Taxation of international investment and accounting valuation*

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ABSTRACT: This paper develops a model of a firm's foreign investment decisions and characterizes its optimal investment and repatriation strategies. It then derives the theoretical relations among the book value of the deferred tax liability, the level of permanently reinvested earnings, and the value of the subsidiary to the parent. It shows that the valuation relevance of these items depends on whether the earnings are invested in operating assets or financial assets. It also shows the effects of a temporary "tax holiday" on firm value.

Key Words: Taxation, multinational investment, deferred tax liability, permanently reinvested earnings.

I. INTRODUCTION

This paper derives the relations among U.S. taxation on foreign investment, the value of these investments, and the accounting disclosures associated with them. We derive the market values of accounting assets, liabilities, and permanently reinvested earnings, and show how these values vary with the firm's optimal repatriation strategy. Our paper helps inform empirical research into the effects of deferred tax liabilities and permanently reinvested earnings on firm value.

Most income earned by a foreign subsidiary of a U.S. corporation is taxed by the foreign government when the income is earned and by the U.S. government when the earnings are repatriated to the parent via a dividend. Certain types of income, such as interest income, is taxed by the U.S. when it is earned. A credit for foreign taxes paid is allowed to prevent double taxation, so if the U.S. tax rate is higher than the foreign tax rate, the investment bears the foreign tax rate when income is earned and the difference between the U.S. and foreign tax rates when the earnings are repatriated. The potential U.S. repatriation tax on after-foreign tax earnings can be disclosed in a firm's financial statements in one of two ways under *Statement of Financial Accounting Standards No. 109: Accounting for Income Taxes* (FASB 1992), paragraphs 31(a) and 44(c). First, the firm can accrue a deferred tax liability equal to the tax that would be due if the earnings were to be repatriated. Second, the firm can instead simply disclose the amount of reinvested earnings. If sufficient evidence exists that the earnings will be reinvested in the foreign subsidiary for an indefinite period, the firm need not

accrue a deferred tax liability on those earnings. The firm can characterize all, some, or none of its reinvested foreign earnings as indefinitely reinvested. For example, in 2001, Pfizer Inc. generated about $6 billion in foreign pretax earnings and incurred foreign income tax expense of $900 million. Pfizer increased its permanently reinvested foreign after-tax earnings from $14 billion to $18 billion from 2000 to 2001. Pfizer's decision to not recognize deferred U.S. tax expense on most of its foreign earnings decreased its 2001 income tax expense for financial reporting purposes by about $1 billion. These issues have increased in importance due to a provision in the American Jobs Creation Act of 2004 that created a temporary "tax holiday" during which earnings from foreign subsidiaries could be repatriated to their U.S. parent at a low tax rate. Many firms took advantage of this tax holiday to repatriate accumulated earnings from foreign subsidiaries (Albring, Dzuranin, and Mills 2005).

We derive the relations among the U.S. taxation of foreign investments, the value of these investments, and the tax accounting disclosures associated with them. We explicitly model the uncertain arrival of tax holidays and the effects of possible future holidays on the firm's decisions. First, we characterize the optimal investment, repatriation, and financing decisions for a foreign subsidiary of a U.S. corporation. Next, given these optimal decisions, we determine the value of the subsidiary to the parent. We also determine the book value of the subsidiary's assets, the deferred tax liability associated with the reinvested earnings, and the amount of permanently reinvested earnings. We then derive the theoretical relations among the book value of

the deferred tax liability, the level of permanently reinvested earnings, and the value of the subsidiary to the parent. Finally, we derive the relations among the change in the value of the subsidiary when the tax holiday occurs, the book value of the deferred tax liability, and the level of permanently reinvested earnings.

We find that the effect of the deferred tax liability and/or the level of permanently reinvested earnings on the value of the subsidiary depends on whether these earnings are reinvested in operating assets or financial assets. The deferred tax liability and permanently reinvested earnings are associated with a lower value of the subsidiary if the earnings are invested in financial assets, but not if they are invested in operating assets. However, we find that the deferred tax liability associated with earnings invested in financial assets overstates the effect of the potential repatriation tax on firm value. The overstatement arises because the deferred tax liability is equal to the tax that would be due if the earnings were repatriated immediately; the effect on firm value is less to the extent the firm has a use of the funds that is better than immediate repatriation.

In Section II we review the theoretical and empirical literature. We present our model in Section III. In Section IV we derive the optimal way a firm repatriates its earnings after its investment in operating assets reaches the optimal size, and consider whether a dividend payment at a holiday that is financed with debt increases firm value. In Section V we derive the optimal level of investment in operating assets and financial assets. Section VI derives the relations between the value of the foreign

subsidiary and accounting disclosures. Section VII concludes.

II. PRIOR LITERATURE

Hartman (1985) was the first to investigate formally the effect of the U.S. repatriation tax system on investment 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. Hartman's model has had a very strong influence on subsequent research into the effects of international taxation, including Sinn (1993), Hines (1994), Sansing (1996), Babcock (2000), Clausing (2005), and Blouin and Krull (2006). It also is the basis for the analysis of foreign investment decisions in Scholes et al. (2005).

While our model is similar in spirit to Hartman's work, we diverge from his framework in several important ways. First, our model features temporary tax holidays. We formally model uncertainty regarding the future U.S. tax regime, in which brief opportunities to repatriate earnings at a lower tax rate arrive in a stochastic fashion. In addition, we allow the possibility of a future tax holiday to change the investment decisions that the multinational firm makes today. Second, we distinguish between *financial assets* and *operating assets*. Dividends can only be paid using financial assets because operating assets are costly to move or liquidate.

Therefore, a foreign subsidiary can only respond to a temporary tax holiday by repatriating financial assets. This is consistent with Slemrod's (1992) tax planning hierarchy in which most tax planning activities involve accounting and financial transactions instead of transactions involving real investment decisions. Third, Hartman's framework features a finite time horizon in which all foreign earnings are ultimately repatriated to the U.S. parent on a future date. This date may be very far in the future, but it will arrive. In contrast, our model features an infinite time horizon. This allows the foreign subsidiary to permanently defer the repatriation tax on its operating assets, repatriating only the earnings on financial assets to the U.S. parent. This also provides a framework in which some foreign earnings are never repatriated, consistent with the financial accounting designation. Genuinely permanent reinvestment cannot arise in Hartman's framework.

Recent empirical research has investigated the relation between accounting disclosures associated with future U.S. repatriation taxes and firm value. Collins, Hand, and Shackelford (2001) find evidence that the unrecognized deferred tax liability associated with permanently reinvested foreign earnings is associated with a lower stock price. This evidence is consistent with evidence found in Amir, Kirschenheiter, and Willard (1997) that deferred tax assets and liabilities are reflected in firm value. Krull (2004) finds evidence that the change in the amount of permanently reinvested foreign earnings is associated with earnings management incentives. The decision whether to accrue a deferred tax liability or simply disclose permanently reinvested

foreign earnings does not affect firm value in our model. Our focus is on the relations between accounting disclosures and the present value of the future after-tax cash flows from the foreign subsidiary to the U.S. parent; therefore, earnings management issues do not arise in our model. Hartzell, Titman, and White (2006) find evidence that the cash holdings of firms are increasing in both the level of foreign income and the potential U.S. tax on a dividend from the foreign subsidiary to the U.S. parent. These findings are consistent with our model.

Albring, Dzuranin, and Mills (2005) examine the responses of firms to the tax holiday enacted as part of the American Jobs Creation Act of 2004. They estimate the level of repatriations of earnings formerly considered to be permanently reinvested, the taxes paid on these repatriations, and the difference between the taxes paid and the taxes that would have been paid had the earnings been repatriated under the normal tax treatment. Blouin and Krull (2006) also document a significant increase in repatriations due to the tax holiday. In addition, they find a significant increase in stock repurchases by firms following these repatriations.

Finally, our paper relates to earlier work that examines the relation between deferred taxes and firm value. Sansing (1998) and Guenther and Sansing (2000) derive the value of a deferred tax liability arising from book-tax depreciation differences and a deferred tax asset arising from expenses that are accrued for book purposes but only deducted for tax purposes when they are paid. De Waegenaere, Sansing, and Wielhouwer (2003) derive the value of a deferred tax asset arising from a net operating

loss carryover.

III. THE MODEL

A firm incorporated in the United States owns 100 percent of a subsidiary incorporated in a foreign country. The firm faces a tax rate on its domestic (U.S.) earnings of τ_D and is owned by risk-neutral investors with a cost of capital $r \geq (1 - \tau_D)R$, where R is the worldwide risk-free interest rate.[1] Let K denote the total investment by the subsidiary in operating assets (OA), and let Y denote the total investment by the subsidiary in financial assets (FA). We assume that investments in operating assets are irreversible, and that their liquidation value is always less than the value of operating the subsidiary as a going concern.

Operating assets generate a pretax return $f(K)$, in perpetuity, where $f(0) = 0$, $f(\cdot) \geq 0$, $f'(K) > 0$, $f''(K) < 0$, $(1 - \tau_D)f'(0) > r$, and $\lim_{K \to \infty} f'(K) = 0$. Financial assets generate a pretax return RY, $R > 0$. Returns on both operating and financial assets are generated continuously over time, and can either be reinvested in additional operating assets, repatriated to the U.S. parent as cash dividends, or invested in financial assets held by the foreign subsidiary.

Returns on both operating and financial assets are taxed by the government of

[1] Because investors are risk-neutral, r represents the after-tax rate of return on the riskless asset, where the relevant tax rate is an average of investor tax rates (Brennan 1970). Our assumption implies that the average investor tax rate is less than or equal to the domestic corporate tax rate.

the foreign country (F) when they are earned at a constant rate of τ_F, $0 \leq \tau_F \leq \tau_D$. The returns may also be subject to tax by the U.S., depending on whether the returns are on operating or financial assets and on whether and when the returns are repatriated to the parent in the domestic country. Returns on financial assets are taxed immediately at the domestic tax rate τ_D, $\tau_F \leq \tau_D < 1$, against which the domestic firm can take a credit for the foreign taxes paid, yielding an effective domestic tax rate of $\tau_D - \tau_F$ on the pretax returns on financial assets. In contrast, returns on operating assets are not taxed by the U.S. until they are repatriated to the domestic parent via a dividend. Because such dividends are from after-foreign tax earnings, the U.S. tax collected on one dollar of such dividends is $\frac{\tau_D - \tau_F}{1-\tau_F}$ dollars. For example, if $\tau_D = 35\%$, and $\tau_F = 20\%$, then the U.S. tax rate on the repatriated earnings is 18.75%. This implies that the U.S. tax on the original return $f(K)$ is $(\tau_D - \tau_F)f(K)$; this repatriation tax is collected when the dividend is paid, which could be many years after it is earned. In contrast, earnings on financial assets are taxed by the U.S. when they are earned.

An exception to the tax treatment on accumulated repatriated earnings arises if the government enacts a "tax holiday," at which repatriated accumulated earnings from foreign investments are taxed at a rate $\tau_H \leq \frac{\tau_D - \tau_F}{1-\tau_F}$. For example, the American Jobs Creation Act of 2004 temporarily reduced the repatriation tax to 5.25%. To emphasize the temporary nature of the holiday, we model a tax holiday as an instantaneous event. Because at the holiday accumulated financial assets can be

repatriated at the lower rate, the anticipation of a future holiday affects the firm's decision whether to reinvest its foreign earnings on operating assets in financial assets or to repatriate them as dividends. We assume that a tax holiday occurs during the next interval of time dt with probability λdt. Therefore, the probability on date t that the next tax holiday occurs before date $t+T$ is $1-e^{-\lambda T}$. We summarize the tax rates imposed on both operating assets and financial assets in Table 1.

IV. REPATRIATION DECISIONS

The foreign subsidiary has three alternative uses of cash that it generates from its assets. First, it can reinvest in its operating assets. Second, it can pay a dividend to its U.S. parent. Third, it can invest in financial assets. Because the marginal return on operating assets decreases to zero as K becomes large (i.e., $\lim_{K\to\infty} f'(K) = 0$), eventually the firm prefers to stop investing in operating assets. In this section, we assume that the subsidiary has reached the optimal level of operating assets K^*, and determine whether it should reinvest earnings in financial assets or repatriate them as dividends, and whether the financial assets themselves should be repatriated.

Because investments in operating assets are irreversible and cannot be profitably liquidated, all repatriations must be in the form of financial assets. Furthermore, because earnings from financial assets are taxed by the U.S. government when they are earned, our assumption that $r \geq (1-\tau_D)R$ ensures that delaying the repatriation of

earnings on financial assets would not increase firm value. Therefore, these earnings should always be repatriated immediately. Finally, because returns on financial assets exhibit constant returns to scale, the subsidiary will at any point in time either repatriate all or none of its financial assets.

Therefore, once the subsidiary stops investing in operating assets, it can pursue one of three strategies. First, it can *permanently reinvest* all of its earnings from operating assets in financial assets and only repatriate the earnings on the financial assets. Second, it can *temporarily reinvest* all of its earnings from operating assets in financial assets, repatriating the earnings from financial assets immediately and the accumulated earnings on operating assets at a later date. Third, it can *immediately repatriate* its earnings from operating assets as they are earned.

In this section, we first derive the present value to the parent of the future cash flows associated with one dollar of after-foreign tax earnings held by the subsidiary under each of these three strategies. We then derive the conditions under which each of these three strategies are optimal. Finally, we consider whether the foreign subsidiary should borrow to finance a dividend payment at a tax holiday.

Value of after-foreign tax earnings

Permanently reinvesting a dollar of after-foreign tax earnings in financial assets and only repatriating the earnings on the financial assets yields a perpetuity of $(1 - \tau_D)R$,

the value of which to the parent is $\frac{(1-\tau_D)R}{r}$, which is less than or equal to one.[2] Suppose instead that the subsidiary immediately repatriates earnings on operating assets by paying a dividend to the parent. This yields an after-tax dividend of $1-\frac{\tau_D-\tau_F}{1-\tau_F}=\frac{1-\tau_D}{1-\tau_F}$ to the parent, which is less than or equal to one because $\tau_F \leq \tau_D$. Finally, suppose that the subsidiary temporarily reinvests the dollar in financial assets, repatriates the interest on the dollar as it is earned, and then repatriates the dollar itself at time T. Then, the value of the after-tax dividends to the parent equals the present value of the after-tax interest on the dollar between dates zero and T, $\int_0^T (1-\tau_D)Re^{-rt}dt$, plus the present value of the after-tax dividend at time T. If no holiday occurs at time T, this is equal to

$$\frac{(1-\tau_D)R}{r}(1-e^{-rT})+\left(\frac{1-\tau_D}{1-\tau_F}\right)e^{-rT},$$

which is clearly dominated by either immediately repatriating, which yields $\frac{1-\tau_D}{1-\tau_F}$, or permanently reinvesting, which yields $\frac{(1-\tau_D)R}{r}$. However, the firm may be able to do better by letting the repatriation date T coincide with the next holiday date. Given the probability distribution of the time T until the next holiday, the expected value of the after-tax dividends to the parent then is

$$\begin{aligned} & \int_0^\infty \left\{\frac{(1-\tau_D)R}{r}(1-e^{-rT})+(1-\tau_H)e^{-rT}\right\}\lambda e^{-\lambda T}dT \\ = \quad & \frac{(1-\tau_D)R+(1-\tau_H)\lambda}{r+\lambda}, \end{aligned} \tag{1}$$

[2]Recall that we model a tax holiday as occurring at a point in time as opposed to during an interval of time, so zero interest accrues at a tax holiday.

which is weakly less than one because $r \geq (1-\tau_D)R$ and $0 \leq \tau_H < 1$.

Henceforth, we refer to a foreign subsidiary that invests all earnings from operating assets in financial assets and never repatriates the financial assets as a *never repatriating subsidiary;* a foreign subsidiary that invests all earnings from operating assets in financial assets until a tax holiday and repatriates all financial assets at the tax holiday as a *holiday repatriating subsidiary*; and a foreign subsidiary that immediately repatriates all earnings from operating assets and never invests in financial assets as an *immediately repatriating subsidiary.*

We let δ_N, δ_H, and δ_I, denote the value to the parent of an after-foreign tax dollar of subsidiary earnings held by a never repatriating subsidiary, a holiday repatriating subsidiary, and an immediately repatriating subsidiary, respectively. We refer to the values δ_N, δ_H, and δ_I as *valuation discount factors.* We summarize the results from this section in Proposition 1.

Proposition 1

(a) The valuation discount factor for a never repatriating subsidiary is $\delta_N = \frac{(1-\tau_D)R}{r}$;

(b) the valuation discount factor for a holiday repatriating subsidiary is $\delta_H = \frac{(1-\tau_D)R+(1-\tau_H)\lambda}{r+\lambda}$; *and*

(c) the valuation discount factor for an immediately repatriating subsidiary is $\delta_I = \frac{1-\tau_D}{1-\tau_F}$.

(d) $\delta_N \leq 1$, $\delta_H \leq 1$, *and* $\delta_I \leq 1$.

The value to the parent of an after-foreign tax dollar of earnings by the foreign subsidiary is less than one dollar because of the tax paid on the dividend and/or the opportunity cost incurred to defer the repatriation tax permanently or until a tax holiday. If the subsidiary immediately repatriates a dollar of after-foreign tax earnings, it incurs a tax $\frac{\tau_D - \tau_F}{1-\tau_F}$. This tax can be deferred, at the cost of delaying the dividend payment. Because the after-tax rate of return earned on a dollar reinvested in financial assets is less than the parent's cost of capital, there is an opportunity cost associated with delaying the repatriation of the earnings.

Optimal repatriation strategy

In this section, we derive the optimal repatriation strategy by the foreign subsidiary once it stops investing in operating assets. To provide some intuition for our results, we first consider whether a firm with a foreign subsidiary that holds financial assets of Y prefers to repatriate the assets when a tax holiday arrives or to continue to hold financial assets.

Repatriating one dollar of financial assets yields an after-tax dividend of $1 - \tau_H$ to the parent. The tax of τ_H can be deferred by reinvesting the dollar in financial assets. Permanently reinvesting a dollar in financial assets and only repatriating the earnings on the dollar yields a value of $\frac{(1-\tau_D)R}{r}$; therefore, the subsidiary will pay a dividend of Y at the holiday if and only if

$$r > \frac{1-\tau_D}{1-\tau_H} R. \tag{2}$$

Note that the foreign tax rate τ_F does *not* affect how a subsidiary with accumulated financial assets will behave at a tax holiday. That decision does not depend on the foreign tax rate because the repatriation tax at a tax holiday only depends on τ_H, and the earnings on a never repatriated dollar are taxed immediately at the foreign tax rate τ_F and at the domestic tax rate $\tau_D - \tau_F$, so that the after-tax dividend only depends on τ_D.

The above inequality determines whether a subsidiary that holds accumulated financial assets should repatriate them *at a holiday*. Now, we investigate how the subsidiary's *current* investment behavior is affected by the repatriation tax and the anticipation of a future tax holiday. We do this by making three pairwise comparisons among immediately repatriating earnings from operating assets, never repatriating earnings from operating assets, and reinvesting operating assets in financial assets to repatriate them at a tax holiday.

For our first pairwise comparison, we compare immediate repatriation to never repatriating the earnings from operating assets. Comparing δ_I to δ_N implies that the firm will prefer immediate repatriation of earnings from operating assets to never repatriating earnings from operating assets if and only if

$$r > (1 - \tau_F)R. \tag{3}$$

We emphasize that even though returns on the financial assets are immediately taxed at τ_D and investing in financial assets has weakly negative NPV because $r \geq (1 - \tau_D)R$, reinvesting earnings from operating assets in financial assets may be

optimal in order to permanently defer the repatriation tax on the earnings from operating assets. Permanently deferring the tax has a benefit of $\frac{\tau_D - \tau_F}{1-\tau_F}$. However, permanent deferral requires the earnings to be invested in an investment with a net present value (NPV) equal to $\frac{(1-\tau_D)R}{r} - 1 \leq 0$. As long as $r < (1-\tau_F)R$, this NPV is larger than $-\frac{\tau_D - \tau_F}{1-\tau_F}$, so that the cost of obtaining the permanent deferral is lower than the benefit.

Next, we compare immediate repatriation to waiting until a tax holiday to repatriate the accumulated earnings from operating assets. Comparing δ_I to δ_H implies that the firm will prefer to invest in financial assets in anticipation of a tax holiday if and only if

$$r < (1-\tau_F)R + \lambda \left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1 \right]. \tag{4}$$

Finally, we compare permanent reinvestment in financial assets to repatriating at a tax holiday. Comparing δ_N to δ_H implies that the firm will prefer to never repatriate earnings from operating assets to repatriating at a tax holiday if and only if

$$r \leq \frac{1-\tau_D}{1-\tau_H} R. \tag{5}$$

We let δ denote the valuation discount factor if the subsidiary follows its optimal repatriation strategy. The three pairwise comparisons above allow us to determine whether δ equals δ_N, δ_H or δ_I, depending on the parent's cost of capital r. The results are presented in Proposition 2.

Proposition 2 *The foreign subsidiary always repatriates interest earned on financial assets as it is earned.*

(a) If $r \leq \frac{1-\tau_D}{1-\tau_H}R$*, then the foreign subsidiary invests all earnings from operating assets in financial assets and never repatriates the financial assets, so* $\delta = \delta_N$*;*

(b) if $\frac{1-\tau_D}{1-\tau_H}R < r < (1-\tau_F)R + \lambda\left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right]$*, then the foreign subsidiary invests all earnings from operating assets in financial assets until a tax holiday and repatriates all financial assets at the tax holiday, so* $\delta = \delta_H$*; and*

(c) if $r \geq (1-\tau_F)R + \lambda\left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right]$*, then the foreign subsidiary immediately repatriates all earnings from operating assets and never invests in financial assets, so* $\delta = \delta_I$*.*

The proof is in the appendix.

Proposition 2 shows how U.S. firms investing in countries with different tax rates will engage in different repatriation strategies. Even though the foreign tax rate τ_F does not affect how a subsidiary with accumulated financial assets will behave at a tax holiday, it *does* affect whether a subsidiary today chooses to repatriate earnings from operating assets or reinvest them in financial assets. An increase in τ_F increases the set of values of r for which the foreign subsidiary is an immediately repatriating subsidiary and decreases the set of values of r for which it is a holiday repatriating subsidiary.

Proposition 2 also shows how the value of λ affects subsidiary behavior. A higher value of λ increases the range of tax parameter values for which a subsidiary will

accumulate financial assets instead of repatriating its earnings from operating assets. The more likely it is that a tax holiday will arrive, the more likely it is that a subsidiary will defer the repatriation tax by investing earnings from operating assets in financial assets until the next tax holiday arrives.

Debt-financed repatriations

We conclude this section by examining the consequences of borrowing money at the tax holiday to finance a dividend repatriation. The dividend yields $1 - \tau_H$ to the parent, after tax. The subsidiary pays all future interest on the debt. The interest paid is deductible by the foreign subsidiary. In addition, each dollar of after-foreign tax interest payments only costs the firm δ dollars, where δ equals δ_N, δ_H, or δ_I depending on the firm's optimal repatriation strategy as determined in Proposition 2. Therefore, the net present value to the firm of this transaction is

$$1 - \tau_H - \int_0^\infty \delta(1 - \tau_F) R e^{-rt} dt = 1 - \tau_H - \frac{(1 - \tau_F)R}{r}\delta. \tag{6}$$

The net present value of this transaction is positive if the cost of capital r is sufficiently high, so that borrowing by the subsidiary then increases firm value.

Implicit in this approach, however, is an assumption that a dollar borrowed by the subsidiary does not affect the borrowing capacity of the parent. Suppose instead that the firm (parent and subsidiary) faces an overall borrowing capacity constraint, so that any borrowing done by the subsidiary must be matched by a reduction in

borrowing by the parent. In that case, we expect the debt to be issued by the parent.[3] Although a dollar of interest paid by the parent costs the firm one dollar, and a dollar of interest paid by the subsidiary costs the firm only δ dollars, this is offset by the higher tax deductions on the interest paid by the parent. The net present value of a dollar borrowed by the parent is

$$1 - \int_0^\infty (1-\tau_D) R e^{-rt} dt = 1 - \frac{(1-\tau_D)R}{r}, \tag{7}$$

which is non-negative because $r \geq (1-\tau_D)R$. Comparing (7) with (6) shows that if foreign debt displaces domestic debt, having the subsidiary borrow to finance a dividend during a tax holiday reduces firm value in two ways. First, because $\delta \geq \delta_I = \frac{1-\tau_D}{1-\tau_F}$, the cost to the parent of the interest paid by the subsidiary, $\frac{(1-\tau_F)R}{r}\delta$, is always weakly higher than the cost of the interest paid by the parent, $\frac{(1-\tau_D)R}{r}$. In addition, borrowing to finance a one dollar dividend triggers the repatriation tax τ_H.

V. INVESTMENT DECISIONS

The previous section derived the optimal repatriation behavior once the subsidiary has reached its optimal investment in operating assets K^*. In order to be able to determine the market and book values of the subsidiary's assets, we need to determine the optimal asset portfolio (financial assets and operating assets) held by the subsidiary

[3] This is consistent with Newberry and Dhaliwal (2001), who find that multinationals tend to issue a disproportionate amount of debt by the entity (parent or subsidiary) located in the country with the higher tax rate.

before and after K^* has been invested in operating assets. The case where the level of operating assets has reached K^* is called the *mature phase.* The time between time zero and the maturity time T^* is called the *growth phase.* The following proposition determines the firm's optimal investment behavior during the growth phase.

Proposition 3

(a) All earnings on operating assets should be reinvested in operating assets until the level of operating assets reaches K^*, where

$$(1 - \tau_F)f'(K^*) = r. \tag{8}$$

(b) The optimal initial capital contribution by the parent satisfies $K_0 < K^*$.

The proof is in the appendix. We emphasize that K^* does not depend on the repatriation tax, the probability of a tax holiday occurring, or on the return on financial assets. The firm prefers to reinvest foreign earnings in operating assets as long as the after-foreign tax marginal return on operating assets is larger than the parent's cost of capital, i.e. $\frac{(1-\tau_F)f'(K)}{r} > 1$. This condition reflects the basic insight in Hartman (1985) that the repatriation tax does not distort the foreign subsidiary's decision whether to reinvest or repatriate its earnings.

Propositions 2 and 3 together allow us to determine the optimal asset composition in the growth phase and in the mature phase. First, Proposition 3 implies that during the growth phase no dividends are paid, and that the subsidiary's

operating assets grow from K_0 to K^*. Moreover, because $r \geq (1-\tau_D)R$ implies that acquiring financial assets with capital contributed by the parent has weakly negative NPV, (a) implies that the level of financial assets during the growth phase is zero. Next, combined with the results from Proposition 2, Proposition 3 implies that a mature subsidiary always holds operating assets K^*, and that its financial assets consist exclusively of retained earnings on operating assets. The level of financial assets held by the mature subsidiary depends on its optimal repatriation strategy. An immediately repatriating subsidiary has no financial assets; a holiday repatriating subsidiary invests operating earnings in financial assets until the next tax holiday; and a never repatriating subsidiary holds financial assets of $Y = (t - T^*)(1-\tau_F)f(K^*)$ at date $t > T^*$, where T^* denotes the date at which the optimal level of K^* is reached.

VI. ACCOUNTING VALUATION

In this section we establish the relations among the book values of the foreign subsidiary's assets and liabilities and the value of the subsidiary to the parent. We define the value (V) of the subsidiary to be equal to the present value of the future after-tax cash flows that the parent will receive from the subsidiary. First, we express V as a linear function of the book values of operating assets (K), financial assets (Y), deferred tax liabilities (DTL), and permanently reinvested earnings (PRE). The valuation coefficients on DTL and PRE will depend on whether these items are

associated with operating assets or financial assets (denoted by the subscripts OA and FA, respectively), so we distinguish between them in our valuation equation.

$$V = \beta_1 K + \beta_2 Y + \beta_3 DTL_{OA} + \beta_4 DTL_{FA} + \beta_5 PRE_{OA} + \beta_6 PRE_{FA}. \quad (9)$$

We derive the coefficients in (9) in the following subsection and summarize them in Table 2.

We first consider the mature phase. Then we consider these issues during the growth phase. Finally, we consider the relation between the change in value of the subsidiary at the tax holiday and changes in related book values.

Accounting valuation in the mature phase

In the mature phase, K^* has been invested in operating assets, and all subsequent earnings on operating assets are either repatriated or invested in financial assets. The book value of the operating assets therefore equals K^*. The firm may also have accrued a deferred tax liability equal to the tax that would be owed to the U.S. government if the retained earnings were repatriated, and so $DTL_{OA} = \frac{\tau_D - \tau_F}{1-\tau_F}(K^* - K_0)$; note that only the retained earnings of the subsidiary, $K^* - K_0$, would be taxed, and not the original contributed capital, K_0. Alternatively, if the subsidiary does not anticipate repatriating these accumulated earnings, the firm can forgo accruing deferred taxes and instead simply report the amount of

permanently reinvested earnings of $PRE_{OA} = K^* - K_0$ in the income tax footnote.[4] If the subsidiary also holds financial assets Y, the book value of the financial assets equals Y. If the firm accrues deferred taxes on its financial assets, it records a deferred tax liability equal to the repatriation tax it would pay on its current financial assets if they were repatriated, so $DTL_{FA} = \frac{\tau_D - \tau_F}{1-\tau_F} Y$. Note that a firm with a holiday repatriating subsidiary would record this liability, because the liability is based on current tax law and not on anticipated future changes in the tax law. Otherwise, the firm records permanently reinvested earnings of $PRE_{FA} = Y$.

Next, we determine the value of a subsidiary holding operating assets of K^* and financial assets of Y. Since the subsidiary only acquires financial assets through retained earnings on operating assets, a repatriation tax would be incurred upon repatriation. Therefore, financial assets of Y are worth $Y\delta$ to the parent, where δ depends on the subsidiary's optimal repatriation strategy as determined in Proposition 2. Next, during the mature phase, operating assets generate a perpetual cash flow of $(1 - \tau_F)f(K^*)$. Each dollar of after-foreign tax operating earnings is worth δ dollars to the parent, so the operating assets themselves are worth $\frac{(1-\tau_F)f(K^*)}{r}\delta$. Therefore the

[4]The firm has the option to record a deferred tax liability for part of the reinvested earnings and designate the remainder as PRE. To avoid overloaded notation, we consider the benchmark case where the firm does one or the other. It can be verified easily that this assumption has no consequences for the valuation coefficients derived in this section.

value V of a subsidiary during the mature phase satisfies

$$V = \left[Y + \frac{(1-\tau_F) f(K^*)}{r} \right] \delta. \tag{10}$$

We decompose the value V between the market value of operating assets, financial assets, and the deferred tax liability or, if none is recorded, the permanently reinvested earnings. To do this, we ask what the value of the subsidiary holding K^* of operating assets and Y of financial assets would be if no repatriation tax would be due upon their repatriation, e.g. if the foreign subsidiary held these assets on date zero instead of accumulating them from an initial investment of K_0 in operating assets. We let V_0 denote this value.

Because the operating assets themselves are never repatriated, the deferred repatriation tax on the retained earnings $K^* - K_0$ has no effect on the value of these assets. In contrast, if no repatriation tax were associated with the financial assets Y, the subsidiary would immediately repatriate them back to the parent instead of investing in financial assets that generate an after-tax rate of return of $(1-\tau_D)RY \leq rY$. This implies

$$V_0 = \frac{(1-\tau_F) f(K^*)}{r} \delta + Y, \tag{11}$$

$$V - V_0 = -(1-\delta) Y. \tag{12}$$

Because V and V_0 only differ with respect to the value of the financial assets, the deferred tax liability and permanently reinvested earnings associated with operating assets have no value relevance, so $\beta_3 = 0$ and $\beta_5 = 0$. Moreover, because financial

assets consist exclusively of retained earnings on operating assets, the difference $V - V_0$ is attributable to either the deferred taxes on the reinvested earnings or the permanently reinvested earnings associated with financial assets, i.e.

$$V_0 = \beta_1 K^* + \beta_2 Y, \tag{13}$$

$$V - V_0 = \beta_4 DTL_{FA} + \beta_6 PRE_{FA}. \tag{14}$$

Comparing (13) and (11) implies that the valuation coefficients on the book value of the operating assets and financial assets, respectively, are equal to $\beta_1 = \frac{(1-\tau_F)f(K^*)}{rK^*}\delta$ and $\beta_2 = 1$.

For an immediately repatriating subsidiary, $Y = DTL_{FA} = PRE_{FA} = 0$, and so the valuation coefficients β_4 and β_6 are irrelevant. If a firm with a subsidiary that holds financial assets accrued a deferred tax liability associated with these assets, then $\beta_4 = \frac{V-V_0}{DTL_{FA}}$, which implies that $\beta_4 = -(1-\delta_N)\frac{1-\tau_F}{\tau_D-\tau_F}$ for a never repatriating subsidiary and $\beta_4 = -(1-\delta_H)\frac{1-\tau_F}{\tau_D-\tau_F}$ for a holiday repatriating subsidiary. If no deferred tax liability has been recorded, the permanently reinvested earnings disclosed in the tax footnote are associated with the difference in the face value of the financial assets and the present value of the future cash flows they will generate for the parent, and so $\beta_6 = \frac{V-V_0}{PRE_{FA}} = -(1- \delta_N)$ for a never repatriating subsidiary and $\beta_6 = -(1-\delta_H)$ for a holiday repatriating subsidiary.

We now analyze the valuation coefficients on the book value of the deferred tax liability and permanently reinvested earnings. First, DTL_{FA} and PRE_{FA} have negative valuation coefficients, whereas the coefficients on DTL_{OA} and PRE_{OA} are

zero. The values of the deferred tax liability and permanently reinvested earnings depend on whether they are associated with financial assets or operating assets because in absence of the repatriation tax, the firm would repatriate the financial assets but not the operating assets. Avoiding the repatriation tax associated with the financial assets imposes an opportunity cost on the firm, which is reflected in the valuation coefficients on DTL_{FA} and PRE_{FA}. In contrast, the value of the subsidiary's operating assets is the same as it would have been if the same dollars had been invested in operating assets with new capital instead of reinvested earnings, which is why DTL_{OA} and PRE_{OA} have valuation coefficients of zero.

Second, DTL_{FA} always weakly *overstates* the effect of the liability on the value of the subsidiary. The book value of the DTL associated with financial assets is the tax that would be paid upon immediate repatriation of these assets. The firm can reduce the burden of this tax by delaying repatriation of the earnings until a holiday, or by permanently reinvesting the earnings in financial assets. However, because investing in financial assets has weakly negative NPV, deferring the dividend payment also has a cost. The value of the deferred tax liability is therefore equal to the present value of the future tax plus the opportunity cost of deferring the dividend payment. The extent to which this value differs from the book value depends on the firm's cost of capital r, where $(1-\tau_D)R \leq r \leq (1-\tau_F)R + \lambda\left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right]$. If $r = (1-\tau_D)R$, the subsidiary is a never repatriating subsidiary. Because a never repatriating subsidiary never pays the repatriation tax and the opportunity cost of

permanently deferring repatriation of the dividend is zero when $r = (1 - \tau_D)R$, the DTL associated with financial assets then has no value, and so $\beta_4 = 0$. If $r = (1 - \tau_F)R + \lambda \left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right]$, the subsidiary is indifferent between repatriating at a holiday and repatriating immediately; the cost of deferring the dividend payment until a tax holiday plus the present value of the repatriation tax is exactly equal to the tax paid upon immediate repatriation. The value of the DTL associated with financial assets is therefore equal to its book value, and so $|\beta_4| = 1$. It can easily be verified that for values of r between the lower and the upper bound, $|\beta_4|$ is monotonically increasing in r. Therefore, the book value of the DTL associated with financial assets always weakly overstates the effect of the liability on the value of the subsidiary. This occurs because the book value is the undiscounted amount of the regular repatriation tax. But if the firm can mitigate the burden of the tax by investing in financial assets either permanently or until a holiday, then the effect of the potential repatriation tax on firm value is less than the book value of the DTL. Likewise, $|\beta_6|$ has a lower bound of zero and an upper bound of $\frac{\tau_D - \tau_F}{1-\tau_F}$, the amount of tax that would be due on an immediate repatriation of a dollar of after–foreign tax operating earnings.

Accounting valuation during the growth phase

Because no dividends are paid during the growth phase, the value of the subsidiary at time $t < T^*$ equals the present value of the value V of the subsidiary at the time T^*, i.e. $V(t) = Ve^{-r(T^*-t)}$. Because during the growth phase all earnings on operating

assets are reinvested in operating assets, the book value of these assets satisfies $K(t) = K_0 + (1 - \tau_F) \int_0^t f(K(s))ds$. Because the subsidiary does not hold financial assets during the growth phase, the coefficients β_2, β_4, and β_6 are not applicable. As is the case for mature firms, the coefficients on the deferred tax liability and permanently reinvested earnings associated with operating assets, β_3 and β_5, are zero because the earnings are never repatriated and thus their value is unaffected by the repatriation tax. We now ask how the valuation coefficient on the book value of the operating assets, $\beta_1 = \frac{Ve^{-r(T^*-t)}}{K(t)}$, evolves between dates zero and T^*.

Proposition 4 *The valuation coefficient on the book value of operating assets is decreasing over time during the growth phase.*

The proof is in the appendix. The valuation coefficient β_1 is higher during the growth phase than during the mature phase, converging to $\frac{V}{K^*}$ on date T^*. The reason is that investing less than K^* on date zero provides the firm with a valuable option to reinvest, which it exercises during the growth phase. Once K^* is invested, the value of the option to reinvest drops to zero and $\beta_1 = \frac{V}{K^*}$ at that point.

Change in subsidiary value at a tax holiday

Finally, we consider the relation between the change in the value of the subsidiary at the tax holiday, ΔV, and changes in the deferred tax liability and/or permanently reinvested earnings. Only the value of a holiday repatriating subsidiary will change

when the holiday occurs. Before the tax holiday occurs, the financial assets Y are worth $Y\delta_H$. When the tax holiday occurs, the financial assets are repatriated at a tax cost of $\tau_H Y$, so that their value is then equal to $(1-\tau_H)Y$. Therefore, at the holiday the value of the subsidiary increases by $Y\left[1-\tau_H-\delta_H\right]$. It is verified easily that for a holiday repatriating subsidiary, it holds that $1-\tau_H-\delta_H>0$. If the firm has a deferred tax liability associated with financial assets, its book value of $\frac{\tau_D-\tau_F}{1-\tau_F}Y$ is reduced to zero and financial assets are reduced by $\tau_H Y$ to pay the repatriation tax. The valuation coefficients imply

$$\Delta V=-\beta_4 DTL_{FA}-\beta_2\tau_H Y. \tag{15}$$

If permanently reinvested earnings had been reported, at the holiday financial assets are reduced by $\tau_H Y$, and permanently reinvested earnings associated with financial asset are reduced by Y to zero. The valuation coefficients imply

$$\Delta V=-\beta_6 PRE_{FA}-\beta_2\tau_H Y. \tag{16}$$

VII. CONCLUSIONS

Our study of the effects of repatriation taxes on investment decisions and accounting valuation highlights the distinction between earnings that are reinvested in operating assets and earnings that are invested in financial assets. Consistent with Hartman (1985), we find that repatriation taxes do not affect the level of a foreign subsidiary's investments in operating assets. However, we also find that repatriation taxes do affect

the level of investment in financial assets. Firms either make no investments in financial assets, permanently reinvest all earnings from operating assets in financial assets, or temporarily invest earnings from operating assets in financial assets until a tax holiday arrives.

The distinction between earnings that are reinvested in operating assets and earnings that are invested in financial assets has important implications for the relations among the deferred tax liability associated with unrepatriated foreign earnings, the amount of permanently reinvested foreign earnings, and the present value of the future after-tax cash flows that the parent will receive from the subsidiary. A deferred tax liability or amount of permanently reinvested earnings associated with financial assets is also associated with a lower value of the subsidiary. In contrast, a deferred tax liability or permanently reinvested earnings associated with operating assets has no relation to the value of the subsidiary.

The book value of the deferred tax liability is the tax that would be due if the earnings were immediately repatriated. We show that the deferred tax liability overstates the effect of the potential repatriation tax on firm value. This occurs because the fact that the earnings have not yet been repatriated implies that the firm has a better use of the funds than to repatriate them right away. Similarly, we show that the effect of permanently reinvested earnings on firm value lies somewhere between no effect and the tax that would be due if the earnings were to be repatriated immediately.

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TABLE 1

Tax rates on reinvested and repatriated foreign earnings

Source of income	Foreign tax rate	Current U.S. tax rate
Interest on FA	τ_F	$\tau_D - \tau_F$
Immediately repatriated earnings	τ_F	$\tau_D - \tau_F$
Reinvested earnings	τ_F	0
Accumulated earnings repatriated before tax holiday	0	$\frac{\tau_D - \tau_F}{1 - \tau_F}$
Accumulated earnings repatriated at tax holiday	0	τ_H

TABLE 2

Coefficients from the valuation equation

$$V = \beta_1 K^* + \beta_2 Y + \beta_3 DTL_{OA} + \beta_4 DTL_{FA} + \beta_5 PRE_{OA} + \beta_6 PRE_{FA}$$

Type of firm	β_1	β_2	β_3	β_4	β_5	β_6
I	$\frac{(1-\tau_F)f(K^*)}{rK^*}\delta_I$	N/A	0	N/A	0	N/A
N	$\frac{(1-\tau_F)f(K^*)}{rK^*}\delta_N$	1	0	$-\frac{1-\tau_F}{\tau_D-\tau_F}(1-\delta_N)$	0	$-(1-\delta_N)$
H	$\frac{(1-\tau_F)f(K^*)}{rK^*}\delta_H$	1	0	$-\frac{1-\tau_F}{\tau_D-\tau_F}(1-\delta_H)$	0	$-(1-\delta_H)$

I refers to an immediately repatriating subsidiary; N refers to a never repatriating subsidiary; and H refers to a holiday repatriating subsidiary.

APPENDIX

Proof of Proposition 2. The cutoff values in equations (3)-(5) can be ranked in the following way.

$$\frac{1-\tau_D}{1-\tau_H}R \leq (1-\tau_F)R \leq (1-\tau_F)R + \lambda\left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right] \tag{17}$$

These rankings arise because $\tau_H \leq \frac{\tau_D - \tau_F}{1-\tau_F}$. When $r \leq \frac{1-\tau_D}{1-\tau_H}R$, (5) implies that never repatriating is preferred to holiday repatriation and (3) implies that never repatriating is preferred to immediately repatriating; therefore, never repatriating is the optimal strategy. When $\frac{1-\tau_D}{1-\tau_H}R \leq r \leq (1-\tau_F)R + \lambda\left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right]$, (5) implies that holiday repatriation is preferred to never repatriating and (4) implies that holiday repatriation is preferred to immediate repatriation; therefore, holiday repatriation is the optimal strategy. Finally, when $r \geq (1-\tau_F)R + \lambda\left[\frac{(1-\tau_F)(1-\tau_H)}{1-\tau_D} - 1\right]$, (3) implies that immediate repatriation is preferred to never repatriating and (4) implies that immediate repatriation is preferred to holiday repatriation; therefore, immediate repatriation is optimal. ■

Proof of Proposition 3

(a) The last dollar reinvested in operating assets yields a perpetuity of $(1-\tau_F)f'(K)$. Each dollar of return yields an after-tax cash flow with a present value of δ to the parent, where δ equals δ_N, δ_H, or δ_I depending on the firm's optimal repatriation strategy as determined in Proposition 2. Therefore, the perpetuity itself has a value of $\frac{(1-\tau_F)f'(K)}{r}\delta$ to the parent. If this last dollar is not invested in operating assets, it can

be repatriated or reinvested in financial assets in the same manner, and thus is also worth δ to the parent. Therefore, the concavity of $f(\cdot)$ implies that K^* solves $(1-\tau_F)f'(K^*) = r$, and that the subsidiary should not invest earnings from operating assets in financial assets before it has invested K^* in operating assets.

(b) Suppose the firm invested K on date zero and followed its optimal repatriating strategy thereafter. Then the net present value of the investment in the subsidiary would be $\frac{(1-\tau_f)f(K)}{r}\delta - K$, which is maximized by the value of K, denoted $\widehat{K}$, that solves $f'(K) = \frac{r}{(1-\tau_F)\delta} > \frac{r}{1-\tau_F} = f'(K^*)$. Because $f(\cdot)$ is a concave function, $\widehat{K} < K^*$. Therefore, $K_0^* < K^*$. ■

Proof of Proposition 4

$$\beta_1 = \frac{Ve^{-r(T^*-t)}}{K(t)}$$

Differentiating this expression with respect to t and simplifying yields

$$\frac{\partial \beta_1}{\partial t} < 0 \iff r < \frac{K'(t)}{K(t)}. \tag{18}$$

Because during the growth phase all earnings on operating assets are reinvested in operating assets, it holds that $K'(t) = (1-\tau_F)f(K(t))$. Moreover, since $f(\cdot)$ is concave and $K(t) < K^*$, it holds that $f(K(t)) > f'(K(t))K(t)$ and $f'(K(t) > f'(K^*)$. Therefore, $\frac{K'(t)}{K(t)} > (1-\tau_F)f'(K(t)) > (1-\tau_F)f'(K^*) = r$, and thus the valuation coefficient is decreasing during the growth phase. ■