Appendix A

The Cost of Avoiding the Repatriation Tax

Interpreting the tax holiday evidence depends on what model of the MNC’s decisions is most consistent with the data. In the pure Hartman-Sinn ‘New View’ model, the foreign subsidiary has only two options for the use of any income, reinvesting in real assets or repatriating dividends to the parent. The MNC initially ‘underinvests’ to take advantage of deferral, first reinvesting all its income, and then repatriating all its income when it reaches the ‘mature’ stage. Even in this model, however, the subsidiary would take advantage of a tax holiday. For example, if the temporary tax holiday rate is zero the subsidiary would liquidate some of its real capital and return to the initial equity injection point. It would begin the Sinn process all over again to take advantage of deferral. The gain to the company is the cash repatriated less the present value of the former level of its repatriations when it resumes them in its ‘mature stage. If the tax holiday rate is positive, the company would repatriate less until the tax cost of repatriating another dollar is just equal to the net gain.

Weichenrieder (1996) and Altshuler and Gruber (2002) showed that the Hartman-Sinn model is based on very restrictive assumptions. For example, it ignores financial assets and debt. Weichenrieder (1996) introduced the possibility that the subsidiary could invest in passive assets rather than repatriating. Altshuler and Grubert (2002) use a more general model and describe various strategies that the subsidiary can use to permanently avoid the repatriation tax while still getting cash back to the parent. One simple strategy is for the subsidiary to invest in passive assets like bonds that are used as informal collateral by the parent for borrowing at home. If the borrowing and lending interest rates are the same, the current taxation of the passive interest under the CFC (subpart F) rules is just offset by the parent’s deduction for the interest. There is no ‘underinvestment’ period, which Altshuler and Grubert (2002) find is consistent with the evidence.

Under the pure Altshuler and Grubert models, the company would never take advantage of any repatriation tax holiday if the tax holiday rate is positive. It can avoid repatriating forever while still getting the cash in the hands of the parent. But their assumption that repatriation avoidance strategies are
costless is unrealistic. For example, there may be a spread between borrowing and lending interest rates. More important, the debt on the company’s balance sheet will balloon as time goes on, raising its borrowing costs. In another Altshuler-Grubert strategy, in which the low tax subsidiary invests in a high tax subsidiary that it uses as a vehicle for indirect tax free repatriations, the low tax subsidiary may eventually run out of eligible candidates to invest in.

The evidence in Grubert and Mutti (2001) and Desai, Foley and Hines (2001) that dividends do increase if the residual repatriation tax is lower suggests that repatriation tax avoidance strategies are not costless. (It is also inconsistent with the ‘New View’.) Each of these papers uses annual cross-sectional data on subsidiary repatriations. The relationship they identify does not reflect temporary changes in a subsidiary’s tax rate because the average country rate is used to construct the repatriation tax rate variable. Country average effective tax rates change only gradually over time and the country ranking of effective rates is very stable. The relationship between repatriation taxes and dividends is also not attributable to greater investment opportunities in the low tax subsidiaries because of the dominance of financial assets in low tax subsidiary balance sheets.

The average actual tax cost of repatriations for companies that repatriated during the holiday was about 3.6 percentage points (see Redmiles 2008). The fact that companies were willing to make very large tax holiday repatriations at this tax rate indicates that the repatriation tax was imposing substantial current or future costs. These could be in the form of the implicit costs of repatriation tax avoidance and the explicit costs of actual future repatriations. Presumably they were willing to pay 3.6 percentage points during the holiday to save at least that much in the present value of future costs they would have incurred. The question is the time pattern of these future costs.

The repatriation equations in Grubert and Altshuler (2008) suggest that the marginal costs of deferrals increase as the pool grows relative to current income. We use the tax holiday evidence to further test this hypothesis. We develop a simple model that embodies the hypothesis and use it to interpret the evidence from the tax holiday. An explicit model is particularly important because the repatriation holiday was a temporary tax reduction. The response therefore depends on expectations about the future.
Unlike earlier analyses of repatriation behavior, the model we develop below looks at the company’s long run plans rather than focusing only the repatriation choices in a single year.

We start with a model of behavior under a permanent repatriation tax. We assume a fixed, indivisible investment that yields an annual return after foreign tax of $Y$ per period.\(^1\) The repatriation tax if $Y$ is repatriated is $TY$. The cost of avoiding repatriation in any year is a function of total accumulated retentions $A$ up to that point, or $F(A)$, with $F'(A)$ a rising function of $A$. The point at which the company stops retaining earnings and starts repatriating its income is time period $D$. The firm chooses $D$ to minimize the present value of the cost of its repatriation strategy.

The present discounted value of these costs is:

$$TC = \int_0^D F(tY)e^{-rt} \, dt + \int_D^\infty F(DY)e^{-rt} \, dt + \int_0^\infty YTe^{-rt} \, dt,$$

where $r$ is the company’s required rate of return. The first term is the cost of retentions until period $D$, the second term is the discounted cost of retaining the fixed accumulation $DY$ after $D$ and the third term is the present value of future repatriations taxes after they begin at $D$. Minimizing $TC$ with respect to $D$, we get:

$$\int_0^D F'(DY)Ye^{-rt} \, dt = TYe^{-rD}$$

which is equivalent to:

$$\int_0^\infty F'(DY)e^{-rt} \, dt = T.$$  

The left hand side is the marginal cost of further permanent retentions of earnings at $D$. Beginning repatriations at period $D$ with retentions $DY$ is optimal when this marginal cost is equal to the repatriation tax $T$. $D$ is the point at which the marginal cost of additional deferrals rises to equal the cost of actual repatriations. (It has not to be confused with the time at which repatriations begin in the Hartman-Sinn model.) This general pattern is consistent with the evidence in Grubert and Mutti (2001) who found that dividends were virtually zero in the first 10 years of a low tax subsidiaries existence.

We can compare this optimal condition for deferrals under a permanent tax with the one that arises under a temporary tax holiday. We assume that under the tax holiday the rate applied to repatriations is temporarily reduced (but not to zero). The optimal date for beginning actual repatriations

\(^1\) A fixed indivisible investment is convenient because it avoids the ‘underinvestment’ issue whenever there is an implicit or explicit repatriation tax, even if relatively small.
at the normal tax rate $T$ is $D$. Assume that the subsidiary has accumulated an amount $A$ and is deciding how much to retain, $R$, after taking advantage of the tax holiday. The temporary holiday tax rate is $H$ where $0 < H < T$. If the company keeps $R$ after tax holiday repatriations, it will retain income for $D - R/Y$ periods and then start repatriating again at the normal repatriation tax $T$. Total repatriation costs therefore are: $H(A-R) + \int_{0}^{D-R/Y} F(R+Yt)e^{-rt} dt + \int_{0}^{D-R/Y} F(DY)e^{-rt} dt + \int_{D-R/Y}^{\infty} Tye^{-rt} dt$. The first term is the tax cost of tax holiday repatriations and the second term is the cost of accumulating earnings until $D$, when repatriations begin under the normal tax $T$. The third term is the cost of permanent retentions $DY$ and the fourth term is the cost of future repatriations at the normal repatriation tax $T$.

Minimizing these costs with respect to $R$ yields:

$$H = \int_{0}^{D-R/Y} F'(R+Yt)e^{-rt} dt + Te^{-r(D-R/Y)}.$$  

We can see that this condition for retentions is much different from the repatriation decision under a permanent tax, where repatriations begin when the marginal cost of permanent accumulations reach the repatriation tax. In the case of the temporary tax reduction, a marginal increase in tax holiday repatriations saves not the constant cost of any further retentions at that point but the rising costs of further accumulations as the process begins again under the permanent normal tax. Holiday repatriations delay the onset of higher marginal costs of future deferrals and also the time at which the subsidiary would start repatriating at the ‘normal’ high tax price. The tax holiday allows the subsidiary to start over deferring income at initial volumes with lower marginal costs. Indeed, a company may repatriate under the holiday even if it has relatively low current accumulated deferrals because of the ‘fresh start’ that saves future costs on large high cost accumulations in the future. This will be particularly true if it expects sharply rising implicit and actual costs in the future.

We use the tax holiday evidence to estimate the $F( )$ function in the optimal condition for tax holiday repatriations. But first we summarize evidence on our basic hypothesis that the marginal costs of avoiding the repatriation tax rise as the accumulated stock of deferrals increase.
The regressions presented in Appendix Table 1 indicate the factors determining the extent to which a company took advantage of the repatriation tax holiday. They are based on linking the information from a company’s CFCs from its Form 5471 at the end of 2004 with the data on its tax holiday repatriations. The Form 5471s filed for each CFC reports on its current earnings, sales, and assets, the taxes it paid, and accumulated earnings not previously taxed by the United States as well as accumulations that have been taxed previously under the CFC (subpart F) rules. Parent level data are created by summing these variables across all of its CFCs. The special Form 8895 has data on qualified repatriations under the holiday. The analysis thus differs from the earlier studies cited above in using parent level responses instead of cross-sections of CFCs in different locations.

The dependent variable in the regressions shown in Appendix Table 1 is the ratio of a company’s qualified repatriations to its accumulated untaxed earnings in 2004. In other words, how much of its accumulated deferrals did it repatriate under the tax holiday. Both linear and semi log versions of the specification are included. We run Tobit regressions rather than OLS since tax holiday repatriations are truncated at zero and only about half of the large MNCs in the sample took advantage of the tax holiday.

The independent variables in the regressions are as follows:

1. The ratio of accumulated untaxed deferrals to 2004 income. This tests our hypothesis that the implicit cost of deferral rises as accumulations increase relative to current income or activity. If the marginal cost of avoiding deferral doesn’t increase with total accumulations, there would be no necessary relationship between the share of accumulations repatriated and the stock of deferrals.

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2 The analysis in Appendix Table 1 is based on a sample of large U.S. nonfinancial corporations. The sample accounted for $247 billion of the repatriations under the 2005 tax holiday. Approximately 45 percent of the sample took advantage of the holiday and made qualified repatriations. Tax holiday repatriations were reported on Form 8895 and these were linked with the company’s tax return for 2004 including its Form 5471s filed for each of its CFCs. The 5471s provided information on the CFC’s sales, Earnings and Profits (E&P), foreign income taxes paid, and also its accumulated untaxed retained E&P.

Some multinational companies were excluded from the Appendix Table 1 analysis. Under the holiday companies which had booked the potential U.S. tax for financial reporting purposes and therefore did not have ‘permanently reinvested earnings’ could not bring back more than $500 million under the holiday. The small number of companies in this category was excluded because of this constraint. Companies with negative accumulated retained earnings in 2004 were also excluded.
2. The parent’s average effective foreign tax rate. This rate indicates the holiday tax saving compared to normal dividends.

3. The ratio of previously taxed accumulations to total foreign sales. These accumulations can be repatriated free from any U.S. tax.

4. The ratio of total tangible capital to sales. This variable may reflect the amount of deferred income invested in the foreign business and indicates opportunities for productive investment in the future.

5. The parent’s R&D intensity in terms of the ratio of qualified R&D to sales. This variable indicates the parent’s industrial intangibles available to the foreign operation.

6. The company’s profit margin on foreign sales. This variable indicates income that is too great to be reinvested profitably in the foreign business.

In addition, in some regressions the ratio of accumulated deferrals to current earnings is interacted with the effective foreign tax rate. If a company has a high effective foreign tax rate it may not choose to repatriate under the holiday because its tax saving relative to normal distributions is lower. Also, it is more likely to have previously distributed excess income not invested in its operations in the past.

The Tobit regressions 1 and 3 in Appendix Table 1, in which the retentions-effective tax rate interacted term is included, confirm that the implicit cost of deferring income rises as accumulations increase relative to current earnings. Companies are more willing to pay the holiday tax price. The estimated coefficient on deferrals relative to income is nearly significant at the one percent level in the linear version and significant at the .1 percent level in the semi log specification. But the interaction terms indicate that as the effective foreign tax rate rises for a given level of accumulated deferrals, companies are less willing to pay the tax holiday price. Fewer accumulations have an implicit cost above the potential holiday tax rate.

The other independent variables tend to have the expected sign. In both specifications, the company’s foreign profit margin on sales and its domestic R&D intensity have positive coefficients which are highly significant, greater than at the 1 percent level. Highly profitable operations exploiting
parent intangibles have few profitable opportunities for investing all of their profits abroad. By the same token the coefficient for the foreign ratio of tangible capital to sales is negative and significant at the 10 percent level in the linear specification and at the 5 percent level in the semi log version. More of earnings are invested in real assets. And, as expected, greater accumulations of previously taxed income lowered tax holiday repatriations because they could be brought back free from any U.S. tax. These findings will be important in designing the minimum tax and the one-time tax on past accumulations when dividends become exempt.

The regressions presented in columns 2 and 4 in Appendix Table 1 do not include the interaction term. The ratio of deferrals to current income is highly significant in the semi log version but not in the linear one. Controlling for the potential tax benefit of the holiday seems important. In both of these regressions, the effective foreign tax rate has a negative coefficient significant at the 5 percent level. As expected companies with higher foreign tax burdens took less advantage of the tax holiday. When the retentions ratio-tax interaction term is introduced, the effective foreign tax rate by itself becomes statistically insignificant. Its impact depends on the level of accumulated retained income.

Appendix Table 2 presents an alternative specification using total current sales as a more consistent scaling variable. The dependent variable is the ratio of tax holiday repatriations to sales. The two columns differ in the construction of the accumulated deferral variables. In the first column the two variables are the ratio of accumulated deferrals to sales and the square of that ratio. In the second column tangible assets are first netted from accumulated retentions. This is intended to leave assets that are more likely to be repatriated under the tax holiday. The squared variables are added to reflect the possibility of disproportionate repatriations as the stock of deferrals grows.

In the first column of Appendix Table 2, the ratio of accumulated deferrals to sales is highly significant and the squared variable is significant at the 10 percent level. However, when real capital is netted from accumulations in the second column, the squared variable has a high level of significance, even greater than the basic ratio. Netting out invested real capital seems to focus on retentions with the sharply rising marginal cost. As in Appendix Table 1, parent R&D intensity has a highly significant
positive coefficient. The foreign profit margin is significant at the 10 percent level in the first column and is easily significant at the one percent level in the second. Profitable high tech foreign subsidiaries were more likely to make larger tax holiday repatriations at any given level of retentions.

We now turn to projecting the cost of deferrals as they accumulate using the analytic model. The $F(\bullet)$ function which gives the cost of accumulating deferrals, relative to annual income, is assumed to be quadratic, which makes the marginal cost of additional deferrals linear. (We assume marginal costs are zero at the origin.) For simplicity, we assume that the company has a 20 year time horizon and that it would not commence repatriations during that period. We further assume a high annual discount rate equal to 10 percent. This is based on the company’s uncertainty about future corporate tax rates, the prospects of another tax holiday, the possibility of the enactment of dividend exemption, and the possibility of future losses that would lower future repatriation taxes. The company is assumed to have a foreign tax rate of 5 percent, making the tax cost of repatriations under the holiday equal to 4.5 percentage points.

The one data point required to apply the optimal tax holiday strategy condition is the number of years of income retained after the holiday. That together with our assumptions permits us to identify the single parameter in the linear marginal cost of deferrals function. In the sample of companies making tax holiday repatriations with profit margins on sales in excess of 20 percent, which is the weighted mean in the sample, the average amount retained was approximately two years of income.

As expected under our assumptions, the marginal cost of deferral is very low immediately after the tax holiday repatriations, but after 10 years, that is, in the year 2015, it rises to about 7 percentage points. This would be the implicit cost of retaining income from a new investment in view of all of the previous accumulations.

BEA data indicate that total retained earnings of nonbank affiliates abroad at the end of 2010 were almost double the amount at the end of 2004 even after the large tax holiday repatriations in 2005 and the severe recession. Thus in the effective tax rate simulations in the text, we are conservative in assuming a cost of 5 percentage points for a mature highly profitable, R&D intensive company. The
The conservatism of our assumption is confirmed by recent industry proposals. The pharmaceutical industry has proposed a 25 percent dividend received deduction for low tax repatriations, which would imply a repatriation tax of about 6 to 7 percent. In addition, the CEO of Apple has testified that they would accept any repatriation tax in the single digits.

Note that we have assumed for the purpose of the calibration that the company would not begin repatriating during the 20 year horizon. In a more general model there would be a short run cost function that moved upward as the stock grew. There might therefore be small and growing repatriations in every period. So when companies repatriated under the holiday, the last dollar repatriated would have reflected actual and implicit costs. There does not seem to any reason why our simplification should bias the result. Furthermore, as Grubert and Mutti (2001) found, companies in low tax locations repatriated virtually nothing in the first 15 years after being incorporated abroad. The companies who repatriated under the tax holiday effectively became similar to new CFCs after their 'fresh start'. Our assumption of no repatriations over the 20 year horizon is therefore not far from reality. Expected actual repatriations probably make up a modest share of the 7 percent we estimate. This presumption is also consistent with the fact that, under normal circumstances, the U.S. Treasury obtains very little revenue from dividends.
Appendix B

Description of the Effective Tax Rate Simulations

This appendix provides details on and formulas for the calculation of the effective tax rates (ETRs) shown in Table 1. The ETR calculations are for real investment undertaken by a U.S. parent corporation in a subsidiary located either in a low tax (LT) or high tax (HT) foreign country. We calculate these rates under various policy alternatives and distinguish between income shifting opportunities available before and after the introduction of check-the-box (CTB). In the post-CTB cases, we allow the parent to shift income from the foreign investments in LT and HT to a hybrid entity in a pure tax haven.

The ETRs are calculated assuming that there are already ongoing operations in each country and that new discrete investments in HT and LT are being considered. The HT subsidiary produces a routine good and earns the normal return on its capital. The new discrete investment in LT produces a high tech good that exploits a U.S. developed intangible asset like a patent and earns a high excess return. The investment in LT therefore permits the parent to shift excess returns now taxed in the United States to the subsidiary in LT. This income shifting is accomplished through the underpayment of royalties and is a function of the difference in tax rates between the LT country and the United States. If the transfer pricing rules worked perfectly this type of income shifting would not be possible and the excess return would all be paid back to the United States as a royalty.

We also assume that any new LT investment creates opportunities to lower the foreign tax rate paid in HT by shifting income to LT. In other words, new investment in the LT country increases the amount of income that can be shifted there from existing operations in the HT country. This is possible because the added investment in LT generates more intercompany transactions, for example, that allow for greater profit shifting through transfer price manipulation. Similarly, we assume that any new discrete investment in HT increases the amount of income that can be shifted to the existing operation in LT. The incentive to shift income between LT and HT increases with the tax rate differential between the

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3 We could have also considered the parent decisions as to whether to manufacture the product based on the new intangible in LT or manufacture it in the US. The set-up would be similar except that the amount shifted would be a proportion of the normal return instead of the excess return.
countries. We assume that this shifting is symmetric in terms of the amount of income shifted. This simple set-up allows us to consider each investment separately in the ETR calculations.

Check-the-box creates further opportunities for tax planning through the use of hybrid entities in tax havens. As explained in the text, introducing the possibility of using hybrid entities in tax havens as a destination for income from HT and LT is the same as assuming that the host countries had lowered their tax rates. Thus, introducing CTB will have an impact on our ETRs.

We calculate the effective tax rate on a new discrete investment of one unit of capital by accounting for all tax payments and deductions made by the U.S. parent to both the host and home country and then dividing the tax payments by the pre-tax income generated by the investment.\(^4\) For simplicity, we ignore debt, assume that depreciation for tax purposes is equal to economic depreciation, and ignore any investment credits so that the host country effective tax rate for an investment undertaken by a domestic firm in the host country is equal to the host country statutory tax rate.

It is important to be clear as to how the tax benefits of profit shifting created by the new foreign investment we consider are assigned. We consider each investment separately so when we account for the taxes associated with the investment in LT, for example, we include the tax benefits that accrue from (i) any underpayment of royalties to the parent, (ii) any shifting of income from HT to LT, and (iii) any post-CTB shifting of income to a hybrid entity in the tax haven. When considering the investment in HT, we include the tax benefits of (i) any income shifted to LT and (ii) any income shifted to the entity in the haven (post-CTB).

We now turn to the formulas we use to calculate the ETRs under the various scenarios. Let \(t_L\) equal the statutory tax rate in low tax country, \(t_H\) equal the statutory tax rate in high tax country, and \(t_U\) be the statutory tax in the United States. In our simulations we assume the LT statutory rate is 5 percent, the HT rate is 25 percent, and the U.S. rate is 30 percent. We assume the tax haven has no tax on corporate

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\(^4\) Grubert (2004) uses a similar approach to calculate effective tax rates for investment in low and high tax countries under a variety of scenarios that take income shifting and the use of hybrid entities into account.
income. We denote income shifted from the United States to the LT operation as \( S_U \) and income shifted from the HT to the LT operation as \( S_H \).

Income shifting is not costless to the parent corporation. Tax planning through income shifting uses valuable resources and there is always the risk of penalties after audit. We assume a cost of income shifting that is a quadratic function of the amount shifted relative to the amount of real capital placed in a location and that differs depending on whether intangibles are being exploited.\(^5\) The costs of shifting functions for the two types of pre-CTB shifting are as follows:

\[
C_U(S_U) = a(S_U/K_L)^2 K_L
\]

\[
C_H(S_H) = b(S_H/K_H)^2 K_L = b(S_H/K_H)^2 K_H
\]

where \( K_L \) is capital placed in LT, \( K_H \) is capital placed in HT, \( C_U(S_U) \) is the cost of shifting income from the U.S. to LT, and \( C_H(S_H) \) is the cost of shifting from HT to LT. We discuss calibration of the shifting functions in the next section.

**Current law before Check-the-Box**

We start by deriving the ETR formulas under current law. The formulas will differ depending on the foreign tax credit position of the parent corporation. Under current law, firms with excess credits pay no U.S. taxes on dividend repatriations to their U.S. parents while firms in excess limitation owe residual taxes to the U.S. Treasury when dividends are remitted from operations in low tax countries. We assume that repatriation taxes impose an additional tax burden for foreign investment and therefore must be incorporated in the ETR calculations. The repatriation tax burden for investment in LT and HT, which we denote \( t_{L,D} \) and \( t_{H,D} \) respectively, include both the tax paid on actual distributions and the implicit deadweight loss attributable to repatriation planning. In our simulations, we set \( t_{L,D} \) equal to 5 percent and \( t_{H,D} \) equal to 1 percent.

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\(^5\) Grubert and Slemrod (1998) use a similar cost of shifting function to examine how income shifting opportunities can impact the after-tax profits of operating in Puerto Rico. Grubert (2003) derives the cost of capital for investments in low and high tax countries using a model in which intercompany transactions provide the opportunity for income shifting. He also uses a quadratic cost of shifting function. The model shows clearly how the conventional cost of capital is altered when the benefits of income shifting are introduced.
Like the taxation of dividend income, the taxation of royalties under the current system depends on the parent's foreign tax credit position. Firms in excess limitation pay full U.S. taxes on royalty remittances received from abroad. Firms in excess credit positions can shield U.S. taxes owed on royalty remittances with excess credits and therefore pay no U.S. tax on royalties.

**Excess limitation case**

To calculate the ETR we first need to know the optimal amount of income to be shifted. We start by solving for the optimal amount of income shifted through the underpayment of royalties on the U.S. developed intangible. Note that in the absence of any cost of income shifting, the optimal royalty payment would be zero. Let $R_T$ be the true royalty and $R$ be the royalty actually paid. The amount of income shifted to the affiliate, $S_U$, is the difference between the true royalty and the actual royalty $S_U = R_T - R$. The net tax benefit to income shifting associated with the investment in LT in the excess limitation case is therefore $(R_T - R)(t_U - t_L - t_{L,D}) - C_U(R_T - R)$.

Since $R_T$ is given (it is known), solving for the optimal royalty payment is the same as solving for optimal $S_U$ and gives us $S_U* = (t_U - t_L - t_{L,D})K/2a$ where * denotes the optimal value. The optimal royalty, $R*$ is $R_T - (t_U - t_L - t_{L,D})K/2a$.

To calculate ETRs we need to calibrate the shifting function. On the basis of several sources of evidence we assume a normal return to investment of 10 percent and an excess return of 30 percent for a high tech investment in a location with a 25 percent tax differential. Furthermore, one third of the excess return is paid back as royalties. Grubert and Altshuler (2008) indicate that in 2002 the profit margin on sales earned by Irish subsidiaries, after the payment of royalties, was three times the average margin of all subsidiaries. Grubert (2012) reports that in 2004 the average profit margin on all foreign sales was almost twice the worldwide average. The one-third, two-third split between parent and subsidiary is based on parallel regressions of royalties paid and earnings and profits and how they depend on parent R&D (see Mutti and Grubert 2006). Accordingly, an excess return of 30 percent, with 10 percent paid in royalties,

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6 We assume here that the tax treatment of the cost of shifting is incorporated in the parameter of the cost of shifting function. In this way, we do not make any assumptions regarding where the cost of shifting is deducted for tax purposes.
for a 25 percent tax differential, seems conservative because the Irish and foreign profit margin averages include some non-high tech investments.

If the tax differential between the low tax country and the U.S. is 25 percentage points, for example, and the excess return was 30 percent, using our cost of shifting function and assuming that firms were optimally shifting under current law results in a parameter \(a\) equal to \(0.625 = 0.25 / (0.3 - 0.1)\).

The net benefit of income shifted through transfer pricing (or, alternatively but not modeled, debt shifting) from HT to LT is 
\[ S_H(t_H + t_{HL} - t_L - t_{LD}) - C_H(S_H). \]
Solving for optimal \(S_H\) gives \(S_H^* = (t_H + t_{HL} - t_L - t_{LD}) K_H / 2b\). We also need to calibrate the cost of shifting function for profit shifting between LT and HT. We assume that the ability to engage in income shifting in the presence of an intangible is much greater than it is when there is no intangible available. In the simulations we let \(b\) be 4.5 times the value of \(a\) \((b=2.81)\).

To calculate the ETR we add up the taxes, \(T_L\), associated with the discrete investment of one unit of \(K_L\) in LT:
\[
T_L = (t_L + t_{LD}) r_N - (t_U - t_L - t_{LD}) S_U^* + a(S_U^*)^2 - (t_H + t_{HL} - t_L - t_{LD}) S_H^* + b(S_H^*)^2 \\
= (t_L + t_{LD}) r_N - (t_U - t_L - t_{LD})^2 / (2a) + (t_U - t_L - t_{LD})^2 / (4a) - (t_H + t_{HL} - t_L - t_{LD})^2 / (2b) \\
+ (t_H + t_{HL} - t_L - t_{LD})^2 / (4b) \\
= (t_L + t_{LD}) r_N - (t_U - t_L - t_{LD})^2 / (4a) - (t_H + t_{HL} - t_L - t_{LD})^2 / (4b)
\]
where \(r_N\) is the normal return to capital. Note that the quadratic cost of shifting function results in a net benefit of each type of income shifting equal to one-half the gross benefit.

The ETR is found by dividing the tax associated with the additional capital placed in LT with the pre-tax return, \(r_N\), on the capital. Thus, the ETR for the excess limit (EL) case, which we denote ETR(EL, LT), is as follows:
\[
ETR(EL, LT) = (t_L + t_{LD}) - (t_U - t_L - t_{LD})^2 / (4a r_N) - (t_H + t_{HL} - t_L - t_{LD})^2 / (4b r_N).
\]

**Excess credit case**

When the parent has excess foreign tax credits, the royalty paid from the affiliate is shielded from U.S. tax by the excess credits and we credit this benefit to the LT investment. In this case there should be
no underpayment of royalties. We assume, however, that parents take into consideration that they may not always be in an excess credit position when royalties are paid and therefore the optimal royalty will be less than the ‘true’ royalty. The net tax benefits to shifting in this case are $t_U R + (t_U - t_L)S_U - C(S_U)$. The first term is the reduction in U.S. tax due to the royalty payment, the second is the benefit of retaining any underpayment of royalty in the low tax location, and the third is the cost of shifting.

We assume that the costs of shifting in the excess limit and excess credit cases differ and parameterize the cost function to give a higher royalty and therefore lower value for the amount retained in the excess credit case. The cost of shifting function becomes $C(S_U) = c(S_U/K_L)^2 K_L$. Solving for the optimal amount of shifting gives $S_U^* = (t_U - t_L) / 2c$ and $R^* = R_T - S_U^*$. In the simulation, we use a parameter value for $c$ that results in a royalty of .15 and income shifting amount of .15.

We also must take into account that the interest allocation rules under current law are binding for firms in excess credit positions. The allocation of domestic interest expense against foreign source income reduces the foreign tax credit limitation and therefore decreases foreign tax credits. As a result, any allocation of domestic interest expense to foreign source income is lost as a deduction. We assume that domestic interest expense that must be allocated abroad is 15 percent of the normal return and therefore increases the effective tax rate by $.15 r_{N_{U}}$ for firms in excess credits.

The taxes associated with the investment in LT for the excess credit case can be written:

$$T_L = t_L r_N + .15 t_{N_U} S_U^{*} - (t_U - t_L)S_U^{*} + c(S_U^{*})^2 - (t_H - t_L)S_H^{*} + b(S_H^{*})^2.$$ 

Dividing by $r_N$ gives us the ETR:

$$ETR(EC, LT) = t_{L} + .15t_{U} - t_{U}(R_T - (t_U - t_L)/(2c))/r_N - (t_U - t_L)^2 / (4cr_{N}) - (t_H - t_L)^2 / (4br_{N}).$$

The current law (CL) effective tax rate for the LT case, $ETR(CL, LT)$, is a weighted average of the excess limitation and excess credit cases where $p$ is the weight given to the excess limit case:

$$ETR(CL, LT) = p*ETR(EL, LT) + (1-p)*ETR(EC, LT).$$

We assume that 20 percent of parent firms are in excess credit positions in our simulations.

We turn now to the relatively simple formulas for the ETRs under current law for investment in HT. Since the routine investment in the HT affiliate earns only the normal return the ETR can only be
lowered below the statutory rate in HT through income shifting to the LT operation. The ETR for the HT investment in the excess limit case, which we denote $\text{ETR}(\text{EL, HT})$ is as follows:

$$\text{ETR}(\text{EL, HT}) = (t_H + t_{H,D}) - (t_H + t_{H,D} - t_L - t_{L,D})^2 / (4br_N).$$

The excess credit case is simply the EC case without any repatriation tax (and any shifting related to intangibles):

$$\text{ETR}(\text{EC, HT}) = t_H + .15t_U - (t_H - t_L)^2 / (4br_N).$$

Again, the current law ETR is a weighted average of the two foreign tax credit cases:

$$\text{ETR}(\text{CL, HT}) = p\text{ETR}(\text{EL, HT}) + (1-p)\text{ETR}(\text{EC, HT}).$$

**Dividend exemption before Check-the-Box**

The ETR formulas for dividend exemption (DE) are straightforward. There is no repatriation tax burden and royalties are fully taxed. The formulas for LT and HT investment are:

$$\text{ETR}(\text{DE, LT}) = t_L - (t_U - (1/2)t_L)^2 / (4ar_N) - (t_H - t_L)^2 / (4br_N),$$

and

$$\text{ETR}(\text{DE, HT}) = t_H - (t_H - t_L)^2 / (4br_N).$$

**Current law after Check-the-Box**

Check-the-box opens up generous tax planning opportunities through the use of hybrid entities in tax havens. As explained in the text, setting up and shifting income to hybrid entities is relatively easy. In our calculations, we assume that half of both the high tax and low tax income is shifted to the haven at no cost. This makes calculating effective tax rates straightforward since the availability of the tax haven to shift one half of income has the effect of lowering the rates in both LT and HT by one-half.

The taxes associated with the LT investment are therefore:

$$T_L = ((1/2)t_{L,L,D})r_N - ((1/2)t_{L-L,D})^2 / (4a) - ((1/2)t_H + t_{H,L,D} - (1/2)t_{L-L,D})^2 / (8b).$$

The ETR for the excess limitation case becomes with check-the-box:

$$\text{ETR}(\text{CB,EL,LT}) = ((1/2)t_{L,L,D})r_N - (t_U - (1/2)t_{L-L,D})^2 / (4ar_N) - ((1/2)t_H + t_{H,L,D} - (1/2)t_{L-L,D})^2 / (4br_N).$$

We adjust the excess credit case for the tax planning opened up by check-the-box similarly:

$$\text{ETR}(\text{CB,EC,LT}) = (1/2)t_{L} + .15t_U - t_U(R_T-t_U - (1/2)t_L)/(2c))/r_N$$

$$- (t_U - (1/2)t_{L})^2 / (4cr_N) - (t_H - t_{L})^2 / (16br_N).$$
As before, the formulas for HT investment are the same as for LT except there is no shifting from the U.S. parent:

$$ETR(CTB, EL, HT) = \frac{((1/2)t_t + t_H - t_L - t_H - t_L)^2}{4b_N}$$

$$ETR(CTB, EC, HT) = (1/2)t_H + .15t_U - (t_H - t_L)^2 / (16b_N)$$

**Dividend exemption after Check-the-Box**

The ETRs for the dividend exemption cases after CTB are as follows:

$$ETR(CTB, DE, LT) = (1/2)t_L - (t_U - t_L)^2 / (4a_N) - (t_H - t_L)^2 / (16b_N)$$

$$ETR(CTB, DE, HT) = (1/2)t_H - (t_H - t_L)^2 / (16b_N)$$

**Japanese type dividend exemption**

The Japanese type dividend exemption system imposes a minimum tax, $t_M$, in each location with an exception for active business income. As a result, the LT and HT real investments qualify for the exception. The tax haven does not since it does not have real operations. Any income in the tax haven pays the U.S. rate and, as a result, it has no benefit for income shifting purposes. The benefits of the “routine” type income shifting --- underpaying royalties and shifting income from HT to LT --- are still available, however. The ETRs are the same as those available under dividend exemption before check-the-box:

$$ETR(JAPAN, LT) = t_L - (t_U - t_L)^2 / (4a_N) - (t_H - t_L)^2 / (4b_N), \text{ and}$$

$$ETR(JAPAN, HT) = t_H - (t_H - t_L)^2 / (4b_N).$$

**Per country minimum tax with and without expensing**

Adjusting the ETRs to take into account the per country minimum tax is straightforward: whether the income is shifted to the haven or not, it is subject to the minimum tax rate. There is still an advantage, however, to shifting the income coming from the high tax investment to the haven entity. Since we assume half of the income is shifted to the haven, the benefit of shifting between HT and LT is now the average of the HT rate and the minimum tax rate compared with the minimum tax rate. This gives an ETR for the no expensing (NE) case:

$$ETR(MIN, NE, LT) = t_M - (t_U - t_M)^2 / (4a_N) - (t_H - t_M)^2 / (16b_N).$$
For the case with expensing (E), the ETR becomes:

\[
ETR(MIN, E, LT) = t_L - (t_U - t_M)^2 / (4ar_N) - (t_H - t_M)^2 / (16br_N). 
\]

The high tax cases are adjusted, as follows, by eliminating the income shifting from the LT case since there is only a routine investment involved and substituting the appropriate rates. Since the returns on the routine investment in HT is not subject to the minimum tax, there is no impact of expensing.

\[
ETR(MIN, NE, HT) = ETR(MIN, E, HT) = (1/2)t_H - (t_H - t_M)^2 / (16br_N) 
\]

**Overall minimum tax with and without expensing**

The ETRs will differ depending on whether the company's overall effective tax rate on foreign source income is above or below the 15 percent minimum threshold. We assume in these simulations that there are existing operations abroad that determine whether the company is above and below this threshold and that the new investment will not affect the company's status. For companies above the threshold, no minimum tax will be paid and the ETRs are the same as under dividend exemption:

\[
ETR(OVERALL, NE, LT) = (1/2)t_L - (t_U - (1/2)t_L)^2 / (4ar_N) - (t_H - t_M)^2 / (16br_N) 
\]

\[= ETR(OVERALL, E, LT) \]

\[
ETR(OVERALL, NE, HT) = (1/2)t_L - (t_H - t_L)^2 / (16br_N) = ETR(OVERALL, E, LT) 
\]

Companies below the threshold face the minimum tax. Unlike under the per country minimum tax, there is no longer an incentive to shift income to the haven or from the high tax to the low tax operation. The ETRs for LT investment are as follows

\[
ETR(OVERALL, NE, LT) = t_M - (t_U - t_M)^2 / (4ar_N). 
\]

For the case with expensing (E), the ETR becomes:

\[
ETR(OVERALL, E, LT) = t_L - (t_U - t_M)^2 / (4ar_N). 
\]

For the routine HT investment, the ETR is the minimum tax rate, \( t_M \), since there is no mechanism in the form of intangibles or debt to shift income from the U.S. to HT in our model:

\[
ETR(OVERALL, NE, HT) = t_M - (t_U - t_M)^2 / (4ar_N). 
\]

Since the routine HT investment earns only a normal return the ETR would be zero with expensing:
$ETR(\text{OVERALL, E, HT}) = 0.$
## Appendix Table 1
### Tax Holiday Repatriations and Retained Earnings
*(Tobit Regressions)*

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Repatriations/ Accumulated Deferrals</th>
<th>Log of Repatriations/ Accumulated Deferrals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulated Deferrals/2004 Income</td>
<td>0.0436 (0.0171)</td>
<td>0.0059 (0.0068)</td>
</tr>
<tr>
<td>Ratio of Deferrals to Income*Effective Foreign Tax Rate</td>
<td>-0.1871 (0.0788)</td>
<td>0.2637 (0.0759) 0.1055 (0.0319)</td>
</tr>
<tr>
<td>Log of Ratio of Deferrals to Income</td>
<td>0.2637 (0.0759)</td>
<td>0.1055 (0.0319)</td>
</tr>
<tr>
<td>Log of Ratio of Deferrals to Income*Effective Foreign Tax Rate</td>
<td>-0.8335 (0.3404)</td>
<td>0.2637 (0.7380) 2.2845 (0.7407)</td>
</tr>
<tr>
<td>R&amp;D/Sales of Parent</td>
<td>3.312 (0.9668)</td>
<td>2.990 (0.8472) 2.2637 (0.7380) 2.2845 (0.7407)</td>
</tr>
<tr>
<td>Foreign Profit Margin on Sales</td>
<td>0.9010 (0.2824)</td>
<td>0.7414 (0.2480) 0.8210 (0.2173) 0.8018 (0.2189)</td>
</tr>
<tr>
<td>Effective Foreign Tax Rate</td>
<td>0.1573 (0.4357)</td>
<td>-0.5333 (0.2677) 0.7146 (0.5325) -0.4849 (0.2327)</td>
</tr>
<tr>
<td>Ratio of Previously Taxed Income to Sales</td>
<td>-0.6573 (0.3703)</td>
<td>-0.5423 (0.3176) -0.6087 (0.2934) -0.5911 (0.2909)</td>
</tr>
<tr>
<td>Ratio of Tangible Capital to Sales</td>
<td>-0.1074 (0.0801)</td>
<td>-0.0814 (0.0698) -0.0891 (0.0611) -0.0864 (0.0610)</td>
</tr>
</tbody>
</table>

**Notes:** N=413. Standard errors in parenthesis. Companies with nonpositive retained earnings excluded. One added to dependent variable in logarithmic specification.
### Appendix Table 2
**Tax Holiday Repatriations Relative to Sales**
(Tobit Regression)

<table>
<thead>
<tr>
<th>Independent Variables:</th>
<th>Dependent Variable: Repatriation/Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulated Deferrals/Sales</td>
<td>0.4566 (0.0582)</td>
</tr>
<tr>
<td>(Accumulated Deferrals/Sales)^2</td>
<td>0.0116 (0.0065)</td>
</tr>
<tr>
<td>(Accumulated Deferrals – Real Capital)/Sales</td>
<td>0.1768 (0.0339)</td>
</tr>
<tr>
<td>[((Accumulated Deferrals – Real Capital)/Sales)]^2</td>
<td>0.0362 (0.0051)</td>
</tr>
<tr>
<td>(R&amp;D/Sales) of Parent</td>
<td>1.81 (0.413) 1.86 (0.451)</td>
</tr>
<tr>
<td>Foreign Profit Margin</td>
<td>-0.302 (0.158) 0.551 (0.121)</td>
</tr>
<tr>
<td>Effective Foreign Tax Rate</td>
<td>-0.163 (0.133) -0.167 (0.144)</td>
</tr>
<tr>
<td>Ratio of Previously Taxed Income to Sales</td>
<td>-0.021 (0.162) -0.270 (0.146)</td>
</tr>
<tr>
<td>Tangible Capital/Sales</td>
<td>-0.0527 (0.0346)</td>
</tr>
</tbody>
</table>

**Notes:** N=413. Standard errors in parenthesis. Companies with nonpositive retained earnings excluded. Accumulated deferrals are net of foreign tangible assets.