \quad (13)$$

Output is inefficient with excessive domestic production in both cases. Subtracting T from T_H yields

$$T_H - T = \tau_F(\lambda_H - \lambda_F) + \tau_D(\lambda_D - \lambda_H) \leq 0.$$

Because harmonization decreases both the foreign and the domestic tax on foreign income, and there is no repatriation tax, it decreases the combined tax imposed on foreign production. Therefore, harmonizing transfer prices increases foreign production and increases efficiency in this case.

Case 2: $\tau_S \leq \tau_F \leq \tau_D$ and $\tau_D \leq I\tau_F$. Then, whereas under inconsistent transfer prices the foreign tax on foreign income exceeds the domestic tax, the opposite holds

under consistent transfer prices. When transfer prices are inconsistent, Proposition 1(a) shows that $T \geq \tau_D$, and so production is inefficient with excessive domestic production. If transfer prices are harmonized, $I = 1$, and Proposition 1(b) shows that $T_H = \tau_D$, which implies that the efficient level of production is achieved. So in this case, harmonizing transfer prices increase foreign production and yields the efficient outcome.

Case 3: $\tau_F \leq \tau_S$ and $\tau_D \leq I\tau_F$. Then, as in Case 2, harmonization brings the foreign tax on foreign income down from above the domestic tax to below the domestic tax. However, Proposition 1(c) with $I = 1$ now implies that deferring the repatriation tax through investment in financial assets is optimal with consistent transfer prices.

Therefore, although $T \geq \tau_D$, harmonization implies that $T_H \leq \tau_D$. So in this case, harmonizing transfer prices increases foreign production, inducing a shift from inefficient excessive domestic production to inefficient excessive foreign production.

The overall effect on efficiency is ambiguous.

Case 4: $\tau_S \leq \tau_F \leq \tau_D$ and $\tau_S \leq I\tau_F \leq \tau_D$. In this case, the foreign tax on foreign income is lower than the domestic tax, even with inconsistent transfer prices.

Proposition 1(b) shows that with either consistent or inconsistent transfer prices, immediately repatriating income is preferred to investing in financial assets, and so $T = \tau_D$ and $T_H = \tau_D$. Productive efficiency is achieved in both cases, and harmonizing transfer prices has no effect on production decisions.

Case 5: $\tau_F \leq \tau_S$ and $\tau_S \leq I\tau_F \leq \tau_D$. As in Case 4, the foreign tax on foreign income

is lower than the domestic tax, even under inconsistent transfer prices. However, in this case it follows from Proposition 1(b) and Proposition 1(c) with $I = 1$ that, whereas under inconsistent transfer prices it is optimal to immediately repatriate income, yielding $T = \tau_D$, under harmonized transfer prices, it is optimal to avoid the repatriation tax through investment in financial assets, yielding $T_H \leq \tau_D$, and there is excessive foreign production. Therefore, harmonizing transfer prices increases foreign production and reduces efficiency in this case.

Case 6: $\tau_F \leq \tau_S$ and $I\tau_F \leq \tau_S$. In this case, Proposition 1(c) shows that avoiding the repatriation tax by investing in financial assets is optimal both under inconsistent transfer prices and under harmonized transfer prices. Specifically,

$$T_H = \tau_D - \lambda_H \frac{(\tau_S - \tau_F)(1 - \tau_D)}{1 - \tau_S} \leq \tau_D \quad (14)$$

$$T = \tau_D - \frac{(\lambda_D \tau_S - \lambda_F \tau_F)(1 - \tau_D)}{1 - \tau_S} \leq \tau_D. \quad (15)$$

In both cases, production is inefficient with excessive foreign production. Subtracting T from T_H shows that

$$T_H - T = \tau_F(\lambda_H - \lambda_F) + \tau_S(\lambda_D - \lambda_H) \leq 0.$$

Therefore, transfer price harmonization induces greater foreign investment and decreases efficiency in this case.

The above six cases show that transfer price harmonization can affect both the location and efficiency of production, and that both these effects depend on whether foreign income is heavily taxed relative to domestic income (i.e. $I\tau_F$ vs. τ_D), and on

whether τ_S is lower or higher than τ_F . Harmonization increases foreign production when foreign income is heavily taxed relative to domestic income ($I\tau_F \geq \tau_D$).

Harmonization also increases foreign production when foreign income is lightly taxed relative to domestic income ($I\tau_F \leq \tau_D$) and the opportunity cost of deferring the repatriation tax by having the foreign subsidiary invest in financial assets is sufficiently low ($\tau_S \geq \tau_F$). When foreign income is lightly taxed relative to domestic income, but the opportunity cost of deferring the repatriation tax by having the foreign subsidiary invest in financial assets is sufficiently high ($\tau_S < \tau_F$), harmonization has no effect on the location of production.

Transfer price harmonization has ambiguous effects on productive efficiency.

When foreign income is heavily taxed, harmonization increases efficiency if $\tau_F \geq \tau_S$ by bringing the combined tax rate on foreign income closer to the domestic tax rate.

When $\tau_F < \tau_S$, however, harmonization brings the combined tax rate on foreign income down below the domestic tax rate, yielding excessive foreign investment; this induces a shift from inefficiently high to inefficiently low domestic production. The overall effect of harmonization could increase or decrease efficiency in that case. When foreign income is lightly taxed, harmonization decreases efficiency if $\tau_S > \tau_F$ and has no effect if $\tau_F \geq \tau_S$. We summarize the effect of transfer price harmonization on the location and efficiency of production in Table 2.

[INSERT TABLE 2 ABOUT HERE]

6 Lowering tax rates

In this section, we use Proposition 1 to investigate how the effects of domestic and foreign corporate tax rate reductions and changes in the shareholder after-tax discount rate depend on the degree of transfer price inconsistency.

Domestic corporate tax rate

The first tax rate change we examine involves lowering the corporate statutory tax rate τ_D . The U.S. currently has one of the highest tax rates among OECD nations, which as we have seen can induce excessive foreign investment. We analyze the effect of a small decrease in τ_D on the location and efficiency of investment. A change in the domestic tax rate affects both the tax rate on domestic production and the combined tax rate T on foreign production. It follows from (8) that the effect of a change in the domestic tax rate on equilibrium production decisions depends on how it affects the ratio $\Pi = \frac{1-T}{1-\tau_D}$ of the after-tax profit from foreign production to the after-tax profit from domestic production. A change in τ_D increases the fraction of demand satisfied by domestic production if it decreases Π . It follows from (8) and (11) that a change in τ_D increases efficiency if it drives the ratio Π closer to one. We emphasize that effects on production location and productive efficiency depend on Π , and not on the difference between the tax rates T and τ_D .

We consider two cases. If $I\tau_F > \tau_D$, then $T > \tau_D$ and thus foreign production has a lower after-tax profit than domestic production, and so $\Pi < 1$. Proposition 1(a)

implies that differentiating Π with respect to τ_D yields

$$\frac{\partial \Pi}{\partial \tau_D} = \frac{\lambda_D - \lambda_F \tau_F}{(1 - \tau_D)^2},$$

which could be positive or negative, depending on whether $I\tau_F > 1$ or $I\tau_F < 1$. If $I\tau_F > 1$, then $\frac{\partial \Pi}{\partial \tau_D} < 0$, and so decreasing the domestic corporate tax rate increases Π , thereby increasing foreign investment and increasing efficiency. If $I\tau_F < 1$, then $\frac{\partial \Pi}{\partial \tau_D} > 0$, and so decreasing the domestic corporate tax rate decreases Π , thereby increasing domestic investment and decreasing efficiency. The effect of a tax rate decrease depends on the level of transfer price inconsistency.

In contrast, a small decrease in τ_D has no effect on production decisions if $I\tau_F \leq \tau_D$. Indeed, if $\tau_S \leq I\tau_F \leq \tau_D$ or $I\tau_F < \tau_S$, then parts (b) and (c) of Proposition 1 imply that the ratio Π of after-tax profits of foreign and domestic production is independent of τ_D . Therefore, a change in τ_D has no effect on production decisions in these cases. If $\tau_S \leq I\tau_F \leq \tau_D$, a change in τ_D has no effect because the repatriation tax implies that foreign income and domestic income are taxed at the same tax rate. If $I\tau_F < \tau_S$, a change in τ_D has no effect because both the income that is allocated to the domestic parent when it is earned ($p(1 - \lambda_D)$) and the interest from after-foreign tax foreign earnings ($R(\lambda_D - \tau_F \lambda_F)$) face a tax rate of τ_D .

We summarize the results of decreasing the domestic corporate tax rate τ_D in Table 3. If foreign income is heavily taxed relative to domestic income, $I\tau_F > \tau_D$, decreasing τ_D decreases efficiency if transfer prices are very inconsistent ($I\tau_F > 1$) and increases efficiency if transfer price inconsistency is not too extreme ($I\tau_F < 1$). If

foreign income is lightly taxed relative to domestic income, decreasing τ_D has no effect on the location of investment and no effect on productive efficiency.

[INSERT TABLE 3 ABOUT HERE]

Foreign corporate tax rate

Next, we examine the effect of lowering the foreign corporate statutory tax rate τ_F . Corporate statutory tax rates have been steadily declining since 2000 (Ernst and Young 2007). We analyze the effect of a small decrease in τ_F on the location and efficiency of investment. In contrast to the case of a domestic tax rate cut, a change in the foreign tax rate affects only the combined tax rate T on foreign production. It increases the fraction of demand satisfied by domestic production if it increases T . A change in τ_F increases efficiency if it drives T closer to τ_D .

We again consider the three cases in Proposition 1. If $I\tau_F \leq \tau_D$, then $T > \tau_D$. Because a small decrease in τ_F decreases the foreign tax on foreign income, and there is no repatriation tax, it decreases T , thereby increasing foreign investment and increasing efficiency. If $\tau_S \leq I\tau_F \leq \tau_D$, then investment decisions are efficient ($T = \tau_D$), and a small change in τ_F has no effect on investment decisions or efficiency. Finally, if $I\tau_F < \tau_S$, then $T < \tau_D$. Because a small decrease in τ_F decreases the foreign tax on foreign income, and the burden of the repatriation tax can be partly mitigated through investment in financial assets, a cut in the foreign tax rate decreases T . Consequently, it increases foreign investment, and decreases efficiency.

We summarize the results of decreasing the foreign corporate tax rate τ_F in Table 4. Because a small decrease in τ_F decreases the foreign tax on foreign income, it increases foreign production unless $\tau_S \leq I\tau_F \leq \tau_D$, in which case the repatriation tax implies that all income is taxed at the rate τ_D . However, the effect on efficiency is ambiguous. If foreign income is heavily taxed relative to domestic income, $I\tau_F > \tau_D$, decreasing τ_F increases efficiency by bringing the combined tax rate on foreign investment closer to the domestic tax rate. If foreign income is lightly taxed relative to domestic income, $I\tau_F \leq \tau_D$, the effect of decreasing τ_F further depends on a comparison between $I\tau_F$ and τ_S , increasing an already inefficiently high level of foreign investment if $I\tau_F < \tau_S$ and having no effect otherwise.

[INSERT TABLE 4 ABOUT HERE]

Shareholder after-tax discount rate

Finally, we examine the effect of changes in the after-tax discount rate used by shareholders to value the firm's riskless after-tax cash flows on the location and efficiency of production undertaken by multinational firms. As shown in the appendix, the discount rate is $R(1 - \tau_S)$, where R is the risk-free interest rate and the parameter τ_S reflects the average shareholder tax rate on interest; τ_S is increasing in the tax rate that taxable investors face on bond interest and in the fraction of taxable investors in the economy. We focus on the parameter τ_S , a decrease in which increases the after-tax discount rate investors use when valuing riskless cash flows. This in turn

determines whether deferring the repatriation tax on foreign earnings by having the foreign subsidiary invest in financial assets increases firm value.

As in the case of a foreign tax rate cut, a change in the shareholder tax rate affects only the combined tax rate T on foreign production, and the effect on production location and productive efficiency depends on whether the change reduces the difference between the tax rates imposed on foreign and domestic production. There are two cases to consider. If $\tau_S \leq I\tau_F$, then τ_S is so low that deferring the repatriation tax via investment in financial assets is unattractive, so a further reduction would have no effect on production decisions or efficiency. If $\tau_S > I\tau_F$, then Proposition 1(c) shows that $T < \tau_D$. A decrease in τ_S increases T , because it increases the cost of avoiding the repatriation tax. Therefore, it increases domestic investment and increases efficiency. We summarize the results of increasing the shareholder after-tax discount rate by decreasing the shareholder tax parameter τ_S in Table 5.

[INSERT TABLE 5 ABOUT HERE]

7 Conclusions

We have examined the effects of inconsistent transfer prices on the location of capital investments in a competitive equilibrium. The decision to invest domestically or in a foreign country depends jointly on statutory tax rates, the extent to which transfer prices are inconsistent, and the after-tax discount rate shareholders use to value

riskless cash flows. We also examine the effects of transfer price inconsistency on productive efficiency in a model in which productive efficiency is equivalent to capital export neutrality. Eliminating the difference between domestic and foreign transfer pricing rules makes foreign investment weakly more attractive, but could either increase or decrease productive efficiency. The efficiency effects of reductions in either the domestic or the foreign corporate tax rates, or changes in the shareholder after-tax discount rate, also depend on the degree of transfer price inconsistency.

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Investment efficiency under the status quo

	Efficiency
$\tau_D < I\tau_F$	Excess domestic investment
$\tau_S \leq I\tau_F \leq \tau_D$	Efficient investment
$I\tau_F < \tau_S$	Excess foreign investment

Table 1

Effect of harmonizing transfer prices on investment location and efficiency

	Production location	Efficiency
$I\tau_F \geq \tau_D; \tau_S \leq \tau_F$	Increase foreign investment	Increase efficiency
$I\tau_F \leq \tau_D; \tau_S \leq \tau_F$	No effect	No effect
$I\tau_F \geq \tau_D; \tau_F \leq \tau_S$	Increase foreign investment	Ambiguous effects on efficiency
$I\tau_F \leq \tau_D; \tau_F \leq \tau_S$	Increase foreign investment	Decrease efficiency

Table 2

Efficiency and location effects of decreasing the domestic corporate tax rate

	Production location	Efficiency
$1 \leq I\tau_F$	Increase foreign investment	Increase efficiency
$\tau_D \leq I\tau_F \leq 1$	Increase domestic investment	Decrease efficiency
$I\tau_F \leq \tau_D$	No effect	No effect

Table 3

Efficiency and location effects of decreasing the foreign corporate tax rate

	Production location	Efficiency
$\tau_D < I\tau_F$	Increase foreign investment	Increase efficiency
$\tau_S \leq I\tau_F \leq \tau_D$	No effect	No effect
$I\tau_F < \tau_S$	Increase foreign investment	Decrease efficiency

Table 4

Efficiency effects of increasing the shareholder after-tax discount rate

	Production location	Efficiency
$\tau_S \leq I\tau_F$	No effect	No effect
$I\tau_F \leq \tau_S$	Increases domestic investment	Increases efficiency

Table 5

Appendix

We consider a model with $M + N$ risk-averse investors who can invest in either a riskless bond or a risky stock. The riskless bond pays interest at the rate R on each date in perpetuity. The stock generates a risky return \tilde{x} on each date in perpetuity. The risky return is normally distributed with a mean of μ and a variance of σ^2 . The investors are of two types: taxable and tax-exempt. There are M taxable investors that face a constant statutory tax rate t_B on interest from the and a constant effective tax rate t_G on the stock return. The effective tax rate t_G can be lower than the statutory rate on realized capital gains because the tax on unrealized gains is deferred until the stock is sold, and tax may be avoided altogether through a charitable gift of the stock, or through a basis step-up upon the investor's death. The remaining N investors are tax-exempt.

Each investor has a utility function over end-of period wealth of the form $U(w) = -e^{-\rho w}$. This utility function has the property that if \tilde{w} is normally distributed with mean μ and variance σ^2 , the investor's certainty equivalent is equal to $\mu - \frac{\rho\sigma^2}{2}$. We normalize the number of shares outstanding for the stock to be one.

An equilibrium is defined as a portfolio for each investor that maximizes that investor's expected utility given the stock price, and a stock price at which supply equals demand. Each of the M taxable investors buys s_T shares at a price of P per share to solve the following maximization problem.

$$\max_{s_T} \left\{ \frac{s_T \mu (1 - t_G) - s_T^2 \rho \sigma^2 (1 - t_G)^2 / 2}{R(1 - t_B)} - s_T P \right\}$$

Differentiation yields the following first-order condition for each of the M taxable investors.

$$s_T^* = \frac{\mu(1 - t_G) - PR(1 - t_B)}{\rho \sigma^2 (1 - t_G)^2}$$

Each of the N tax-exempt investors buys s_E shares of stock at a price of P per share to solve the following maximization problem.

$$\max_{s_E} \left\{ \frac{s_E \mu - s_E^2 \rho \sigma^2 / 2}{R} - s_E P \right\}$$

Differentiation yields the following first-order condition for each of the N tax-exempt investors.

$$s_E^* = \frac{\mu - PR}{\rho \sigma^2}$$

The market clearing condition completes the characterization of the equilibrium.

$$M s_T^* + N s_E^* = 1$$

Substituting each investor's demand into the market clearing condition and solving for P yields the equilibrium stock price.

$$P = \frac{\mu \left[\frac{M}{1 - t_G} + N \right] - \rho \sigma^2}{R \left[\frac{M(1 - t_B)}{(1 - t_G)^2} + N \right]}$$

We determine the appropriate discount rate for riskless cash flows by finding the discount rate r_f for which $\frac{\Delta\mu}{r_f} = \Delta P$, because an increase in μ with no corresponding increase in σ^2 represents an increase in riskless cash flows. Therefore,

$$r_f = \frac{1}{\partial P / \partial \mu}.$$

Differentiating P with respect to μ and solving for r_f yields

$$r_f = \frac{R \left[\frac{M(1-t_B)}{(1-t_G)^2} + N \right]}{\frac{M}{1-t_G} + N}.$$

Finally, we express the discount rate as $r_f = R(1 - t_S)$ to highlight the relation between investor tax rates and the appropriate discount rate. Solving for t_S yields

$$t_S = \frac{\frac{M(t_B - t_G)}{(1-t_G)^2}}{\frac{M}{1-t_G} + N}.$$

When $t_G = 0$, $t_S = \frac{Mt_B}{M+N}$, the average shareholder tax rate on interest; when $t_G > 0$, $t_S < \frac{Mt_B}{M+N}$. For the discount rate $R(1 - t_D)$ to be normatively appropriate in our model, we require $N = 0$, $t_G = 0$, and $t_B = t_D$. In other words, no tax-exempt investors own stock taxable investors face a tax rate on bond interest equal to the domestic corporate tax rate, and taxable investors face a zero effective tax rate on accrued capital gains.