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**Taxpayer Responses to Competitive Tax Policies and Tax Policy
Responses to Competitive Taxpayers: Recent Evidence**

by

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Evidence from the tax returns of U.S. multinational corporations (MNCs) suggests that with globalization come changes in the role of international taxation. For instance, during the 1980s and early 1990s, the investment location behavior of U.S. manufacturing corporations became more sensitive to differences in tax rates across host countries and there is some evidence that governments may have engaged in heightened tax competition (see Altshuler, Grubert, Newlon 2001 and Grubert 2001 among others). In this paper, we attempt to determine whether some of the recently documented trends in government and company behavior have continued, abated, or intensified. In addition, we focus on the relationship between the increased mobility of U.S. manufacturing assets and changes in host country effective tax rates. Exploring this relationship should shed some light on the extent to which tax competition exists. We also consider some new related issues such as the use of “self-help” by companies to reduce tax liabilities on foreign source income and its possible impact on tax competition. In the next section, we selectively review some recent evidence on how effective tax rates abroad have evolved in recent times, how MNC responses to taxes abroad have changed, and whether governments have altered the way in which they set taxes. Section II outlines our research questions and provides a sharper picture of our approach to measuring company and country responses to tax competition. Section III contains a description and discussion of our results to date. We offer some tentative conclusions in section IV. This draft is preliminary and was prepared for presentation at the December 9th conference.

I. Background

Grubert, Randolph, and Rousslang (1996) were the first to document the fall in the average tax rate faced by U.S. MNCs on income earned abroad. They find that while U.S. parent corporations in the manufacturing industries faced an average tax rate on foreign source income of about 36 percent in 1984, this same rate had fallen to 25 percent by 1992. Grubert, Randolph and Rousslang’s analysis suggests that the decrease in the average foreign tax rate was due

primarily to reductions in country average tax rates which paralleled the reduction in the U.S. statutory rate in 1986.

Desai (1999) finds similar patterns of declining tax rates faced by U.S. MNCs investing abroad using data from the Bureau of Economic Analysis. In particular, he reports that the ratio of foreign income taxes to profit-type return for U.S. MNCs fell significantly between 1982 and 1995. He argues that large capital exporters with foreign tax credit systems such as the United States can trigger transitional periods of tax competition when they lower their corporate income tax rates. Altshuler and Goodspeed (2003) also provide some evidence of this dynamic. They estimate tax reaction functions of European governments competing with other European national governments that take into account the possibility that these countries react not only to changes in their neighbor's corporate tax rates but also to changes in the U.S. tax rate. Essentially they test whether European countries "follow" the U.S. lead in setting their tax rates on corporate income. Their work provides evidence that from 1986 to 1996, European countries have reacted to changes in both U.S. corporate tax rates and the rates of the countries with whom they compete for capital.

A related and important issue is whether differences in tax rates across locations explain where MNCs place capital. Work on this question using data from the 1980s suggests that the location decisions of MNCs are responsive to tax differences (see Grubert and Mutti 1991 and Hines and Rice 1994). A 1997 working paper by Grubert and Mutti, published in 2002, was the first to suggest that the sensitivity of U.S. investment abroad to after-tax rates of return abroad had increased in the 1990s (Grubert and Mutti 2002). Altshuler, Grubert, and Newlon (2001), hereafter AGN, explicitly test whether the location of capital held abroad by manufacturing affiliates of U.S. MNCs became more sensitive to differences in host country effective tax rates between 1984 and 1992. This work provides strong evidence that firms have become more

responsive to differences in tax rates.¹ Whether this trend has continued is a focus of our current project.

In research using the same tax return data as AGN, Grubert (2001) looks for changes in the behavior of both taxpayers and governments. He investigates the role of tax planning in explaining the decrease in effective tax rates between 1984 and 1992. He also asks whether the behavior of governments during this period suggests more tax competition. The evidence provided is mixed. For instance, he finds that income shifting from high-tax to low-tax locations seems to have become more aggressive over the period. However, tax minimization behavior involving the strategic placement of debt in high-tax countries seems to have been stable. The evidence on whether tax competition has intensified also presents a mixed picture. Grubert finds that smaller, poorer, and more open countries lowered their tax rates the most between 1984 and 1992. This is consistent with tax competition since one would expect that these countries would be most affected by the increased mobility of capital. However, Grubert does not find evidence that more mobile manufacturing industries, such as electronics, received greater tax concessions between 1984 and 1992. Nor does he find that the gap between the effective tax rates faced by finance affiliates and manufacturing affiliates increased as would be predicted if countries were actively trying to attract more mobile capital. Whether these findings have changed in recent years is an important focus of the current paper.

Grubert (2003) addresses the issue of how company and government behavior can impact effective tax rates. He shows that some of the most important features of a home country tax system for determining the tax burden on cross-border investment are rules that either limit or accentuate the ability of firms to use “self-help” techniques to lower their tax burdens. For example, Grubert’s work demonstrates that whether companies can use tax haven finance

¹ Desai, Foley, and Hines (2003) use affiliate-level data from the Bureau of Economic Analysis to study the sensitivity of investment location and reported profits of U.S. MNCs to tax rate differences across countries. They analyze data from the period 1982-1997 that includes both directly and indirectly owned affiliates. Interestingly, they find that the investment location decisions are particularly sensitive to tax rate differences in Europe and when affiliates are indirectly owned.

subsidiaries or other aggressive planning schemes can have a profound impact on effective tax rates for investments abroad. These rules are shown to have a much larger impact on tax burdens for foreign investment than those relating to whether foreign income is exempt from home country taxation, for example.

After exploring the role played by home country tax law, Grubert (2003) uses 1996 tax return data to study whether tax competition is evident at the subsidiary-level. The question is whether the tax benefits that host governments grant are consistent with their competing for operations that contribute the most to national welfare. The results suggest that countries do engage in tax competition to attract certain types of companies. Host countries grant lower tax rates to more mobile high-technology companies and extract rents from the average R&D intensive company. This suggests that they distinguish between mobile rents and those that are specific to a location. In addition, the results indicate that improving national trade may be an important policy goal: host countries lower tax rates to those companies that sell a greater share of output abroad and raise tax rates on those that import a relatively large share of their components. In this paper, we examine whether these results, which are consistent with tax competition, appear in the 1984 data.

II. Research questions

The goal of this research is to further explore the trends discussed above. To do this, we have updated the Treasury tax return data to include the most recently available tax files. At this time, the most recent subsidiary-level data is from 1996 and aggregate country level data is available for 2000. The subsidiary-level information necessary for our analysis is taken from the Form 5471. This form, which U.S. parents must file for each of their controlled foreign subsidiaries (CFCs), reports subsidiary-level information on assets, taxes paid, earnings and

profits, and other information from balance sheets and income statements.² As in our previous work, we have information on the manufacturing controlled foreign subsidiaries of U.S. manufacturing parents in 58 locations abroad (see the appendix for a list of countries). We focus on three broad questions related to tax competition:

- Are recent decreases in country average effective tax rates consistent with tax competition? We start by examining factors that may explain why some countries lowered their tax rates more than others since 1992. If countries are engaging in tax competition we would expect those that are losing market share (those with the most to gain) to lower their effective tax rates more than the average. We also explore whether the increased mobility of capital documented by AGN, for instance, plays any role in explaining patterns of declines in effective tax rates. Finally, we allow for the possibility that the tax minimizing behavior on the part of companies may explain the most recent decreases in country effective tax rates. Given the ability of U.S. MNCs to use hybrid affiliates and other “self-help” methods to lower tax burdens a natural question to ask is whether companies actually need tax competition.
- Have the bonuses and penalties offered by countries to different types of firms changed over time? The focus here is on exploring whether countries have become more aggressive in their use of tax concessions to attract particular types of investment.
- Has the role of taxes in the location decisions of U.S. manufacturers continued to increase in the 1990s? We compare 1992 and 2000 estimated “tax elasticity of capital” to investigate whether capital has become even more mobile. As explained further below, the “tax elasticity” measures the responsiveness of capital to differences in after-tax rates of return across countries.

III. Preliminary results

A. Average Effective Tax Rates, 1980-2000

Table 1 presents the means and standard deviations of average effective tax rates for U.S. manufacturing subsidiaries in 58 countries. Average effective tax rates in each country are calculated by dividing the total income taxes paid by U.S. CFCs in the manufacturing sector by their total earnings and profits (only CFCs with positive earnings and profits are included in the totals).³ The global mean for each year presented in the table is an average of the effective tax rates

² Information from the Form 5471 is compiled only in even years. At present, the 2000 data is available only in aggregate form (aggregated over countries).

³ Both earnings and profits and total income taxes appear on the Form 5471. Parent corporations must report their CFCs’ earnings and profits using the definition in the U.S. Internal Revenue Code. This

in all 58 countries weighted by the number of CFCs in each country in 1990.

Table 1 shows that the decline in average effective tax rates documented in earlier work with this data has continued. Since 1980, the global average effective tax rate has fallen by about 12 percentage points. The most recent data shows a relatively large drop in effective tax rates between 1998 and 2000. Whether this dip will be sustained is an open question. It is interesting to note that the distribution of worldwide tax rates has become tighter in the last decade (the standard deviation has fallen and increased relative to the mean) indicating some convergence in effective tax rates.

B. Do changes in capital share explain recent decreases in country average effective tax rates?

We start our analysis by focusing on the pattern of declines in effective tax rates. Before proceeding, however, it is important to discuss the ability of companies to use “hybrid” structures to lower effective tax rates. A hybrid is an entity that is incorporated from the host country point of view and a branch from the U.S. point of view.⁴ Setting up hybrids has become simplified by the check the box regulations which came out in December of 1996 and were effective January 1, 1997. How hybrids impact the effective tax rates we observe depends on where the transparent entity (to the U.S.) is located. For example, the transparent entity could be set-up as a Cayman Islands branch (from the U.S. point of view) of a German affiliate or alternatively as a German branch (from the U.S. point of view) of a Cayman Islands affiliate. There is evidence for both structures in our data. For instance, companies incorporated in the Cayman Islands (as CFCs of U.S. manufacturing parents) report real capital on their balance sheets. In fact, the effective tax rate for manufacturing

measure of earnings and profits is meant to reflect net book income (and is consistent across countries). Since the numerator reflects taxes actually paid and accrued, our computation of the effective tax rate reflects the actual deals given to MNCs by host governments.

⁴ It is also possible to have the reverse case for tax planning purposes. In this case, the hybrid entity is a corporation to the U.S. and a partnership in the foreign country. It is our understanding that this structure can be used to increase foreign tax credits.

CFCs in the Cayman Islands was almost 6 percent in 2000. And real capital reported in Cayman Island manufacturing CFCs increased by more than 500 percent between 1992 and 2000. This capital stock represents about 70 percent of real capital reported in the Irish manufacturing CFCs of U.S. parents in 2000. We have excluded the Cayman Islands and Bermuda from our analysis since we are concerned that the real plant and equipment reported by companies incorporated on these islands is actually somewhere else. Therefore, the hybrids reflected in our data will have the transparent portion in a tax haven.

While we think it is possible that tax competition between countries is responsible for part of the drop in effective tax rates since 1992 (our initial year of analysis for this project), we suspect that the growth of hybrids (and thus company responses) may play an important role in explaining the most recent decreases in effective tax rates. For this reason we look at changes in country effective tax rates between 1992 and 1998 separately from the changes between 1998 and 2000.⁵

We start by using simple regression analysis to test for evidence of tax competition in the period between 1992 and 1998. We investigate whether country responses to changes in their share of U.S. capital explain changes in effective tax rates. We then look at the period between 1992 and 2000 to see whether the process explaining decreases in country effective tax rates have changed. Finally we focus on the last two years of data, 1998 and 2000, and test whether company versus country responses explain differences in the pattern of declines in effective tax rates across countries.

The data is subsidiary-level information from the Form 5471 aggregated up to the country level (for the same 58 countries used in table 1 and shown in the appendix). To control for heteroscedasticity, we weight by the number of CFCs in each country in 1992. The dependent variable is the change in a country's average effective tax rate (AETR) measured by subtracting the 1998 rate from the 1992 rate. Thus, if the change is positive (negative), effective tax rates have fallen (increased).

⁵We are currently repeating our analysis using 1996 as a breakpoint.

The main independent variable of interest is the percentage change in U.S. manufacturing affiliate capital which we calculate by subtracting the log of real capital held by U.S. manufacturing affiliates in a country in 1984 from the log of real capital held in 1992. This is the change in capital studied in AGN. The data used in AGN was readily available to us and convenient to use. Note that including a lagged value of the change in capital share ensures that this independent variable is not endogenous.

In all of the regressions, we control for the country's initial level of effective tax rate and include a dummy variable that equals one if the country is "small" (has a population of less than 15 million in 1992). Note that we use the 1990 rate to control for the "initial" level of each country's effective tax rate. Including the 1992 effective tax rate in the regression could result in a spurious correlation since the rate from 1992 would appear on both the right-hand and left-hand side of the equation.

The results presented in table 2A are suggestive of a tax competition story. The first column presents results from what we consider to be a basic test for tax competition. The coefficient on the change in capital share, $\log(\text{capital in 1992}) - \log(\text{capital in 1984})$, is negative and highly significant. Countries losing market share relative to their neighbors (those with the most to gain) cut their rates more between 1992 and 1998. Conversely, the higher was a country's increase in capital between 1984 and 1992, the smaller were their tax cuts.

Turning to the other independent variables we see that rates fell more for countries with higher initial effective tax rates. The estimated coefficient on the 1990 average effective tax rate variable is positive, large in magnitude, and statistically different than zero at more than a one percent confidence level. This is also consistent with a tax competition story. Those countries that had relatively high rates made adjustments to their tax structure which resulted in larger decreases in effective tax rates over the period 1992 to 1998. In a competitive environment, these countries would be the ones that feel the greatest pressure to reduce rates.

Finally, the coefficient on the dummy for small countries is positive and is also very

significant again suggesting an international motivation for corporate tax reductions. Smaller countries, which may face the most elastic supply of capital, lowered effective tax rates relatively more than the average. Grubert (2001) finds the same result in his analysis of the factors causing the fall in country average effective tax rates between 1984 and 1992. Interestingly, as we will see, this result vanishes when we focus on the changes in country effective tax rates between 1998 and 2000.

In the second column of table 2A we show the results of a regression that includes a term that interacts the market share variable with the 1990 effective tax rate. This allows us to test, for example, whether countries that had gained market share between 1984 and 1992 and had relatively high effective tax rates felt less pressure to lower their tax rates. Alternatively, the question can be posed as follows: does the increase in capital mobility over the 1984-1992 period explain the pattern of declines in effective tax rates? The estimated coefficient on the interaction term, shown in column 2, is not significantly different from zero. This suggests to us that the changes in effective tax rates between 1992 and 1998 are more the result of simple tax competition among countries than countries responding to recent increases in capital mobility.

The third column shows the result of a more sophisticated test designed to identify the role played by increased capital mobility. We start by using the coefficient estimates from the regression equation in AGN to predict the change in capital between 1984 and 1992. We then calculate the difference between the actual change in capital and the predicted change. Countries with more elastic supplies of capital will gain (lose) more capital when tax burdens are lowered (increased). To capture this, we interact the difference between the actual and predicted change in capital with the tax terms relevant for the change in capital (the 1984 effective tax rate and the difference in the 1984 and 1992 rates) and test whether the interacted term is a significant explanatory variable. Column 3 shows that the interaction term is not statistically different from zero. Although preliminary, our results suggest that increased mobility does not explain movements in effective tax rates as well as simple differences in changes in capital shares.

We test whether changes in effective tax rates differ across regions in the fourth column of table 1. Only the dummy variable for Latin America has an estimated coefficient that is statistically different from zero at conventional levels. Interestingly, the coefficient is negative which indicates that Latin American countries cut their rates less on average between 1992 and 1998. In an experiment that we do not report, we interact regional dummy variables for two areas of interest, the EEC and Asia, with the change in capital share variable (log of capital in 1992 – log of capital in 1984). Neither coefficient on the regional interaction terms were statistically different from zero which suggests that tax competition was no different on average in these regions.

Table 2B adds the 2000 data to our analysis. As mentioned above, we are interested in exploring whether, in recent years, company rather than country behavior explains the pattern of decreases in effective tax rates. Accordingly, an important explanatory variable to include in the analysis is the statutory tax rate. The higher is this rate the greater the incentive to strip income out of high-tax countries with related party debt, for example, to lower the effective tax burden on investment. Thus, the extent to which company responses cause decreases in effective tax rates will be captured by the coefficient estimate on the statutory rate. However, if country responses are driving the changes in effective tax rates, we would not expect statutory rates to be correlated with changes in effective tax rates. Countries with high statutory rates and low effective tax rates would not feel pressure to lower effective tax rates to attract investment.

The first column of table 2B adds the statutory tax rate in 1992 to our regressions and shows that it is not statistically different from zero. These results change markedly when we extend our analysis to the year 2000. Changes in capital share no longer explain differences in effective tax rate decreases. And the statutory rate in 1992, while not significant at conventional levels has much greater explanatory power. This suggests to us that tax changes between 1998 and 2000 may be the result of a different dynamic than that explaining the 1992 to 1998 experience. Tax competition seems to explain the changes in rates between 1992 and 1998; company tax-minimizing behavior becomes important when we add the 2000 data. This suggests to us that companies may no longer

need tax competition to lower the effective tax rates they face on investment abroad. Table 3 takes a closer look at the last two years of our data.

As explained above, the incentive to use these “self-help” tools such as hybrid entities to lower tax burdens depends on statutory tax rates. Table 3 begins by testing whether the 1996 average effective tax rate (we use the 1996 rate for the same reasons we used the 1990 rate in the table 2 regressions) or the statutory tax rate better explains differences in changes in average effective tax rates across countries between 1998 and 2000. Again the dependent variable is constructed to be positive when tax rates fall: it equals the AETR for 1998 minus the AETR for 2000.

The first two columns of table 3 test whether the average effective tax rate in 1996 is correlated with any of the variation in tax changes. Note that the estimated coefficient on the 1996 rate while positive is not statistically different from zero at standard levels. Also, the coefficient on the small country dummy is no longer positive and is not statistically different from zero. The evidence for tax competition found in table 2A which examines the period from 1992 to 1998 is no longer evident.

In columns 3 and 4 we substitute the statutory rate in 1998 for the AETR in 1996. This exercise provides some suggestive evidence that company rather than country behavior may be responsible for the decrease in effective rates between 1998 and 2000. The estimated coefficient on the statutory rate is positive and significant at the 10 percent confidence level. However, when we add regional dummies to this regression (in column 4) the magnitude of the coefficient decreases and the standard error increases.

The final column of table 3 shows the results of the test of the tax competition story we explored in tables 2A and 2B. Not surprisingly given the results in the last column of table 2B, the change in capital share variable is not significantly different from zero. Although suggestive and preliminary, our results point to company behavior and not tax competition explaining changes in effective tax rates in the most current data.

B. Have the bonuses and penalties offered by countries to different types of firms changed?

Grubert (2003) tests for tax competition using subsidiary level for 1996. He argues that if governments are engaged in tax competition it should be observable at the subsidiary level as well as at the country level: governments would compete for mobile companies that are particularly valuable to the local economy. Further, governments would be expected to distinguish between different types of potential foreign investors when setting tax burdens. They would consider companies' sensitivity to tax rates in choosing locations and the benefits their prospective operations offer to the host country. Grubert provides evidence that suggests that countries distinguish between subsidiaries that generate mobile and locational rents. For instance, he finds that in 1996 effective tax rates are lower, *ceteris paribus*, for those manufacturing affiliates in mobile high-technology industries such as electronics and computers. At the same time, the effective tax rates on the average R&D intensive affiliate are higher, *ceteris paribus*, suggesting that countries are extracting locational rents. We now look back at the 1984 tax files to determine whether this government "tax-setting" behavior is a recent phenomenon.

Table 4 shows regressions for the determinants of company effective tax rates for 1984 and 1996. We include parent-specific, country-specific, and CFC-specific control variables. The CFC-level data necessary for this analysis was collected only for the top 7,500 CFCs in terms of asset size in 1996. In contrast, the 1984 data file contains detailed information for a much larger set of CFCs. We experimented with a couple of different methods to create a comparable set of CFCs in 1984. We started by restricting the analysis to those CFCs in the manufacturing sector with more than 5 million in assets in 1984. These results are shown in table 4. We also repeated the analysis using a cut-off of 10 million in assets. Finally, we examined those CFCs with greater than 5 million in total sales. The results were generally consistent across these alternative datasets.

Our results suggest that while some of the determinants of company effective tax rates have changed in recent years, some are essentially the same. We start by discussing some factors of interest that are similar in 1984 and 1996.

- We include the country's statutory tax rate since we are interested in how the tax burden on a particular CFC compares with CFCs in the same location. Not surprisingly, the local statutory tax rate has a highly significant coefficient which is similar in size and magnitude across the two years of analysis.
- The dummy variable for industries with mobile operations, electronics and computers, has a significant negative coefficient both in 1996 and in 1984. Mobility, due either to the presence of intangible assets which are easily moved or production that is easily movable, brings more favorable tax treatment. What is surprising is that countries were giving bonuses to these more mobile CFCs in 1984.

There are some interesting differences between the determinants of company effective tax rates in 1984 and 1996.

- The highly significant negative coefficient on sales from related parties in 1996 is not as evident in 1984. The first column of table 4 shows that while CFC sales seems to have a similar quantitative effect on company effective tax rates the estimated coefficient is not statistically significant at conventional levels. As Grubert (2003) explains, the 1996 results on CFC sales may reflect mobile intangibles and higher sensitivity to taxes. CFC sales provide a measure of the company's ability to sell its products in world markets. The interpretation is that in recent years (1996), host government gave concessions to these operations since they may be more responsive to taxes. In 1984, however, these concessions may not have been necessary possibly because these operations were not perceived to be mobile.
- Similar to the result for CFC sales, the highly significant coefficient on CFC purchases appears only in the 1996 data. Grubert (2003) concludes that the positive coefficient on CFC purchases in 1996 most likely reflects governments taking terms of trade benefits into account when setting tax rates. Companies importing a great deal of components may contribute to terms of trade losses. As we discuss below, the magnitude of interaffiliate trade increased substantially between 1984 and 1996.
- The coefficient on parent size changes signs between 1984 and 1996 and becomes statistically significant at conventional levels. Large companies seemed to have gained more bargaining power perhaps because they have operations in more locations.

Table 5 indicates that the manufacturing subsidiaries' transactions with related parties increased very dramatically between 1984 and 1996. The share of total sales accounted for by sales to other affiliates more than quadrupled over the period and purchases from affiliates more than

doubles. This increase in the importance of transactions with offshore affiliates is consistent with the increased sensitivity of investment to tax considerations.

Grubert and Mutti (1991) found that low tax rates attracted production for sales in foreign markets, not locally. This is what one would expect because low local tax rates do not confer any advantage to the U.S. MNC over purely domestic companies. The increased mobility of capital also increases purchases from affiliates because it becomes cost effective to put different stages of production in locations with differing comparative advantages.

C. *Did capital mobility continue to increase after 1992?*

As mentioned in section I, previous work has shown that U.S. multinationals in the manufacturing sector became more responsive to differences in local effective tax rates between 1984 and 1992. As table 1 shows, this was a period in which average effective tax rates for our 58 country sample fell by more than 10 percentage points (from .34 in 1984 to .25 in 1992). This was also a period of “globalization”: trade barriers and capital constraints were loosened and technological advances decreased the costs of operating globally. Our focus in this section is on the period after 1992. We make use of data from 1992, 1998, and 2000 to explore whether firms have become even more sensitive to differences in tax burdens abroad. As we will see, the results are not conclusive but do suggest that in recent years local taxes have become a more significant factor for explaining differences in the distribution of real assets abroad.

We use simple ordinary least squares to estimate the elasticity of assets to after-tax rates of return. The after-tax rate of return is simply $(1-AETR)$, where AETR equals the country average effective tax rate. As in section III.A, we aggregate the subsidiary level data provided on Form 5471 to the country level and continue to focus entirely on manufacturing CFCs of manufacturing parents. The reduced form model we estimate follows the model used in Grubert and Mutti (1991) and other studies. The model assumes that the derived demand for capital by multinational firms in a country is a function of after-tax rates of return and exogenous country characteristics that affect

supply and demand (such as GDP and GDP per capita).⁶ This reduced-form relation between after-tax returns and investment is consistent with a partial equilibrium model in which firms allocate assets abroad to maximize after-tax returns to investment. The estimating equation is

$$\log(\text{Assets}) = \text{constant} + \beta_1 \log(1-\text{AETR}) + \beta_2 \log(\text{GDP}) + \beta_3 \log(\text{GDP per capita}) \\ + \beta_4 \text{TRADE} + \beta_5 \text{TRADE} * \log(1-\text{AETR}) + \varepsilon ,$$

where TRADE is a trade policy variable that allows us to control for the degree of openness of each country's economy. This measure comes from the *World Development Report* (World Bank 1987) and runs from zero (most open) to 3 (most restrictive).⁷ Notice that TRADE is entered twice, by itself and interacted with the tax term which allows for the possibility that the benefit of low tax rates may be smaller in more restrictive regimes. For countries with the most open trade regimes, the estimated coefficient on the tax term, β_1 , gives the (constant) elasticity of assets to changes in after-tax returns (for a given pre-tax return) for the most open countries. We refer to β_1 as the "tax elasticity" in our discussion.

Table 6 presents results from our simple cross-sectional estimates. Each column shows the results from a regression that uses one year of country-level data. In this discussion we focus only on the tax elasticity. Note that the tax elasticity for 1992 is 2.93 and is highly significant. This implies that a 1 percent increase in the after-tax return in a country leads to about a 3 percent increase in real assets located in that country. The results in the remaining columns of table 6 suggest that capital may have become more responsive to tax rate differences in recent years.⁸ The second column uses the 2000 data and shows a slightly higher tax elasticity of 3.49 (also statistically significant at a more than one percent confidence level). The third column averages

⁶ We obtained information on GDP and GDP per capita from the World Bank's *World Development Indicators*.

⁷ Unfortunately there is only one observation of this measure --- it has not been updated for the years after 1985. It is interesting that this measure continues to have considerable explanatory power in our regressions explaining the location of MNC assets abroad.

⁸ The 1998 elasticity, not shown to conserve on space, is 3.81 (with standard error of 1.24).

the data from 1998 and 2000. Here we see an even larger elasticity of 4.12 (with standard error of 1.12).

While working with the data, we found that there were some countries with quite substantial changes in the stock of real capital between 1998 and 2000. We worry that there may be noise in this data. In the final column we test the sensitivity of our results to the inclusion of countries that may be outliers by eliminating those countries in which the capital stock in 2000 increased or decreased by 75 percent or more. The resulting tax elasticity increases to 4.56 (with standard error of 1.22) again suggesting that the sensitivity of location decisions to differences in after-tax returns may have increased substantially between 1992 and 2000. We next test whether there is any statistical difference between these tax elasticities.

The regressions in table 7 are run on differenced data to control for unmeasured country specific fixed effects which may bias the coefficient estimates on the tax terms. We difference the data by subtracting the 1992 observations from the ones from 2000. We test for differences in the tax elasticity estimates in table 6 using the same methodology as AGN: we add the 1992 tax term [$\log(1-ETR)$ for 1992] to the regression. Doing this allows the tax elasticity to differ across the two years of data. The estimated coefficient on the difference of the tax terms [$\log(1-ETR)$ for 2000 – $\log(1-ETR)$ for 1992] is the tax elasticity for 2000; the estimated coefficient on the 1992 tax term captures the difference between the two tax terms. The elasticity has increased if the coefficient on the latter term is positive and statistically different from zero.

The results of our analysis of the differenced data are shown in table 7. We draw two tentative conclusions. First, although more recent tax elasticities are larger in magnitude, the difference in elasticities is not statistically significant. For all three of our experiments with the 2000 data, the estimated coefficient on the log of the 1992 tax term is about equal in magnitude to its standard error. Second, it seems that fixed country effects have become more important. The elasticities estimated using the differenced data are smaller in magnitude (and less significant)

than those in table 6. In contrast, AGN found that fixed country effects had little impact on the tax elasticity estimates for 1984 and 1992.

The location of intangible assets

Finally, because U.S. direct investment abroad is strongly motivated by the exploitation of intangible assets like patents and trademarks, it is of interest to know whether these intangibles are increasingly being located in low-tax countries. Even though part of the return on these intangibles is paid out in deductible royalties, the evidence suggests that the foreign subsidiary retains a significant portion, which means that a low-tax jurisdiction is a favorable potential location. But the royalties actually paid by affiliates can be used as an indication of where intangible assets are being invested.

Data in the BEA Benchmark Surveys of U.S. Investment Abroad in 1994 and 1999 suggest that low-tax countries are becoming much more important destinations for U.S. produced intangible assets. Specifically, the share of total affiliate royalties accounted for by Ireland and Singapore doubled over that 5 year interval. The share of total royalties paid by subsidiaries in these locations increased from 9.3 percent to 20.9 percent, and the share of royalties paid to the U.S. parent increased from 8.4 percent to 19.6 percent. Royalties paid by Irish affiliates now exceed royalties paid by German and United Kingdom affiliates, and total royalties paid by Singapore affiliates are only 25 percent lower than royalties paid by Japanese affiliates.

IV. Preliminary conclusions

The following points summarize our preliminary conclusions from our work to date.

- The evolution of country effective tax rates between 1992 and 1998 seems to be driven by tax competition. Countries that had lost shares of U.S. manufacturing affiliate real capital cut their rates the most over this period. Further, smaller countries and those with high initial average effective tax rates experienced larger declines in effective tax rates relative to the average.

- Countries may not need tax competition to lower effective tax burdens abroad. We find that the evolution of country effective tax rates between 1998 and 2000 seems to be driven by company rather than country behavior. Changes in the country's capital share, the initial level of the country's effective tax rate, and whether the country is small no longer explain differences in declines in effective tax rates over this period. The statutory tax rate, which measures the incentive to use self-help techniques to lower effective tax burdens, is positively correlated with decreases in effective tax rates between 1998 and 2000.
- Countries were already rewarding more mobile companies and those that were perceived to be more beneficial to the local economy with lower effective rates in 1984.
- Manufacturing subsidiaries' transactions with related parties increased very dramatically between 1984 and 1996. This increase in the importance of transactions with offshore affiliates is consistent with the increased sensitivity of investment to tax considerations.
- U.S. manufacturers may have become more sensitive to differences in local tax rates across countries in recent years. Although our results on the differences in tax elasticities across our time period are not conclusive, they do suggest that host country tax rates continue to play a very important role in explaining the location of real manufacturing capital held abroad by U.S. parents.
- Low-tax countries are becoming much more important destinations for U.S. produced intangible assets. This is of interest because U.S. direct investment abroad is strongly motivated by the exploitation of intangible assets like patents and trademarks.

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Appendix

Country Database

Argentina	Kenya
Australia	Luxembourg
Austria	Malaysia
Belgium	Mexico
Brazil	Morocco
Canada	Netherlands
Chile	New Zealand
China	Nigeria
Colombia	Norway
Costa Rica	Pakistan
Denmark	Panama
Dominican Republic	Peru
Ecuador	Philippines
Egypt	Portugal
El Salvador	Singapore
Finland	South Africa
France	South Korea
Germany	Spain
Greece	Sri Lanka
Guatemala	Sweden
Honduras	Switzerland
Hong Kong	Taiwan
India	Thailand
Indonesia	Turkey
Ireland	United Kingdom
Israel	Uruguay
Italy	Venezuela
Jamaica	Zambia
Japan	Zimbabwe