

# *Intangible Income, Intercompany Transactions, Income Shifting, and the Choice of Location*

**Abstract** - The links between intangible income, intercompany transactions, income shifting and the choice of location are investigated using data on U.S. parent corporations and their manufacturing subsidiaries. The objective is to better understand the income shifting process and its implications. In particular, do opportunities for income shifting distort “real” behavior such as the choice of location and the volume of intercompany transactions? Do prospective benefits from income shifting change behavior in both high-tax and low-tax locations? The results present a coherent, consistent picture. Income derived from R&D based intangibles accounts for about half of the income shifted from high-tax to low-tax countries. R&D intensive subsidiaries engage in a greater volume of intercompany transactions and, therefore, have more opportunities for income shifting. In addition, subsidiaries in locations with either very high or very low statutory tax rates, with a strong incentive to shift income in or out, also undertake a significantly larger volume of intercompany transactions. Finally, R&D intensive U.S. parent companies respond to the opportunities for income shifting by investing in countries with either very high or very low statutory tax rates. As a sidelight, we find that the allocation of debt among subsidiaries and the shifting of R&D based intangible income together account for virtually all of the observed difference in profitability between high and low tax countries.

## INTRODUCTION

Several studies have found evidence indicating that multinational corporations (MNCs) shift income from high-tax to low-tax locations (Grubert and Mutti, 1991; Hines and Rice, 1994, among others). But there has not been much analysis of how opportunities for income shifting vary by type of company and how it affects their behavior. There are a number of interesting questions. In particular, what type of income is typically shifted? Is it income attributable to parent R&D and advertising that is very difficult to value? Furthermore, do incentives for income shifting distort “real” decisions? For example, are companies induced to engage in more intercompany transactions, at the expense of arm’s length transactions, because of the income shifting opportunities

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they offer? Is an MNC's choice of location affected by the opportunity for shifting income out of high-tax locations and into low-tax ones?

This paper attempts to answer these questions. The issues we address are related and greater confidence is gained in the results if they are consistent with each other. For example, if it appears that income attributable to R&D accounts for a large part of the income shifted among locations, is it true that affiliates of R&D intensive parents trade more with each other? Furthermore, is the choice of location by R&D intensive companies influenced by income shifting incentives?

The literature that investigates the sources of income shifting and its implications for real transactions is relatively limited. Grubert and Slemrod (1998), hereafter referred to as GS, presented a model of income shifting and investment in Puerto Rico. The analysis in this paper differs in several crucial respects. Puerto Rico being a low-tax country, GS naturally focused on income shifting to a low-tax location and its implications for investment in that location. No attention was given to behavior in the location out of which income is shifted. However, investment in both *high-tax* and low-tax foreign locations can be affected by opportunities for income shifting. Indeed, a naive extension of the GS specification is not fruitful for studying investment in the whole spectrum of countries because it assumes that only investment in the low-tax country promotes income shifting. The fact that GS only had one observation for a foreign tax rate, the Puerto Rican rate, also necessarily limits the generality of their results.

Another reason why the Grubert-Slemrod results may not have general application is that Puerto Rico offered a unique tax environment, different from other low-tax foreign locations such as

Ireland and Singapore. Income shifting to Puerto Rico was in fact sanctioned by the Internal Revenue Code.<sup>1</sup> For example, a U.S. parent could choose to attribute *half* of the combined income from Puerto Rico based production to its Puerto Rican affiliate, including the contribution of valuable parent marketing and manufacturing intangibles, with no questions asked. It was not necessary to follow the general arms' length transfer pricing rules that apply to U.S. companies in other locations. As noted below, the special features of the Puerto Rican regime help explain why the results in this paper differ in important respects from Grubert and Slemrod.

The present paper studies the effect of income shifting on the volume of intercompany transactions in addition to the choice of location. Opportunities for income shifting can distort the choice between arms' length and related party transactions, which is related to but distinct from the choice of location. Evidence on this possible distortion has received little attention in the literature.

Two papers in the accounting literature have explored the sources of income shifting. Harris (1993) investigates the impact of the Tax Reform Act of 1986 on income shifting into or out of the United States. He relates income shifting to the 'flexibility' of the company's expenses, a composite measure based on the significance of interest, R&D, rent and advertising. The separate role of each of these expense categories is not identified. The results in this paper, however, show that R&D and advertising appear to offer far different opportunities for income shifting. Jacob (1996) extends Harris (1993) by relating income shifting to the volume of the company's interregional transactions. But he does not study whether the volume of intercompany transactions itself is distorted by income shifting incentives. He

<sup>1</sup> There have been a series of cutbacks in the tax benefits of a Puerto Rican location since 1993 and the incentive program is scheduled to lapse entirely in 2005.

also does not show how different company characteristics, such as R&D intensity, affect the number of intercompany transactions.

As already mentioned, one major conceptual and empirical issue is how opportunities for income shifting affect the volume of intercompany transactions and investment in both high *and* low tax countries. The earlier papers tended to focus on only one end of the tax spectrum. Mintz and Smart (2001), for example, on the basis of a model of income shifting through intercompany debt, argue for an asymmetric effect—that income shifting reduces the sensitivity of real investment to tax differentials because it allows income to be stripped out of high tax locations. Grubert and Mutti (1991) showed that low host country taxes cause U.S. parents to increase related party exports to that country relative to exports to unrelated parties, but they did not test the possibility that subsidiaries in high-tax countries also had an incentive to increase their intercompany transactions. Altshuler and Grubert (2000) did show how various financial strategies can lower effective tax rates in *both* high and low tax countries but they do not test the implications for real transactions.

This paper explores the symmetry issue and its implications for 'real' behavior, the effect of income shifting on the volume of intercompany sales and the choice of location. Accordingly, the simple model presented at the beginning of the next section introduces the explicit relationship between the volume of intercompany transactions, which provide the opportunity for income shifting, and the capital in two locations, one low-tax and the other high-tax. It shows how the effective tax rate in *both* high-tax and low-

tax countries can fall depending on the extent to which additional capital in a location expands intercompany transactions and thereby the opportunities for income shifting. The empirical results also suggest a relatively symmetric effect with both the choice of location and the volume of intercompany transactions altered at both ends of the tax spectrum.

After presenting the simple model of MNC investment in two subsidiaries that attempts to clarify the relationship between intercompany transactions, income shifting, intangible assets and investment, the paper then proceeds to study these relationships empirically using the 1996 Treasury files for U.S. based MNCs and their manufacturing subsidiaries. The first empirical section evaluates the extent to which the correlation between profitability and local tax rates found in earlier studies depends on the presence of parent intangible assets. It finds that income associated with parent R&D seems to account for about 50 percent of the income shifted from high-tax to low-tax countries.<sup>2</sup> The second empirical section examines data on intercompany transactions to see if a greater tax incentive to shift income in or out causes a greater volume of related party as opposed to arms' length transactions. The results indicate that R&D intensive companies engage in a greater volume of intercompany transactions. Advertising intensive companies have a lower than average volume. Furthermore, companies in both very high-tax and low-tax countries enter into a much greater number of related party transactions.

The third empirical section tests the implications of the results in the first two sections for the choice of investment location. The results complete a coherent

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<sup>2</sup> This paper focuses on shifting by means of "nonfinancial" transactions between affiliates, e.g., transactions such as the purchase and sale of goods or the payment of royalties. However, we will add a simple empirical analysis of the allocation of debt in the MNC to see how much of the overall mechanism of income shifting we can identify.

picture. R&D intensive MNCs are more likely to invest in locations with either very high or very low statutory tax rates, holding other variables including the country *effective* tax rate fixed. However, advertising intensive parents are less likely to choose these locations with extreme differences in tax rates.

#### A SIMPLE MODEL OF INTERCOMPANY TRANSACTIONS AND INCOME SHIFTING

The purpose of this simple model is to clarify the relationship between intercompany transactions and income shifting, and then see how opportunities for income shifting affect the choice of location and the level of investment in both high-tax and low-tax countries.

There are two subsidiaries (or a parent and a subsidiary), with real capital  $K_1$  in the high tax country and  $K_2$  in the low tax country. We assume for the purpose of the model that statutory and effective tax rates are equal in each country and are  $t_1$  and  $t_2$ , respectively.<sup>3</sup> The two return to capital (or production) functions are  $g_1(K_1)$  and  $g_2(K_2)$ . Capital does not depreciate.

The two subsidiaries engage in intercompany transactions such as the purchase and sale of components or services. The “normal” level of transactions between the two parties, undistorted by tax considerations and reflecting only cost advantages, is  $m(K_1, K_2)$  and depends on the amount of capital in each location. The specific  $m$  function will depend on the characteristics of the parent company and the comparative advantage of each location. As we will see, affiliates of R&D intensive parents engage in a much greater level of intercompany transactions.

Intercompany transactions provide the opportunity for income shifting. Compa-

nies can, of course, enter into a “greater than normal” level of intercompany transactions, but this comes at a cost or loss of efficiency. For example, it might otherwise have been less costly for the buyer to trade at arm’s length with an unrelated party or to manufacture the components itself. The extra costs of these “greater than efficient” level of intercompany transactions have the simple quadratic form:

$$\frac{c}{2} \left( \frac{T-m}{m} \right)^2 m,$$

where  $T$  is the *actual* volume of transactions and  $c$  is the parameter indicating the cost of excess transactions.

The amount of income shifted *per transaction* is  $s$ , so the tax gain from shifting, before penalties, is  $(t_1 - t_2)sT$ . Income shifting runs the risk of tax penalties and additional legal and accounting expenses, etc., and these potential costs increase as  $s$  becomes a larger percentage of each transaction. We assume that the expected cost of shifting function has the simple quadratic form, common in the tax evasion literature,  $(p/2)s^2T$ , where  $p$  is the cost of shifting parameter. As in GS,  $p$  may depend on company intangibles such as patents or trademarks because they are difficult to value, but this is an issue we will introduce later in this section.

The full after-tax profits from the two locations for given  $K_1$  and  $K_2$  are:

$$g_1(K_1)(1 - t_1) + g_2(K_2)(1 - t_2) + (t_1 - t_2)sT -$$

$$\frac{c}{2} \left( \frac{T-m}{m} \right)^2 m - \frac{p}{2}s^2T - r(K_1 + K_2),$$

where  $r$  is the required return to equity. We assume that equity is the only source of finance. Home country taxation is ignored.<sup>4</sup> The tax deductibility of the tax penalties and of the extra costs of inter-

<sup>3</sup> How the profit maximizing conditions change when statutory and effective rates differ will be indicated below.

<sup>4</sup> Althuler and Grubert (2000) show how companies can use various strategies to avoid home country repatriation taxes. Grubert and Mutti (2001) and Grubert (2001a) present evidence that the residual U.S. tax on dividend repatriations is very modest, even from low-tax countries because repatriation rates from them are virtually zero.

company transactions is not explicitly displayed and is embodied in the penalty and costs functions already. Expressing net profits in present values would not alter the results.<sup>5</sup>

Taking the derivative of net profits with respect to  $s$  and  $T$ , holding  $K_1$  and  $K_2$  fixed, we find that the optimal levels are:

$$s = \frac{(t_1 - t_2)}{p} \quad \text{and} \quad T = \left(1 + \frac{(t_1 - t_2)^2}{2pc}\right) m.$$

The first of these familiar looking conditions simply states that optimal shifting per transaction increases with the tax differential and decreases with the shifting penalty. The second states that the transactions that are "above normal" increase with the net benefit of shifting per transaction and decrease with the extra cost of excess transactions. Using these optimal conditions for  $s$  and  $T$ , we find the condition for the optimal level of investment  $K_i$ :

$$g^{Ki}(K_i)(1 - t_i) = r - \left[ \frac{(t_1 - t_2)^2}{2p} \left(1 + \frac{(t_1 - t_2)^2}{2pc}\right) - \frac{c}{2} \left( \frac{(t_1 - t_2)^2}{2pc} \right)^2 \right] m^{Ki},$$

where the variable in the superscript refers to the partial derivative with respect to  $K_i$ . Note that if the marginal effective tax rate differs from the statutory rate, it would be substituted for  $t_i$  on the left hand side. The large term in the square bracket is the net shifting benefit from additional transactions. When  $c$  becomes very large, the marginal net shifting benefit per transaction reduces to:

$$\frac{(t_1 - t_2)^2}{2p}.$$

Even if the cost of going beyond the 'normal' level of transactions is prohibitive,

additional investment still benefits from the shifting opportunities offered by this 'normal' level per unit of capital.

The condition for the optimal  $K_i$  shows how the conventional cost of capital can be straightforwardly altered when the benefits of income shifting are introduced. The change depends critically, of course, on  $m^{Ki}$ , the marginal increase in transactions resulting from an increase in investment in  $K_i$ . It seems reasonable to assume that  $m(K_1, K_2)$  is linear, homogeneous in the  $K_i$ s, and that it has properties similar to a production function. That is, if  $K_1$  is small relative to  $K_2$ , one might assume that an expansion of  $K_1$  would increase transactions more than a similar absolute increase in  $K_2$ . Along the same lines, in a world of many countries with fewer low-tax countries than high-tax ones, the benefits of shifting would probably reduce the marginal effective tax rate (or cost of capital) by a greater amount in the low-tax countries than in the high-tax locations.

### *The Role of Intangibles*

Intangibles can enter the model in two mutually reinforcing ways. One is through  $m$ , the number of "normal" intercompany transactions, which determine opportunities for income shifting. As shown in the next section, subsidiaries of R&D intensive parents engage in a significantly greater amount of intercompany transactions. Thus, the  $m$  function depends on company characteristics including R&D and advertising. The other, complementary route is through the effect of intangible assets on the shifting penalty parameter  $p$ , as in GS. It is much more difficult to estimate arm's length prices for high technology products such as drugs or semiconductors, a range of uncertainty that companies can exploit. But to take advantage of the greater feasibility of

<sup>5</sup> With no cost of repatriating income, there is no reason for the company to defer going to the optimal level of investment in the first period.

shifting intangible income from a high-tax foreign subsidiary to a low-tax foreign sibling, actual transactions between them are necessary. (For shifting intangible income from the United States to a low-tax subsidiary, inadequate royalty payments back to the parent are all that is required.)

This simple model shows how opportunities for income shifting can stimulate a greater volume of intercompany transactions and investment in both high and low tax countries. The extent of the decline in the effective tax rate on new investment in a location, either high or low tax, depends simply on the additional amount of income shifting facilitated by an increase of investment there. The model also shows that there are two channels through which intangible assets can promote income shifting. One is by increasing the volume of intercompany transactions and thereby expanding opportunities for income shifting. The other is by increasing the range of uncertainty in what constitutes an "arms' length" price for intercompany sales and thus reducing the cost of an aggressive pricing policy.

All intercompany transactions are subject to the transfer pricing rules, which mandate "arms' length" prices, the prices that a comparable unrelated party would pay. If the parent company transfers an intangible asset such as a patent to a subsidiary, the Internal Revenue Code specifies that the royalty be "commensurate with the income attributable to the intangible." There are also detailed regulations that spell out appropriate methods for applying these principles, but the range of uncertainty is necessarily very wide in the case of "unique" high-tech intangibles for which valid arms' length comparable transactions are unlikely to be available.

## EMPIRICAL ANALYSIS

The data used in the empirical analysis is derived principally from the Treasury corporate tax return files for 1996. They include data from the Form 1120, the basic corporate tax return, and the Form 5471, an information return filed for each of the company's controlled foreign corporations (CFCs). A CFC, as defined in the Internal Revenue Code, is a foreign company, more than 50 percent of which is owned by U.S. shareholders.<sup>6</sup> Data from Compustat are also linked with these files for the purpose of obtaining more accurate data on company R&D. (See the Appendix for a more detailed description of the data.) The sample in the first two sections is derived from the data for the 7,500 largest CFCs because detailed information is only available for them. The sample is cut down further by restricting it only to CFCs with positive earnings.<sup>7</sup> In the first two sections, there are 1,751 manufacturing CFCs in the sample owned by 389 parents.

### *Which Type of Income or Expense is Shifted?*

Several previous studies have presented evidence consistent with income shifting from high-tax to low-tax countries. These include Grubert and Mutti (1991), Hines and Rice (1994) as well as others cited by Hines (1996) in his review article. In general they show that profitability is much higher in low-tax countries and that the magnitude of the differential is difficult to explain on other grounds. But there is much less evidence on the factors that contribute to income shifting, such as the presence of intangible assets or even the use of debt. GS have reported on the contribution of parent R&D and advertising to the profitability

<sup>6</sup> Shareholders for this purpose must each own at least 10 percent of the company.

<sup>7</sup> The results are not sensitive to this restriction. Indeed, they are stronger if CFCs with losses are included.

of U.S. companies in Puerto Rico, but as we have explained the special nature of the Puerto Rican tax incentive makes it difficult to draw any general conclusions. This section uses data on profitability in virtually the entire range of countries in which U.S. based manufacturing companies operate to test the hypothesis that intangible assets are a major facilitator of income shifting.<sup>8</sup>

The dependent variable in the Table 1 regressions is the ratio of CFC pre-tax earnings to CFC sales. CFC earnings are "Earnings and Profits" (E&P), which are defined in the Internal Revenue Code and are intended to approximate book net profits. E&P, therefore, has the advantage of being defined consistently across jurisdictions. As in the earlier studies, a correlation between profit rates and the tax in-

**TABLE 1**  
REPORTED PROFITS AND SHIFTING INCENTIVES—MANUFACTURING CFCs IN 1996 DEPENDENT  
VARIABLE IS THE RATIO OF CFC PRE-TAX EARNINGS TO CFC SALES  
(t values in parentheses)

Independent variables					
CFC age <5 years	.0045 (.521)	.0041 (.47)	.0035 (.40)	.0035 (.39)	.0149 (1.76)
CFC age 5–15 years	.0097 (1.62)	.0092 (1.5)	.0093 (1.55)	.0095 (1.57)	.0101 (1.77)
Parent R&D/sales	.735 (4.20)	2.041 (4.04)	2.25 (4.31)	2.06 (4.06)	1.93 (3.97)
Parent advertising /sales	.268 (3.37)	.242 (.93)	.238 (.91)	.292 (1.12)	.374 (1.50)
Parent domestic profits/sales	.112 (2.73)	.112 (2.74)	.295 (2.44)	.120 (2.89)	.086 (2.19)
Local statutory tax rate	-.129 (5.61)	-.068 (1.90)	-.037 (.91)	-.039 (1.02)	.0026 (.08)
Log of parent sales	.0006 (.34)	.0008 (.42)	.0008 (.42)	.00 (.00)	.0018 (1.03)
CFC assets/sales	.0389 (14.49)	.0388 (14.46)	.0388 (14.46)	.0392 (14.55)	.0349 (13.45)
R&D * statutory tax rate		-3.83 (2.75)	-4.25 (3.07)	-3.88 (2.78)	-3.53 (2.64)
Advertising * statutory tax rate		.112 (.16)	.116 (.17)	-.013 (.02)	-.227 (.33)
Parent profits * statutory tax rate			-.535 (1.60)		
GDP per capita				-.0084 (2.32)	
CFC debt/asset ratio					-.129 (12.12)
Adjusted R <sup>2</sup>	.143	.146	.147	.149	.212

Notes to Table 1: The mean of the dependent variable is .123. N = 1,751.

<sup>8</sup> The 60 countries in the sample are listed in Grubert and Mutti (2000).



cervatives to shift income, controlling for other factors such as a company age, is interpreted as being consistent with income shifting. E&P is defined after deducting interest expense and royalties, which can be used as vehicles for income shifting in addition to commodity transactions and are discussed separately below.<sup>9</sup> E&P is also defined net of the *subsidiary's* R&D, which tends to be small judging by aggregate industry statistics. The R&D measure used in this paper is *parent* R&D because the focus is on parent-developed intangibles.<sup>10</sup>

*Pre-tax* earnings are chosen for the profitability measure instead of *after-tax* earnings because it is a more rigorous test for the identification of profit shifting. If MNCs equalize the (marginal) *after-tax* rate of return across locations, as they might be expected to do in the absence of income shifting, then *after-tax* returns would appear to be the appropriate variable to test whether higher tax rates in a jurisdiction induce lower reported profits. However, we cannot be sure that *after-tax* returns would be equalized because *other* forces such as debt flows and commodity trade might tend to equalize *pre-tax* returns.<sup>11</sup> If *pre-tax* returns do tend to equalize, there would be a negative correlation between tax rates and *after-tax* returns even without any income shifting. Any observed negative correlation could therefore not be interpreted as evidence of income shifting. *Pre-tax* returns are therefore used to make sure that any finding consistent with income shifting is not spurious. But this means that any negative relationship actually observed *understates* the degree of income shifting to the extent that there is some

tendency for *after-tax* rates of return to be equalized.

Sales are chosen instead of assets as the denominator in the profitability measure because assets are based on historical book values and are therefore an unreliable measure of current market values. This observational error could greatly increase the variance in the ratio of profits to assets. Current sales may in fact be a better indicator of current asset values. However, the ratio of assets to sales is added as an explanatory variable because it can on the average provide a valid indication of differences in capital intensity per unit of sales. In any case, the results do not seem sensitive to which denominator is used.

The first column presents a profitability regression equation similar to ones in previous studies. (See, for example, Grubert, 1998.) The country statutory tax rate is the basic indicator of the incentive on the margin to shift a dollar of income in or out. The other independent variables are parent and CFC characteristics, including parent R&D and advertising intensity, parent domestic profitability, and CFC age dummies based on date of incorporation. The non-tax variables are included because they are expected to have an independent effect on profitability. Parent R&D and advertising intensity and domestic profitability indicate intangible assets that would contribute to CFC profits. The age dummies are used because of the possibility that newer companies are less profitable because of start-up costs.

Reviewing the results in Column 1 for the non-tax variables first, we see that the indicators of company intangible assets,

<sup>9</sup> As noted below, there may be an interaction between shifting with commodity prices and royalties. It may therefore be difficult to separate the two effects.

<sup>10</sup> It is possible that subsidiaries in high-tax countries perform more R&D but this should not bias the results. On the average, the current deduction should be reflected in higher E&P in the future.

<sup>11</sup> For example, Samuelson-Lerner factor price equalization because of trade refers implicitly to *pre-tax* factor prices.



parent R&D and advertising, contribute significantly to CFC profits.<sup>12</sup> Also, more profitable parents have more profitable subsidiaries. Surprisingly, the coefficients for the age dummies are not statistically significant and are positive, suggesting that newer operations are more profitable.

Moving on to the tax incentive to shift income, we see that a higher local statutory tax rate has a very significant negative impact on reported earnings, consistent with income shifting, as expected. For example, a reduction of the statutory tax rate from 45 percent to 15 percent increases profitability by more than one-third.<sup>13</sup>

The regression in the second column of Table 1 tests the hypothesis that income attributable to intangible assets such as patents or trademarks facilitates income shifting. It interacts each of the intangible asset indicators, parent R&D and advertising intensity, with the statutory tax rate. Does the statutory tax rate have an impact only to the extent that intangible assets are present? The coefficient of the R&D–statutory tax rate interaction variable is negative, as expected, and significant statistically. However, the coefficient of the advertising interaction variable is virtually zero. Income associated with industrial intangibles such as patents and know-how is shifted from high-tax countries to low-tax countries, but income from marketing intangibles apparently is not. Furthermore, the basic coefficient of the statutory tax rate variable by itself falls almost by 50 percent in absolute value compared to column 1. About half of the observed difference in profitability between high and low tax countries seems to be accounted for by the shifting of income derived from industrial intangibles.

Appendix Table 1, which presents R&D and advertising intensity by industry, shows where the R&D intensive companies are concentrated. Pharmaceutical companies are the most R&D intensive, followed by computers and electronics. Food and beverage companies are on the average very advertising intensive with very little R&D. Pharmaceutical companies are relatively advertising intensive as well, indicating that they have significant marketing intangibles in addition to their manufacturing intangibles. In contrast, electronics companies have below average advertising intensity, indicating that their intangible income is derived primarily from patents and other manufacturing intellectual property.

The third regression in Table 1 adds an interaction between the statutory tax rate and parent domestic profitability on the grounds that higher parent profitability reflects an intangible asset not captured by R&D or advertising. Its coefficient turns out to be negative and is significant at about the 10 percent level. The coefficient of the basic uninteracted statutory tax rate shrinks even further and is no longer significant at conventional levels. This would suggest that income from intangible assets accounts for even more than the half of shifted income estimated above.

When we refer to the shifting of intangible income to low-tax countries, we do not necessarily imply that it is shifted only from high-tax *foreign* countries. It may be shifted from the United States in the sense that CFCs in low-tax countries pay inadequate royalties or pay too little for U.S. components. Also, the income shifted from high-tax foreign countries to low-tax ones should perhaps have been paid

<sup>12</sup> We do not have data on R&D or advertising performed by the CFC itself. The R&D and advertising coefficients may in part reflect CFC activities. But more aggregate data in the U.S. Commerce Department 1994 Benchmark Survey of U.S. Direct Investment Abroad indicate that R&D performed by CFCs is relatively modest.

<sup>13</sup> The effect is much larger quantitatively when companies with losses are included in the sample.

as royalties to the U.S. parent. The coefficients in columns 2 and 3, for the direct impact of R&D and the indirect effect through the R&D–tax interaction term, indicate that at a local statutory tax rate just above 50 percent the CFC’s net profits appear to lose all the benefits of parent R&D. However, it is difficult to conclude definitively that these highly taxed subsidiaries are reporting the “correct” amount of income under arm’s length principles, and that any “excess” income obtained by low-tax subsidiaries really belongs in the United States. It may be that, under arm’s length principles, an owner of a patent would share some of the profits with an *unrelated* arm’s length licensee in order to ensure efficient performance.

Whatever the source of the intangible income shifted to low-tax countries, the large coefficients for R&D in columns 2 and 3 do show that low-tax CFCs benefit a great deal from parents’ industrial intangibles. To illustrate, we can first note that mean R&D intensity is .014 with a standard deviation of .015. (See Appendix Tables 1 and 2 for summary statistics.) An increase in parent R&D intensity by one standard deviation would raise the profitability of a hypothetical zero-tax subsidiary by more than 25 percent of the mean profit rate in the sample.

A possible objection to these results, and the shifting literature in general, is that the regressions do not include other country and company variables that may affect profitability. Accordingly, in the fourth column of Table 1, country per-capita income is included as another explanatory variable. Its coefficient turns out to be negative and significant, indicating that profitability is higher in poorer countries, perhaps because of low labor costs. However, comparing this regression with col-

umn 2 shows that the basic results on the sources of shifting are not affected. If anything it strengthens the importance of R&D based intangibles in income shifting. Another regression, not shown in the table, added the country’s GDP growth rate from 1990 to 1999 on the grounds that companies in faster growing economies are more profitable.<sup>14</sup> Its coefficient turned out to be statistically insignificant and had virtually no effect on the other results. Also, variables indicating parent company excess credit positions were added to some regressions but they were not statistically significant and did not affect the other coefficients.<sup>15</sup>

This paper focuses on income shifting linked to intangible assets, intercompany purchases and sales of goods, and the payment of royalties. Altshuler and Grubert (2000) outline various *financial* strategies that companies can use to shift income around the worldwide enterprise. In a regression with debt–asset ratios as the dependent variable, they show CFC leverage is a highly significant negative function of the local statutory tax rate. Here we are interested in how much this contributes to the disparity in profitability between high and low tax countries. In the last regression in Table 1, we, therefore, simply add the CFC’s debt–asset ratio as another independent variable in the net profitability equation. The question of interest is what happens to the coefficient of the basic stand-alone statutory tax rate variable. The debt–asset ratio has a highly significant negative coefficient, as expected, but more important in this context, the coefficient of the statutory tax rate becomes virtually *zero*. The shifting of income attributable to industrial intangibles and the allocation of debt among high- and low-tax countries seems to account for all of the observed differences in prof-

<sup>14</sup> A direct measure of average country profitability for purely local companies is very difficult to construct.

<sup>15</sup> Companies with excess credits might be expected to shift more income to low-tax countries because the income can then be repatriated without paying any U.S. tax. See Grubert and Mutti (2001) for further discussion.

itability between high and low statutory tax countries.<sup>16</sup>

*Intercompany Transactions and Shifting Incentives*

One of the objectives of the “arm’s length principle” for transfer pricing is presumably to prevent differences in country tax rates from distorting the choice between related party and unrelated party transactions. But if companies *can* take advantage of the ambiguity in the application of the transfer pricing rules, they will have an incentive to engage in more transactions with fellow affiliates. (This is suggested by the model as long as the cost parameters  $c$  and  $p$  are not so high as to make it unprofitable.) This section tests the hypothesis that affiliates in both very high and very low statutory tax rate jurisdictions, which can potentially gain the most from income shifting, engage in a greater volume of intercompany transactions. For example, a CFC in a country with a very high statutory tax rate will have a relatively large number of affiliates with lower tax rates to which it can potentially shift income, and it gains more from shifting income to any given lower tax CFC.

The Table 2 regressions show which companies engage heavily in intercompany transactions and how tax incentives alter their behavior. The sample is the same group of large manufacturing CFCs used in Table 1. The dependent variable in each of the regressions in Table 2 is constructed from the related party purchases and sales of goods, or “stock in trade,” as

reported on the Form 5471 filed for each CFC. In each case these are expressed in relation to the CFC’s total sales.

Two tax variables appear in the regressions because there are two related decision margins that can be influenced by tax considerations, the choice of location, and the choice between arm’s length and related party transactions. As shown in Grubert and Mutti (1991), low *effective* tax rates attract production that is sold offshore. Effective tax rates are an important determinant of the countries chosen as “export platforms” and are, therefore, the first tax variable. The average effective tax rates are based on the information that each parent company provides on each of its CFCs. The country effective rate is the ratio of all income taxes paid by manufacturing CFCs in that location to total Earnings and Profits, the measure of book income.<sup>17</sup> (See the data appendix for more details.)

The second tax variable identifies the incentive to engage in a greater volume of intercompany transactions in order to exploit shifting opportunities. As a measure, we use the *absolute* difference between the local *statutory* tax rate and 25 percent. A statutory tax rate of 25 percent was chosen because it is approximately half-way between the highest and lowest rates in the sample.<sup>18</sup> The CFCs that confront both very high and very low statutory tax rates have the greatest incentive to engage in transactions that provide the opportunities for income shifting.

To be sure, the two decisions, location and the volume of transactions, are not entirely separable. As clear in the model,

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<sup>16</sup> This conclusion on the role of debt in explaining profitability differentials seems robust to different specifications. In one alternative, the ratio of interest deductions to sales is used as the debt variable. In another, which may be econometrically more valid, a debt–asset regression of the type found in Altshuler and Grubert (2001) is used to impute what interest deductions would be at various statutory tax rates.

<sup>17</sup> The next section on location discusses the relative merits of these average effective tax rates compared to Hall–Jorgenson marginal effective tax rates, the calculation of which are in any case infeasible for the array of potential locations we use.

<sup>18</sup> The mean and median among the 60 potential countries in the sample are about 30 percent. The results were not very sensitive to the intermediate rate chosen in the few alternatives with which we experimented.

**TABLE 2**  
**TRANSACTIONS AND SHIFTING INCENTIVES**  
 DEPENDENT VARIABLE IS THE RATIO OF TRANSACTION ITEM TO TOTAL CFC SALES  
 (t values in parenthesis)

Independent Variable	Transaction					
	Sum of sales & purchases (foreign related parties)	Sale and purchases (foreign related parties)	Sales to foreign related parties	Purchases from foreign related parties	Sales to U.S. related parties	Purchases from U.S. Related parties
Parent R&D/sales	3.18 (6.47)	3.21 (6.53)	1.49 (3.77)	1.69 (6.83)	.477 (1.72)	1.33 (5.48)
Parent advertising/sales	.285 (1.24)	.284 (1.23)	.204 (1.11)	.081 (.70)	-.751 (5.77)	-.589 (5.18)
Country average effective tax rate	-.816 (8.31)	-.943 (7.10)	-.726 (9.23)	-.091 (1.85)	-.283 (5.10)	.042 (.87)
Absolute value of: (statutory tax rate - .25)	.786 (7.00)		.607 (6.77)	.178 (3.16)	.072 (1.14)	-.066 (1.20)
Log of parent sales	.0223 (4.15)	.0218 (4.06)	.012 (2.74)	.0105 (3.91)	.0104 (3.46)	.0094 (3.55)
CFC age <5 years	.069 (2.70)	.069 (2.70)	.067 (3.26)	.002 (.18)	.018 (1.25)	-.007 (.53)
CFC age 5-15 years	.015 (.87)	.017 (.97)	.027 (1.97)	-.012 (1.81)	.006 (.61)	.019 (2.23)
(Statutory tax rate - .25) if positive, otherwise zero		.875 (6.80)				
(.25-statutory tax rate) if positive. Else zero		.513 (2.30)				
R <sup>2</sup>	.079	.080	.068	.039	.038	.030
Mean of dependent variable	.250	.250	.154	.095	.070	.082

Notes: N = 1,751.

the company's cost of capital in a location is a function both of the 'standard' cost of capital *and* the net shifting benefit from additional investment. The shifting incentive coefficient may therefore in part reflect the attraction of companies with a large volume of intercompany transactions in addition to the increased transactions by existing firms. Indeed, the effect of shifting incentives on the choice of location is the subject of the next section.<sup>19</sup>

The R&D and advertising intensity of parents are included as explanatory variables, both because they may influence the extent

to which affiliates trade with each other and because, as we have seen, some types of intangible income are more susceptible to income shifting. Parent size, measured by the log of sales, is used as an independent variable because a larger parent is more likely to have a greater number of affiliates abroad with which the CFC can trade.

The dependent variable in the first column of Table 2 is the sum of purchase and sales to other foreign related parties divided by the CFC's total sales. The tax variables both have highly significant coefficients with the expected signs. The

<sup>19</sup> It would in principal be possible to disentangle the combined effect by using the relative importance of effective tax rates and shifting incentives in the location decision, as revealed in the next section, to determine the remaining 'pure' effect of shifting incentives on the volume of transactions given the choice of location.

negative coefficient for the local average effective tax rate confirms the finding that low effective tax rates attract manufacturing operations with a high level of offshore transactions. A 1 percentage point reduction in the local effective tax rate is associated with an increase of intercompany transactions equal to 3 percent of the mean level.

The shifting incentive variable, based on statutory tax rates, has a highly significant positive coefficient and suggests an impact of substantial magnitude. For example, a 1 percentage point higher absolute difference between the local statutory tax rate and 25 percent increases intercompany transactions by more than 3 percent of the mean level.

Turning to the other independent variables, the contrasting role of R&D and advertising intensity is worthy of note. The coefficient for R&D intensity is large and highly significant statistically while the advertising coefficient is small by comparison and not statistically significant. CFCs with R&D intensive parents appear to trade high tech components but marketing assets do not seem to contribute much to intercompany transactions.

The second regression in Table 2 uses the same dependent variable as in column one, the sum of purchases and sales, but in order to examine the symmetry of the shifting incentive's impact it divides it into high tax and low tax components. One variable is 25 percent minus the statutory tax rate if this is positive and zero otherwise. The other bifurcated variable is the statutory tax rate minus 25 percent if that difference is positive and zero otherwise. Both coefficients are statistically significant with the high tax segment seeming to have a stronger effect.

The regressions in columns 3 and 4 present intercompany sales and purchases separately. The average effective tax rate

is much more significant for sales, which is not surprising because earlier papers show that a low effective tax rate attracts a *net* increase in local production. (See the papers on investment cited in the next section.) The shifting incentive variable has a positive statistically significant coefficient for both sales and purchases, but the effect on sales is quantitatively much larger.<sup>20</sup>

The last two columns of Table 2 present regressions for manufacturing CFC's transactions with their U.S. related parties. Low effective tax rates do attract production that is sold back to the United States although the effect is not as strong as for sales to foreign companies. However, the shifting incentive variable has no consistent statistically significant role, which may not be surprising since the U.S. statutory tax rate was 35 percent. Substituting the absolute difference between the local tax rate and 35 percent does not seem to improve the results.

What is particularly striking about transactions with the United States is the contrasting impact of R&D and advertising. R&D is associated with a much higher level of transactions, particularly purchases, while MNCs with marketing intangible assets have a much lower level of transactions between foreign subsidiaries and their U.S. parents. Advertising intensive companies, therefore, seem to have many fewer opportunities for shifting income.

In some regressions, not shown, other country variables were added as controls. In particular, country size, as measured by the log of GDP, was included to guard against the possibility that some of the tax results may be spurious; CFCs in smaller economies are likely to engage in more offshore transactions and at the same time smaller countries may also have lower tax rates. The log of GDP variable tended to

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<sup>20</sup> Aggregate purchases and sales need not be equal in the sample. Some of the sales by these manufacturing CFCs may go to sales affiliates in other locations. The sales may also go to CFCs that are not among the top 7500.

have a negative coefficient, as expected, but the other coefficients were virtually unaffected.

One natural question, in relating these transactions results to the shifting results in the previous section, is whether CFCs that engage in a greater volume of intercompany transactions *actually* do shift more income. Accordingly, in a regression not shown, the interaction of total intercompany transactions with the local statutory tax rate was added as a variable in the profitability regressions. It had a negative coefficient as expected, showing that transactions magnify the negative effect of a high tax rate on profitability. But the coefficient just missed being significant at the 5 percent level and in fact increased the absolute value of the statutory tax rate coefficient itself. The transactions effect may already be captured by the other variables already in the regression such as R&D intensity and the statutory tax rate.

As an alternative to the shifting incentive variable used in this section and the next, it might seem preferable to use the absolute difference between the local statutory tax rate and the *actual* average statutory tax rate paid by *that* MNC's other affiliates.<sup>21</sup> That strategy was not implemented for at least two reasons. First, transactions data is only available for the largest subsidiaries so all of a parent's CFCs could not be included in the sample. Second, it is not apparent which subsidiaries should be included, only those in manufacturing or trade and services as well.

In any case, the failure to include the parent-specific average tax rate in the shifting incentive variable does not appear to bias its coefficient upwards. If anything, any increased error in measuring the independent variable would cause a *down-*

*ward* bias in its coefficient. Furthermore, the results in the next section indicate that there is no simple relationship between R&D intensity and the tax rates in the investment locations chosen. This suggests that not including the parent-specific average tax rate in the regressions does not cause any systematic bias in the results on the role of intangibles in promoting income shifting. Finally, when parent fixed effects were introduced into these transactions regressions, the shifting incentive variable remained highly significant, both statistically and quantitatively.<sup>22</sup> (These fixed effect regressions are not given in the tables.)

Another question that might arise is what the increased dollar volume of transactions in response to shifting incentives is actually measuring. Do they reflect a higher level of real intercompany transactions or simply greater price distortions themselves? For several reasons, the "distorted prices" interpretation seems unlikely. First, the effect is quantitatively much too large to be credibly due in large measure to distorted prices. For example, the shifting incentive coefficient indicates that a CFC with a 5 percent statutory tax rate engages in almost 75 percent more intercompany transactions than a CFC with a 25 percent rate. It is difficult to believe that a 75 percent price distortion would escape the notice of tax inspectors.

The "distorted price" interpretation would also require that intercompany sales to a foreign affiliate are a negative function of the statutory tax rate on the grounds that high-tax CFCs charge lower prices. By the same token, intercompany purchases should be a positive function of the tax rate because the high-tax subsidiaries overpay. In fact, both sales and purchases are positive functions of the local statutory tax rate, with the coefficient in

<sup>21</sup> The same question also arises in the shifting analysis in the previous section.

<sup>22</sup> When MNC-wide average effective tax rates were computed for manufacturing subsidiaries in Grubert (2001b), there turned out to be very small differences among MNCs and a particular MNC's average rate did not seem to convey much information.



the sales equation much the larger of the two, even though it should be negative in the distorted price interpretation. (These regressions are not shown on the table.)<sup>23</sup>

These results on intercompany commodity transactions complement the results on royalty payments in Grubert (1998) and Grubert (2001a). Those papers found that royalty payments to the U.S. parent were a *negative* function of the local statutory tax rate, which may be surprising in view of the obvious incentive to shift income out of high tax countries. The suggested interpretation was that intangible income is shifted to low-tax countries through commodity and other transactions and that some of this income is then paid out to the parent in royalties. This interpretation seems to be borne out by the findings in this paper.

Summing up this section, the regressions for intercompany transactions do show that foreign subsidiaries seem to be induced to engage in more transactions in response to the incentive to shift income either in or out. Furthermore, subsidiaries of R&D intensive companies have a much higher volume of intercompany transactions while marketing intangibles are, if anything, associated with a lower than average volume of intercompany transactions.

#### *Opportunities and Incentives for Income Shifting and the Choice of Location*

The previous sections have shown that income attributable to parent R&D accounts for an important portion, perhaps half, of the income that is shifted from high-tax to low-tax countries. Variations in debt financing by subsidiaries seems to account for the other half. Also, CFCs that have R&D intensive parents and those

that are in locations with either very high or very low statutory tax rates trade much more actively with other related affiliates. The simple model presented above suggested that income shifting would weaken the negative impact of a high tax rate on the desirability of a location and also magnify the attraction of a low tax rate. The hypothesis tested in this section is that R&D intensive companies do invest more in very high and very low statutory tax rate locations, holding other variables such as the effective tax rate fixed. In other words, do opportunities for income shifting affect the choice of location?

Previous papers have shown that local effective tax rates are very significant determinants of the amount of U.S. manufacturing capital in a location. Early examples are Grubert and Mutti (1991) and Hines and Rice (1994), that used U.S. Commerce Department Survey data. More recently Grubert and Mutti (2000) and Altshuler, Grubert, and Newlon (2001), using U.S. Treasury tax return data, have found an even higher degree of sensitivity to effective tax rates and that it seems to have been increasing over time. But except for the special case of Puerto Rico referred to earlier, the role of income shifting incentives in the choice of location has not been examined. This paper extends the methodology used at the country level in Grubert and Mutti (2000), Altshuler, Grubert, and Newlon (2001), and at the firm level in Grubert and Mutti (2001) and Altshuler and Grubert (2001). The latter two papers evaluated the role of parent excess credit positions in the choice of location and generally found no consistent impact, which is why excess credit variables are not included in these probits. Here we use the shifting incentive variable constructed in the previous

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<sup>23</sup> Clausing (2001) attributes changes in intercompany trade all to distorted transfer prices. But she does not distinguish between the effect of the local effective tax rate in attracting mobile companies and the effect of statutory tax rates on income shifting. Indeed, she uses only one tax variable, the average effective tax rate, and interprets her findings as due exclusively to transfer price distortions.



section to explore the role of opportunities for income shifting in the choice of location.

The determinants of the foreign locations chosen by 728 large U.S. manufacturing parents for a manufacturing operation are given in Table 3. As explained in the Appendix, the data on which locations were chosen were not confined to the CFC sample used in Tables 1 and 2. Each manufacturing CFC that a parent reports on is recorded as revealing that a location has been chosen even if it was not one of the largest 7,500 in the entire universe and data on its intercompany transactions were not available. Because the samples are not identical, the statistical analysis in this section could not be combined with the analysis in the previous two sections.

The probit analysis presented in Table 3 identifies the company and country characteristics that affect the probability that a particular parent will choose to locate in a given country. In the probits, each potential country–company pair is a *separate* observation. With 60 potential locations and the 728 parents, there are altogether 43,860 observations. If one of the 728 parents is located in a particular country, that observation receives a one as the dependent variable in the all-or-nothing probit; otherwise it scores a zero. In GS, the question in each observation in the probit analysis was whether the particular potential parent had located in Puerto Rico. Here we ask a similar question for each parent 60 times, once for every possible location. MNCs can, of course, choose to establish a manufacturing subsidiary in more than one location. In fact, the average number of locations chosen in the sample is 7.1.<sup>24</sup>

Let us quickly summarize the results for the variables that have already been used in the earlier papers before focusing on

the new shifting incentive variables at the bottom of the table. Starting with the company variables, we can see that MNCs that are R&D and advertising intensive, large in size as measured by real assets, and labor intensive are more likely to invest abroad. Capital intensive companies, in contrast, are less mobile. Moving on to the country characteristics, we find that, not surprisingly, the size of country GDP is a very important determinant of which locations are chosen, presumably because larger GDP means both larger markets for goods produced by U.S. MNCs and also more productive capacity to produce them. GDP per capita has a positive coefficient but it is not statistically significant.

The basic tax variable indicating the cost of capital, apart from income shifting considerations, is the local average effective tax rate in manufacturing. It is expressed in net of tax form—i.e.,  $\log$  of  $(1 - \text{the effective tax rate})$ . Marginal effective tax rates of the Hall–Jorgenson type are not used because, in part, they are available for only a few countries. As suggested in Grubert and Mutti (2000), average effective tax rates may, in any case, be the most appropriate for the all-or-nothing choice of location that probit analysis addresses because they include the tax on inframarginal rents. Observed average effective tax rates also capture the many special features of local tax systems that are usually ignored in the construction of Hall–Jorgenson rates.

The first column of Table 3 confirms that local average effective tax rates are a highly significant determinant of which locations are chosen, as has been reported elsewhere in earlier analyses. A measure of the openness of the country's trade and capital market regime is also included, going from 0 for the most open to 3 for the most restrictive.<sup>25</sup> Restrictive regimes

<sup>24</sup> Because location choices are not mutually exclusive, methods such as multinomial logit could not be used.

<sup>25</sup> The openness measure is derived from categories in the World Bank 1987 *World Development Report*. See Grubert and Mutti (2000) for more detail.

**TABLE 3**  
DO OPPORTUNITIES FOR INCOME SHIFTING AFFECT CHOICE OF MANUFACTURING LOCATION?  
PROBITS – 1996 DATA FOR 728 COMPANIES IN 60 POTENTIAL LOCATIONS  
(t values in parenthesis)

<i>Parent characteristics</i>					
R&D/sales	3.70 (4.67)	4.03 (5.16)	4.08 (5.26)	6.53 (4.83)	4.15 (5.26)
Advertising/sales	5.58 (10.58)	4.56 (14.11)	4.56 (14.11)	4.96 (5.22)	4.56 (14.11)
Log of assets	.239 (28.77)	.239 (28.77)	.239 (28.76)	.239 (28.75)	.239 (28.76)
Labor costs/sales	.540 (5.37)	.540 (5.37)	.540 (5.36)	.542 (5.39)	.540 (5.36)
Real capital/sales	-.657 (13.87)	-.656 (13.86)	-.656 (13.86)	-.655 (13.84)	-.656 (13.86)
<i>Country variables</i>					
Log of GDP	.331 (39.41)	.334 (39.46)	.332 (39.55)	.331 (39.04)	.332 (39.48)
Log of GDP/per capita	.015 (1.14)	.010 (.78)	.013 (1.00)	.018 (1.34)	.013 (.94)
<i>Policy variables</i>					
Log (1-ETR)	1.31 (12.62)	1.29 (12.29)	1.35 (13.19)	1.24 (11.37)	1.36 (12.15)
Trade regime	-.130 (5.46)	-.127 (5.29)	-.133 (5.57)	-.124 (5.14)	-.134 (5.53)
Trade regime *(1-ETR)	-.304 (3.88)	-.288 (3.66)	-.306 (3.91)	-.291 (3.68)	-.308 (3.92)
Absolute difference between statutory tax rate and .25					.043 (.25)
R&D *absolute difference between statutory tax rate and .25	28.0 (4.98)		24.57 (4.52)		23.91 (3.95)
Advertising * absolute value of (statutory tax rate -.25)	-9.75 (2.44)				
R&D * (statutory tax rate -.25) if positive. Else zero		21.44 (3.81)			
R&D*(.25-statutory tax rate) if positive. Else zero		41.28 (4.65)			
R&D*statutory tax rate				.802 (.20)	
Advertising*statutory tax rate				-1.28 (.46)	

Notes to Table 3: Regional dummy variables are not displayed. Each company-country pair is a separate observation so there are altogether 43,680 observations. ETR = average effective tax rate.

discourage investment, and as shown by the trade regime–tax interaction, they also weaken the impact of tax differentials.

In column 1, the two shifting variables are the interaction of parent R&D intensity with the absolute difference between the local statutory tax rate and 25 percent, and the parallel interaction term for advertising intensity. The results are fully consistent with the findings in Tables 1 and 2. A very high *or* a very low–statutory tax rate attracts R&D intensive companies, presumably because R&D based intangible assets facilitate the shifting of income in *and* out. In contrast, an extreme statutory tax rate, if anything, discourages advertising intensive companies, which is consistent with our finding above that they are less likely to engage in intercompany transactions and that they are not able to shift the income attributable to their marketing intangibles.

The second column examines the symmetry of the R&D–statutory tax rate differential effect. It breaks the absolute statutory tax rate differential into the high and low components and treats each as a separate variable. In column 2, each component is statistically significant, but the low tax segment is the stronger. Perhaps this is due to fact that there are fewer low–tax countries than high tax ones and any low–tax country can therefore be a potential shifting destination for many high–tax siblings. The third column of Table 3 is the same as column 1 except that it excludes the advertising interaction as a variable. The results for the R&D interaction variable are basically unchanged.

As indicated at the beginning of the paper, a naïve application of the GS model, which focused exclusively on shifting to a low–tax location, to a sample that includes a mix of high–tax and low–tax countries seems to suggest no impact of income shifting on the choice of location. This is shown in the fourth probit in Table 3, which includes the GS specification, the simple interaction of R&D and advertising intensity

respectively with the local statutory tax rate. It assumes that income shifting increases the attractiveness only of low–tax locations. Compared with the coefficients for the shifting incentive variables used in the first three columns, the coefficients for these interaction variables are tiny, much smaller than their standard errors. They are completely without any statistical or quantitative significance and demonstrate that a more general model has to include the possibility that income shifting lowers the effective tax rate on investment in both high–tax and low–tax countries.

The results in the first three columns are consistent with the hypothesis that the prospective shifting of R&D based intangible income affects location. However, column 5 indicates that the allocation of debt, which accounts for part of the variation in profitability, does *not*. The absolute statutory tax rate differential by itself, which determines how much debt the CFCs carry, has a virtually zero coefficient when the R&D interaction variable is present. This would not be true if the simple reallocation of debt in response to tax differentials affected marginal effective tax rates in high and low tax countries irrespective of how much R&D the parent performs.

As in the shifting results in Table 1, these results also suggest that some of the intangible income that is shifted to low–tax countries should have been domestic U.S. income. Recall, in Table 2, that advertising intensive companies have many fewer transactions with the U.S. based parent and therefore fewer opportunities to shift income from the United States. This was not true of transactions with other foreign affiliates. The fact that advertising intensive MNCs are less affected by shifting incentives in their choice of location seems to indicate that opportunities for shifting income from the United States plays a role in the choice of location.

The disparate effect of manufacturing and marketing intangibles may reflect

both technological and tax considerations. R&D intensive companies seem to engage in a much greater number of intercompany transactions, even apart from tax incentives. Perhaps the various stages in producing a high tech good can more easily be placed in different locations in response to cost differences, the labor intensive stage in low wage countries, for example. Further, in contrast to the case of Puerto Rico, the tax rules make it very difficult to shift income from *domestic* U.S. sales out to a foreign subsidiary if the U.S. income is attributable to a marketing intangible such as a trademark. However, a parent could transfer a domestically-developed patent to a low tax country and attempt to exploit the range of uncertainty in the application of the transfer pricing rules by either paying too high prices for the goods brought back or receiving inadequate royalties for the use of the patent. But in either interpretation, the volume of transactions or the tax rules, it is the opportunity for shifting income from the United States that seems to have an effect on location.

Both the differences in relevant legal provisions and in the composition of transactions with the U.S. parent may explain why these results differ from GS. They found that parent marketing intangible assets related to advertising *also* motivated companies to locate in Puerto Rico. Under the law applying to Puerto Rico, a U.S. company could transfer a U.S. marketing intangible, such as a trademark for U.S. *domestic* sales, to Puerto Rico where it could assign half of the combined profits. This would be impossible with any foreign location in our sample. In addition, virtually all of Puerto Rican production, whether R&D or advertising intensive, was sold back in the mainland, in contrast to production in foreign low-tax countries.

We can use these results to estimate the extent to which opportunities for income shifting by R&D intensive companies can

offset the negative effect of a high effective tax rate. Consider a hypothetical location with a statutory tax rate of 45 percent and an effective tax rate of 40 percent, and a company with a ratio of R&D to sales of .03, or one standard deviation above the mean. Using the column 1 coefficients for the basic effective tax rate and for the R&D-shifting incentive interaction, we find that the opportunity for income shifting is equivalent to a reduction of the effective tax rate by more than 8 percentage points. The opportunity for income shifting can have a large effect on the role of tax considerations in the choice of location.

One concern about the Table 3 results may be that the significance of the R&D-shifting interaction variable is sensitive to the particular algebraic form of the basic effective tax variable. But various alternative specifications, not shown on the table, show that this concern is not warranted. For example, when the effective tax rate is used in simple linear form, not the log of the net-of-tax form in Table 3, the results are not much affected. The same is true when the inverse of the tax rate is used to capture any increased sensitivity of investment to tax changes at the low end of the tax spectrum.

## CONCLUSIONS

This paper has provided answers to the questions posed at the outset. Industrial intangibles linked to R&D account for a major component of income shifted from high to low tax countries. In contrast, marketing intangibles associated with advertising do not seem to promote income shifting. One reason may be that advertising intensive companies engage in many fewer intercompany transactions and, therefore, have fewer opportunities for shifting income. Furthermore, incentives for income shifting *do* distort real operations undertaken by MNCs. Subsidiaries in countries with both very high and

very low statutory tax rates engage in a significantly greater volume of intercompany transactions. This is consistent with their incentive to shift income either in or out. In addition, R&D intensive companies are more likely to invest in locations with very high or very low statutory tax rates, which is consistent with the opportunities for income shifting provided by manufacturing or industrial intangibles. Thus, for R&D intensive companies, income shifting seems to diminish the negative impact of a high tax rate while magnifying the attraction of a low tax rate. The empirical findings indicate that opportunities for income shifting have a relatively symmetric effect, altering investment and intercompany transactions in both high and low tax countries.

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## APPENDIX

### *Description of the Data*

The principal data sources are the linked Forms 1120 and 5471 Treasury files provided by the Statistics of Income Division of the Internal Revenue Service. The Form 1120 is the basic corporate tax return giving the parent's income and deductions. MNCs file a Form 5471 for each of their controlled foreign corporations. It gives the CFC's income, foreign taxes paid, and transactions with related parties including the parent. Income refers to Earnings and Profits, which is defined in the Internal Revenue Code and is intended to reflect book income, not local taxable income. The transactions used in Table 2 are purchases and sales of "stock in trade" derived from Schedule M of the Form 5471.

Information on the parent's R&D is based on the "qualified research and experimentation" (R&E) reported on the tax return for purpose of the research credit. Only R&E performed in the United States qualifies. In the minority of cases (less than 20 percent) in which the parent does not claim an R&E but is reported as performing R&D in COMPUSTAT, the latter is used to impute qualified R&E. Qualified R&E for the purpose of the credit is generally smaller than R&D reported in COMPUSTAT when both are available and this information is used in the imputation. Parent advertising is taken from the Form 1120.

Country statutory tax rates are taken from Price Waterhouse (1996). Average effective tax rates by country are taken from the "Income, War Profits, and Excess Profits Taxes Paid or Accrued" and the "Earnings and Profits" reported on the Form 5471s. Country GDP data are obtained from World Bank tables. The construction of the trade regime variable is based on World Bank tabulations and is described in greater detail in Grubert and Mutti (2000).

Appendix Tables 1 and 2 provide additional background data for the estimates in the body of the paper. It is first necessary to indicate the differences between the sample used in Tables 1 and 2 in the text and the location sample in Table 3. The sample in Table 1 and 2 are the large manufacturing CFCs for which transactions data is available. It therefore is dominated by the parent companies that do most of the investing, e.g., the large ones that are R&D and advertising intensive. Similarly, the country data give disproportionate weight to the most important host countries, i.e., the large high income locations, because it is a sample of CFCs. In contrast, the location sample is made up of every possible country–parent pair. Each parent and location therefore get an equal weight in the sample averages.

Appendix Table 1 presents the R&D and advertising intensity of the 731 parent MNCs in Table 3 by industry. Not surprisingly, there is substantial variation among industries. For example, Pharmaceuticals are highly R&D intensive and Food and Beverages are highly advertising intensive.

**APPENDIX TABLE 1**  
R&D AND ADVERTISING INTENSITY BY INDUSTRY

Industry of Parent (Number of Companies in Parenthesis)	R&D/Sales	Advertising/Sales
Food and Beverages (56)	.0028	.0411
Pharmaceuticals (36)	.0414	.0295
Petroleum (30)	.0005	.0080
Industrial Chemicals (100)	.0064	.0187
Non-electrical Machinery other than Computers (42)	.0081	.0098
Computers (26)	.0263	.0165
Electronics (144)	.0237	.0111
Motor Vehicles and Parts (33)	.0076	.0068
All Companies (731)	.0111	.0169

Notes to table: The industry ratios are unweighted averages. R&D is Qualified Research and Experimentation for purposes of the Research credit and averages about half the R&D reported on financial statements. The advertising and sales data is taken from the first page of the basic corporate return, the Form 1120.

**APPENDIX TABLE 2**  
MEANS OF INDEPENDENT VARIABLES IN CFC SAMPLE USED IN TABLES 1 AND 2\*

Variable	Mean	Standard Deviation
Age dummy 0-5	.095	.294
Age dummy 5-15	.253	.434
Log of parent sales	15.55	1.39
Ratio of CFC assets to Sales	1.068	.957
Parent Profit Rate	.0406	.064
GDP per capita	14543	7842
Local Statutory Tax Rate	.354	.111
Local Effective Tax Rate	.239	.093
Parent R&D/Sales	.0141	.015
Parent Advertising/Sales	.0269	.033

\* See Appendix text for differences from Table 3 sample.