HAS U.S. INVESTMENT ABROAD BECOME MORE SENSITIVE TO TAX RATES?

Rosanne Altshuler
Harry Grubert
T. Scott Newlon

Working Paper **6383**

NBER WORKING PAPER SERIES

HAS U.S. INVESTMENT ABROAD BECOME MORE SENSITIVE TO TAX RATES?

Rosanne Altshuler
Harry Grubert
T. Scott Newlon

Working Paper 6383
http://www.nber.org/papers/w6383

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 1998

We thank Gordon Wilson and Paul Dobbins for providing us with the data files in a convenient form. We are grateful to James Hines Jr., Jack Mintz, William Randolph, Frank Vella and participants at the NBER International Taxation Conference held in October 1997 for helpful comments. Any opinions expressed are those of the authors and not those of the U.S. Treasury Department or the National Bureau of Economic Research.

Has U.S. Investment Abroad Become More
Sensitive to Tax Rates?
Rosanne Altshuler, Harry Grubert
and T. Scott Newlon
NBER Working Paper No. 6383
January 1998
JEL Nos. F23, H25, H87

ABSTRACT

We use data from the U.S. Treasury corporate tax files for 1984 and 1992 to address two related questions concerning the investment decisions of U.S. multinational corporations. First, how sensitive are investment location decisions to tax rate differences across countries? And second, have investment location choices become more sensitive to differences in host country tax rates? We regress a measure of the real capital held in the manufacturing affiliates of U.S. manufacturing firms in each of the 58 countries in our sample on tax rate variables and measures of non-tax characteristics of countries. The availability of two years of data allows us to control for unmeasured country fixed effects. We find large estimated tax elasticities for investment abroad. Our basic estimates yield an elasticity of real capital to after-tax rates of return of close to three in 1992 and about 1.5 in 1984; both the elasticities and the difference between them are significant at standard levels. The increase of more than one in the estimated elasticities from 1984 to 1992 suggests that the allocation of real capital abroad may have become more sensitive to differences in host country taxes in recent years. These results are consistent with increasing international mobility of capital and globalization of production.

Rosanne Altshuler
Department of Economics
Rutgers, The State University of New Jersey
75 Hamilton Street
New Brunswick, NJ 08901-1248
and NBER
altshule@rci.rutgers.edu

Harry Grubert
U.S. Treasury Department
Office of Tax Analysis
International Taxation
1500 Pennsylvania Avenue, NW
Washington, DC 20220
harry.grubert@treas.sprint.com

T. Scott Newlon
U.S. Treasury Department
Office of Tax Analysis
International Taxation
1500 Pennsylvania Avenue, NW
Washington, DC 20220

This paper attempts to address two related questions. The first question is how sensitive U.S. firms' investment location decisions are to tax rate differences across countries. Finding the answer to this question clearly is important for determining the revenue and efficiency consequences of many tax policies. The second question is whether the location of investment abroad by U.S. firms has become more sensitive to tax rate differences across countries. A finding that investment location decisions have become more sensitive to tax rates would be consistent with the view that technological advances and the loosening of trade restrictions and capital controls have in recent years increased the ease with which capital can cross national borders. If different locations became closer substitutes for the location of production, it would not be surprising if investment location decisions became increasingly responsive to tax considerations.

We use data from the U.S. Treasury corporate tax return files for 1984 and 1992 to address these questions. The use of these data gives two benefits not available to recent cross-sectional studies of the effect of host country tax rates on the distribution of U.S. direct investment abroad (e.g., Grubert and Mutti 1991, Hines and Rice 1994, and Grubert and Mutti 1997). The first benefit is that, with the time element in our data, we can examine whether investment location choices abroad have in fact become more sensitive to tax rates over the period spanned by our two sample years. The second benefit is that we can control for unmeasured country fixed effects.

Our data come from the information forms filed with the tax returns of U.S. parent corporations on each controlled foreign corporation (CFC) abroad.[1] This information form, described more fully below, includes details from the balance sheets and income statements of CFCs. We aggregate these data up to country level and combine it with information from a variety of other sources to control for non-tax features of different locations. The data include information for almost 60 countries. We limit our analysis to the manufacturing CFCs of U.S. manufacturing parents.

---

[1]A CFC is a foreign corporation that is at least 50 percent owned by a group of U.S. shareholders each of whom have at least a 10 percent interest in the company. In fact, most of the CFCs in our sample are 100 percent owned by the U.S. parent corporation.

Following the earlier studies by Grubert and Mutti (1991), Hines and Rice (1994) and Grubert and Mutti (1997), we regress a measure of U.S. multinational firms' real capital in each country on tax rate variables and measures of non-tax characteristics of the countries. The focus is on the effect of differences in host country tax rates on investment choices across foreign locations, not on the choice between investing at home or abroad. Our work has two main findings. First, we find large estimated tax elasticities for investment abroad. Controlling for fixed country effects produces tax elasticities that are slightly larger and more precisely estimated than those from our single-year cross-sections. Second, our results suggest that the location of real capital in manufacturing affiliates has become more sensitive to tax rates in the period from 1984 to 1992. Our basic estimates indicate that the elasticity of real capital to changes in after-tax returns increased from about 1.5 in 1984 to 2.8 in 1992 (for countries with the most open trade regimes). Both the elasticities and the difference between them are statistically significant at standard levels.

We perform a variety of tests to check the robustness of our elasticity estimates. With few exceptions, the magnitude and significance of our 1992 and 1984 elasticities changes little when we screen our sample in various ways or change the measure of host country taxes. The difference between the 1984 and 1992 elasticities is large in absolute terms, is statistically significant, and its absolute and statistical significance is robust to our sensitivity checks.

The remainder of the paper is organized as follows. Section 1 contains a brief review of studies using cross-sectional data to estimate tax effects on location decisions of U.S. multinational corporations. We highlight the elasticity estimates in previous studies and note that they provide suggestive but inconclusive evidence that investment location has become more sensitive to tax rates in recent years. Section 2 describes the data and how our tax and capital measures are constructed

from the Treasury tax files. Empirical results are contained in section 3 and the final section presents our conclusions.

1. A brief review of the recent literature

While early studies of the responsiveness of U.S. direct investment to after-tax rates of returns used aggregate time-series data,[2] the most recent work in this area exploits cross-sectional data. In this section, we review the three studies which relate most directly to our approach: Grubert and Mutti (1991), Hines and Rice (1994), and Grubert and Mutti (1997). All three papers contain estimates of the effect of local taxes on the allocation of real capital. While the tax variable in these papers is similar (each uses a measure of average effective tax rates), it appears in different forms in the estimating equations, making the comparison of estimated tax effects difficult.

Both Grubert and Mutti (1991) and Hines and Rice (1994) use the 1982 benchmark data on U.S. direct investment abroad from the Bureau of Economic Analysis. One important difference between these two papers is the sample studied. Grubert and Mutti analyze the allocation of capital by manufacturing affiliates of U.S. parents across 33 host countries. The focus of Hines and Rice is on the activity of U.S. multinationals in tax havens. Their sample includes all majority owned nonbank affiliates of U.S. parents which results in a larger set of countries (73), more than half of which are tax havens (41) with little real capital.[3]

---

[2]This work includes Hartman (1981), Boskin and Gale (1987) and Newlon (1987). The literature on the effects of taxation on foreign direct investment abroad has been carefully reviewed in Hines (1997). This review does not include the recent work in Grubert and Mutti (1997), however.

[3]Hines and Rice report that 4.2 percent of all property, plant, and equipment is located in the tax havens in 1982.

Grubert and Mutti (1991) regress the log of the net stock of property, plant, and equipment (PPE) on two different forms of the average effective tax rate: the log of one minus the tax rate and the inverse of the tax rate. The first specification gives a (constant) tax elasticity that measures the sensitivity of the demand for real capital to changes in after-tax returns (for a given pre-tax return) or, alternatively, to changes in the cost of capital (for given after-tax returns). The second specification allows for larger tax effects at lower tax rates. Using the first specification, Grubert and Mutti estimate tax elasticities that range from 1.5 (for all manufacturing affiliates) to 2 (for majority-owned manufacturing affiliates) but were statistically not highly significant. The inverse formulation, however, produced a highly significant tax coefficient of -0.11. At lower tax rates, this tax effect is particularly strong. Grubert and Mutti report that reducing local tax rates from 20 to 10 percent will increase U.S. affiliates' net plant and equipment in a country by 65 percent.

Hines and Rice (1994) regress the log of PPE on host-country average tax rates. The coefficient on their tax term is -3.3 and is significantly different from zero.[4] This coefficient suggests that at their mean tax rate of 31 percent, a one percent increase in after-tax returns leads to a 2.3 percent increase in the real capital stock of U.S. affiliates. Hines and Rice's inclusion of the tax haven countries, as well as examining the allocation of capital in all nonbank affiliates, may be responsible for their higher estimated elasticity.

The most recent analysis of the effects of taxes on investment location decision of U.S. multinational firms is Grubert and Mutti (1997). They estimate tax elasticities using country- and firm-level cross-sectional data on the manufacturing affiliates of U.S. manufacturing parents in 60

[4]Hines and Rice (1994) also report results of regressions that include both the tax rate and the square of the tax rate as explanatory variables. However, the squared tax rate is not significantly different from zero.

locations from the 1992 Treasury tax file. As in their previous study, they enter the tax variable in log(1-t) form.

When compared to the results of their previous paper, the estimates from Grubert and Mutti (1997) suggest that the location of capital may have become more sensitive to differences in after-tax returns between 1982 and 1992. Using the aggregated country-level data, they estimate a tax elasticity which is greater than 3 (for open economies) and is statistically highly significant. Using the firm-level data, they calculate a "combined" elasticity measure that takes into account the probability of choosing to locate capital in a country and the amount of capital invested into account. They report a combined elasticity of capital to after-tax returns for open economies of about 3.

To summarize, the results of previous work with cross-sectional data indicates that taxes have a significant impact on the investment location decisions of U.S. multinational firms. In addition, a rough comparison of the elasticity estimates suggests that these decisions may have become more sensitive to host country tax rates in recent years; however, the validity of this comparison is questionable, since the estimates were derived from different data sources.

2. The Data

Our principal source of data is the Treasury corporate tax files compiled by the Statistics of Income (SOI) division of the Internal Revenue Service. This data set is derived from a variety of tax and information forms filed by U.S. parent corporations. Much of the data necessary for our analysis comes from the Form 5471 which reports on the activities of each CFC of a U.S. parent. This form, which U.S. parents must file for each of their CFCs, reports subsidiary level information on assets, taxes paid, earnings and profits, and other information from balance sheets and income statements.

Information from the Form 5471 is compiled only in even years and was available to us from 1980 through 1992. However, the level of detail recorded from this form on the SOI files differs from year to year. For example, both the 1984 and 1992 files provide information on the composition of assets from the balance sheet portion of the Form 5471 while the other sample years do not. The interval from 1984 to 1992 is particularly appropriate for our study, since it covers a period of large declines in effective tax rates in some locations abroad.[5] We use the information in the remaining even years between 1980 and 1992 to calculate country average effective tax rates. These effective tax rates are used in various forms as independent variables in our regressions.

We restrict our sample to the manufacturing CFCs of all large U.S. manufacturing corporations.[6] We aggregate the subsidiary-level information from the Form 5471 across parents by country.[7] One advantage of using country-level data is that it eliminates some of the complicated statistical problems associated with subsidiary-level data: for example, the problems that arise from using data that are truncated at zero when errors may be correlated across observations within a country because of omitted variables. A drawback is that we lose information on the characteristics of the parent corporations that may affect their location decisions.

---

[5]This period also straddles the Tax Reform Act of 1986, which made significant changes in U.S. taxation of both domestic and international business. Our analysis considers the choice of investment across foreign locations, not between domestic and foreign locations. However, we allow the intercept in our estimates to vary by year, which to some extent may capture the effect of changes in U.S. taxes over the time period. Some evidence of the responsiveness of foreign investment to changes in U.S. tax rates is provided in Harris (1993). He finds that firms which were most negatively impacted by the 1986 tax reform responded by increasing their investment abroad.

[6]Although beyond the scope of this project, it is possible that the behavior of firms in the manufacturing industry differs from those in other industries. As discussed in section 1, the difference between the estimates of the elasticity of property, plant and equipment to average host-country tax rates found in Grubert and Mutti (1991) and Hines and Rice (1994) may be due to the inclusion of nonbank affiliates in the latter study. Given the focus of this paper on the location of real capital, it seemed appropriate to limit the sample to data from manufacturing affiliates.

[7]The 1984 sample includes all U.S. corporations with at least one CFC and total assets greater than $250 million. All U.S. corporations with at least $500 million in assets were included in the 1992 sample.

Aggregating across subsidiaries in each country leaves us with data for 58 locations for 1984 and 1992.[8] Our two cross-sections are "unlinked" in that there is no requirement that the same parents (or the same CFCs) appear in both years of data. We also experimented with a sample drawn from a panel that contains *only* those CFCs associated with parents that appear in both years.[9] We report results using this "linked" data set in our sensitivity analysis.[10]

We augment the Form 5471 data with country-specific information from some other sources to help control for non-tax characteristics of countries that may affect location decisions. We obtained population, GDP, and inflation data from the *International Monetary Fund International Financial Statistics* (International Monetary Fund 1984, 1992) supplemented in a few cases by information from statistics from the United Nations. As in Grubert and Mutti (1997), we use the trade regime classification developed in the *World Development Report* (World Bank 1987) to control for the degree of openness of each country's economy. This measure is based on observations from 1973 to 1985 of (i) the country's effective rate of protection, (ii) its use of direct controls such as quotas, (iii) its use of exports, and (iv) the extent of any overvaluation of its exchange rate. The variable runs from 0 (most open) to 3 (most restrictive). Unfortunately, there is only one observation of this measure; it has not been updated for the years after 1985.

---

[8]Locations for which there were less than five CFCs were eliminated from the analysis. This left us with 60 locations. Our analysis was further limited to 58 countries because we were unable to locate complete information for Taiwan and the Cayman Islands.

[9]The link is based largely on employer identification numbers (EINs), but a special effort using corporate names was made to identify large companies whose EIN may have changed. Companies may disappear because of mergers and may appear because they moved over the threshold for inclusion during our time interval.

[10]Our unlinked panel has, however, some advantages over the linked panel. For example, if a parent disappears due to a merger, the unlinked country totals will contain both its 1984 and 1992 assets and income.

Before turning to our empirical results, we briefly discuss how we use the Form 5471 information to measure real capital and to calculate effective tax rates. Both variables are reported in appendix table 1.

2.1 Measuring assets

Our measure of real capital in each year is comprised of end of year depreciable assets (plant and equipment) and inventories from the balance sheet information reported on the Form 5471. Since parents are required to report subsidiary assets according to U.S. accounting principles these figures are not distorted by host country incentives such as accelerated depreciation. However, the asset measures reflect historical book values and therefore may be affected by local inflation and exchange rates.[11]

Another potential problem with our real capital measure is that the assets reported by a CFC may not be located in the country in which the CFC is incorporated. This problem is especially serious in tax haven countries, which are often hosts to holding companies and financial CFCs. Including only manufacturing affiliates in our country data helps mitigate this problem. In addition, we investigate how our results are affected when we remove countries that are likely to be tax havens from the analysis.

[11]In some cases the parent may maintain historical values in terms of dollars originally invested (particularly in locations with hyperinflation), but this is not mandated.

2.2 Measuring effective tax rates

We calculated the average effective tax rate for manufacturing CFCs incorporated in each country by dividing total income taxes paid by total earnings and profits.[12] Both variables appear on the Form 5471. Parent corporations must report their CFCs' earnings and profits using the definition provided by the U.S. Internal Revenue Code. This measure of earnings and profits is meant to reflect net economic income, not host country (or domestic U.S.) taxable income, which would be affected by investment incentives such as accelerated depreciation.[13]

One potential problem with our country average effective tax rate calculations, particularly in small countries with few CFCs, is that they appear to contain noise. We were particularly concerned about the 1984 effective tax rates. Appendix table 2 reports the results of regressing previous year average effective tax rates on 1986 and 1990 average effective tax rates. We found that the 1982 effective tax rates are better predictors of 1986 effective tax rates than the 1984 rates. To diminish the role of the 1984 effective tax rates in our analysis, we averaged them with effective tax rates from the previous two even years. For consistency, we average the 1992 effective tax rates with those from 1990 and 1988. We also experiment with using lagged effective tax rates.

Another potential problem with our effective tax rate measures is that they may be correlated with inflation since depreciation allowances are based on the historic costs of assets. In addition to including inflation as an explanatory variable, we also checked the relation between differences in

---

[12]Only CFCs with positive income were included in the calculation; otherwise, the tax measure would be biased upwards. As indicated, only income taxes are included in the average effective tax rate measure. However, foreign affiliates operating in host countries are sometimes also subject to property and assets taxes. These taxes may also influence the investment patterns of U.S. multinationals. Our data do not permit us to identify these taxes.

[13]As noted in Grubert and Mutti (1997), earnings and profits on the Form 5471 seem very close to book income (which is also reported).

inflation and differences in effective tax rates. We found that the change in inflation between 1984 and 1992 explains less than 4 percent of the variation in our effective tax rate variables.

A further issue is that average effective tax rates are to some extent endogenous to investment decisions. The effective tax rate in a country may be low in a year because of a recent increase in investment activity in that country that qualifies for investment incentives such as accelerated depreciation that accrue early in an investment's life.[14] One approach to avoiding this potential endogeneity problem is to replace average effective tax rates with statutory rates. Although statutory rates have the virtue of being exogenous to investment decisions, they do not reflect all the variation in the tax advantages of investment in different locations since they do not measure tax base differences across countries. Statutory rates also do not capture ad hoc deals between host countries and individual foreign investors. For this reason, statutory rates are better indicators of the advantages of placing financial capital in a location and the gains to income shifting. Nevertheless, we use statutory rates as well as instrumental variable techniques to test the sensitivity of our results to alternative measures of taxes. We collected country statutory tax rates from the Price Waterhouse (1984, 1992) guides.

Given that we are implicitly modeling investment decisions, it might seem appropriate to use host country marginal effective tax rates rather than average effective tax rates. Marginal effective tax rates were not available for many of the countries included in our sample. Even if Hall-Jorgenson-King-Fullerton marginal effective tax rates as they are usually modelled were calculated for

---

[14]Grubert and Mutti (1997) found that recently incorporated CFCs had significantly lower effective tax rates than the country average in the 1992 file. To correct for "age effects" they adjust the country average effective tax rates by the age distribution of CFCs in each country. Their tax elasticity estimates were unaffected by this adjustment. Grubert (1997b) indicates that age effects were the same in 1984 as in 1992.

all the countries and both years in our sample, it is not clear that they would be superior at capturing the effects of taxes on investment location decisions. As discussed previously by others, there are serious drawbacks to the use of marginal effective tax rates. For example, taking into account all of the features of tax systems that are important for investment decisions in the calculation of marginal effective rates is generally not feasible. There may be features of tax codes that are difficult to model (such as the alternative minimum tax in the United States), tax incentives that apply only to some regions of countries, and ad hoc deals between companies and host countries. Finally, the formulas used to compute Hall-Jorgenson-King-Fullerton tax rates are sensitive to the required rate of return assumed.

The tax variable used in the location equations, the local average effective tax rate, tends to overstate the cross-country variation in tax burdens, and thus understate the true investment elasticity. For one thing, multinational corporations can allocate more debt to high (statutory) tax locations, diluting the impact of the local tax on net equity income. In addition, the tax variable does not include the residual U.S. tax on repatriations from each location.[15] If anything, residual U.S. taxes would tend to even out differences in tax rates across the countries; if a company's foreign tax credits do not fully offset its U.S. tax liability on repatriated income, additional repatriations from a low tax country trigger an additional U.S. tax, while repatriations from countries with a tax rate above the U.S. rate yield a bonus because some of the foreign tax credits can shield other income (see Grubert and Mutti 1997 for a discussion of this issue).

[15]See Altshuler and Newlon (1993) or Grubert (1997a) for a detailed description of repatriation taxes.

2.3 Variation in effective tax rates across countries and time

Our empirical strategy relies on the existence of variation in effective tax rates across countries and across our time period. Fortunately, this was a period of intense tax reform activity around the world. Along with the U.S., many countries reduced their corporate tax rates (including Canada, the U.K., France, Belgium, and the Netherlands). These reforms resulted in substantial declines in average effective tax rates for U.S. CFCs between 1984 and 1992.[16]

Table 1 provides information on the mean and standard deviation of average effective tax rates (for manufacturing) for the 58 locations in our data set. The table shows that average effective tax rates in our sample steadily declined between 1980 and 1992. In addition, the standard deviation of average effective tax rates was greater than 11 percent in each year. We also calculated the variation in country average effective tax rates across years. We found that average effective tax rates in manufacturing fell by more than 15 percentage points between 1984 and 1992. The standard deviation of the change was 17 percentage points, indicating substantial variation in the change in tax rates.[17]

---

[16]Grubert, Randolph and Rousslang (1996) found that there was a substantial decrease in the average foreign tax rate faced by U.S. multinationals on repatriated income between 1984 and 1992. They conclude that the decrease in average foreign tax rates (from 36 percent in 1984 to 25 percent in 1992) was primarily due to reductions in country average effective tax rates and not to changes in income repatriation patterns.

[17]As explained below, we use differences in effective tax rates averaged over three years, lagged effective tax rates and statutory tax rates in our regression analysis. The decline in effective tax rates averaged over the years 1980, 1982, and 1984 and effective tax rates averaged over the years 1988, 1990, and 1992 was 11 percentage points with a standard deviation of 12. Average effective tax rates fell by 14 percentage points (with a standard deviation of 15) between 1982 and 1990. Finally, statutory tax rates fell almost 14 percentage points between 1984 and 1992 with a standard deviation of 14.

3. Estimation Results

For our estimates we use a reduced form model that follows the model used in Grubert and Mutti (1997) and is similar to the models used in Grubert and Mutti (1991) and Hines and Rice (1994). 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).[18] This reduced form relation between tax rates and investment in real capital would result from a standard partial equilibrium economic model in which parent firms allocate capital abroad to maximize after-tax returns.

The basic reduced form model is:

$$\log K_{it} = const_t + \alpha' \mathbf{Z}_{it} + \beta \log(1-t_{it}) + \gamma TRADE_i * \log(1-t_{it}) + \epsilon_{it} \qquad (1)$$

where i subscripts countries, t subscripts the year of analysis (t=1984 or 1992), K is real capital, **Z** is a vector of non-tax country characteristics, t is the tax variable, and TRADE is the trade policy variable. Notice that our tax variable is interacted with the trade variable (which also appears by itself in the vector **Z**) to control for the possibility that the benefit of low tax rates may be smaller in more restrictive trade regimes. Thus, the estimated coefficient β describes the elasticity of total real capital with respect to after-tax returns (for a given pre-tax return), for the most open regimes (in which the trade variable is zero). We use log GDP and log population as scale variables to reflect the

[18]We recognize that there may be general equilibrium responses in factor returns that affect the role of taxes in multinational behavior. As Gordon (1986) shows in a small country model with homogeneous capital and perfect mobility of portfolio capital, any increase in the local tax rate on capital is offset by lower local wage costs. But, as discussed in Grubert and Mutti (1997), many features of a more realistic model would diminish or even reverse this general equilibrium response. In any case, if the Gordon (1986) model is valid, we should observe no effect of local taxes on the location of multinational corporations. Indeed, bringing potential U.S. tax credits into the picture would predict that U.S. companies should locate in high-tax countries.

economic size of each country. Since we use the log form, we are implicitly controlling for differences in GDP per capita across countries.

3.1 Single year cross-sectional analysis

Table 2 presents our main results.[19] The first column reports regression results for the 1992 cross-section. We include regional dummies to control for unmeasured geographic characteristics.[20] Our results indicate that the "open regime" tax elasticity is 2.7 and is highly significant. The trade regime variable is also highly significant and negative, indicating the adverse effect of trade restrictions on the desirability of a location for investment. As expected, the presence of trade restrictions lessens the responsiveness to lower tax rates: the trade-tax interaction term is negative and significant at the 5 percent level. Although we included inflation as an independent variable in other estimates, we do not report these results in the table since inflation rates had no effect on the tax variables and were never a significant explanatory variable.

The analogous regression for 1984 is presented in the second column of table 2. In contrast to the 1992 results, neither the tax term nor the trade-tax interaction term is significant at conventional levels in the 1984 cross-section. In addition, the coefficient on the tax term is (about) one-half as large in the 1984 regression as in the 1992 regression.

Before turning to the fixed effects estimates, we pool the data and test whether the coefficients on the log(1-t) terms are statistically different from each other in 1984 and 1992. We restrict all of

---

[19]Since the number and size of CFCs differs across countries in our dataset, we report White-corrected standard errors to correct for heteroskedasticity.

[20]The excluded countries are a highly heterogeneous group which include African, Scandinavian and Middle Eastern countries, among others.

the coefficients except the ones on log(1-t) terms to be equal; an F-test does not reject this specification.

The pooled regression results appear in column (3) of table 2. In these regressions, the tax term (log(1-t)) appears by itself and interacted with a year variable that equals one in 1984. Therefore the 1992 "open economy" elasticity is the coefficient on the log(1-t) term, the interacted term gives the difference in the 1984 and 1992 "open economy" elasticities, and the sum of the two terms gives the 1984 "open economy" elasticity. The bottom two rows of the table report the 1984 and 1992 elasticity estimates with standard errors.[21]

Interestingly, in the pooled regression, the 1992 coefficient decreases in size and significance; the opposite is true of the 1984 coefficient which is now significant at the ten percent level. In addition, the difference between the rates, although still large, is not statistically significant. Controlling for fixed country effects will increase the precision of these estimates if our tax terms are correlated with omitted non-tax country variables. To the extent that these omitted variables do not vary over time, we can control for their fixed effects by estimating the model in first difference form.

3.2 Controlling for permanent non-tax features of different locations

As in the pooled regression, we allow the tax coefficients to differ over time. This gives the following model in difference form:

[21]The standard error comes from the analogous regression in which YEAR84 equals one for the 1992 observations.

$$\log K_{i,92} - \log K_{i,84} = \text{const} + \alpha'(\mathbf{Z}_{i,92} - \mathbf{Z}_{i,84}) + \beta_{92}\log(1-t_{i,92}) - \beta_{84}\log(1-t_{i,84}) + \gamma \text{TRADE}_i[\log(1-t_{i,92}) - \log(1-t_{i,84})] + \iota. \quad (2)$$

By rearranging this equation as follows we can test directly whether tax elasticities have changed over time while controlling for fixed country effects:

$$\log K_{i,92} - \log K_{i,84} = \text{const} + \alpha'(\mathbf{Z}_{i,92} - \mathbf{Z}_{i,84}) + \beta_{92}[\log(1-t_{i,92}) - \log(1-t_{i,84})] + \beta_{\text{diff}}\log(1-t_{i,84}) + \gamma \text{TRADE}_i[\log(1-t_{i,92}) - \log(1-t_{i,84})] + \iota. \quad (3)$$

where $\beta_{\text{diff}} = \beta_{92} - \beta_{84}$.

The fourth column of table 2 presents estimates of equation (3); summary statistics on the regression variables are presented in appendix table 3. Three main findings emerge. First, the 1992 elasticity increases substantially in magnitude (from 2.21 to 2.77).[22] Second, the 1984 coefficient also becomes larger (from 1.42 to 1.53) and is more precisely estimated.[23] And finally, the difference in elasticities is more than one and is significant at the 5 percent level, indicating that the location of real manufacturing capital by manufacturing firms may indeed have become more sensitive to tax rates. These results indicate that the estimates in column (3) may have been affected by correlation between the tax rate variable and omitted country characteristics.

Notice that by including a constant term in this regression, we have assumed that the constant terms in the yearly regressions are not identical. It is interesting to note that the constant is positive and highly significant (and remains so in all the estimates). Among other things, this term may be

[22]We can also calculate a weighted elasticity that reflects the effects of the trade restrictions. Adjusting the elasticity by trade regime using the 1992 real capital stocks as weights gives a slightly lower tax elasticity of 2.64.

[23]To test the significance of the 1984 rate we ran the same regression as in equation (3) but with $\log(1-t_{i,92})$ instead of $\log(1-t_{i,84})$ entered separately. The result is presented in the last row of table 2.

controlling for changes in both tax and non-tax factors that affected the attractiveness of the United States relative to other countries as a location for investment.

Apart from "globalization", another possible explanation for the increased tax sensitivity of investment after 1984 is the change in companies' excess foreign tax credit expectations as a result of the Tax Reform Act of 1986. The Act lowered the U.S. rate from 46 to 34 percent. If there were no changes in behavior by companies or reactions by foreign governments, the number of companies with excess foreign tax credits would have expanded dramatically. If a company moves into an excess credit position, its effective tax burden in a high tax country goes up because repatriations do not provide a bonus in terms of usable tax credits while the effective tax burden in low tax countries declines because there is no residual U.S. tax.

3.3 Alternative specifications of the difference regression

We experimented with a few different specifications of this regression that are not reported in the table. As was the case in the previous formulation, including the difference in inflation rates in this regression had no effect on the tax elasticities. We also tested whether the trade-tax interaction term is different in the two time periods by adding the 1984 trade-tax term. This additional variable had no impact on the tax effects and was not significantly different from zero. In addition, we dropped the trade-tax interaction terms from the regression to determine whether our results are sensitive to their inclusion.[24] Without the trade-tax term, the 1984 elasticity looses its significance

[24]We also ran the regression using only the 22 countries for which the trade variable equaled zero. While the difference between the two estimated elasticities remains larger than one, the magnitude of the two elasticities decreases slightly. Both the 1992 tax coefficient and the coefficient on the difference between tax rates remain significant at conventional levels. However, the 1984 tax coefficient loses significance at the ten percent level.

(at conventional levels) and the magnitude of both elasticities diminishes slightly: 2.18 for 1992 and .87 for 1984. However, the 1992 elasticity and the difference between the elasticities remains highly significant at above the five percent level.

As in Hines and Rice (1994), we also entered our average effective tax rate variables in the linear form. When average effective tax rates appear on the righthand side instead of the log of one minus the average effective tax rate, the coefficients on the 1992, 1984 and difference in tax terms are respectively, -4.23, -2.63, and 1.60. All three terms are statistically different from zero at the five percent level or better. At the mean tax rates for 1992 and 1984 given in table 1, these coefficients imply that a one percent increase in after-tax returns in a country would increase the real capital stock held by U.S. affiliates in that country by 3.2 percent in 1992 and 1.7 percent in 1984. When squared tax terms are added, their coefficients are positive, not negative as would be expected if the logarithm specification is exactly correct, but they are not statistically significant. There seems to be greater tax sensitivity at low-tax rates than would be suggested by the log specification, but in any case, there does not seem to be much substantive difference between the double log and semilog specifications. Given this fact, we prefer the log specification because it yields coefficients that can be directly interpreted as elasticities.

3.4 Sensitivity Analysis

The remaining two tables test the robustness of the results in column 4 to differences in the tax variables (table 3) and the sample (table 4) used. In particular, we focus on the significance of the two elasticities and the difference between them. The results are generally consistent with those presented above, although the 1984 tax elasticity is not always statistically significant.

In the first column of table 3, we replace the three-year average effective tax rates with lagged effective tax rates. This eliminates the noise contained in the 1984 tax rates, but by eliminating the averaging of tax rates over three years it may also increase the noise in the tax rate variable. Using lagged tax rates yields a slightly smaller tax coefficient for 1992. Although the difference between the two tax coefficients is smaller, it is still statistically different from zero at a five percent confidence level. One possible reason for the decrease in the magnitude of the difference in elasticities is that the 1988 rates no longer receive any weight in the analysis. Table 1 shows that the big drop in rates occurred between 1988 and 1990. Averaging in 1988 with 1990 and 1992 may have led to an underestimate of the tax rate change between 1984 and 1992 and an overestimate of the responsiveness of investment to the change.

As discussed above, a potential problem with the average effective tax rates is that they are endogenous to investment decisions. The effective tax rate in a country may be low in one year because of a recent increase in investment activity in that country. Using statutory tax rates eliminates this potential endogeneity problem. At the same time though, statutory rates do not capture the effects of tax base differences across countries. The second column shows that our qualitative results are unaffected by this measure of taxes --- both the 1992 tax elasticity and the difference in elasticities are positive and significant. However, the 1984 elasticity is no longer statistically significant. Notice that the magnitude of the tax coefficients decreases, suggesting that investment location decisions are more responsive to differences in average effective tax rates than to differences in statutory rates.

An alternative way of addressing the endogeneity problem is to use an instrumental variables approach. In column three, we present estimates which use statutory tax rates as instruments for

average effective tax rates. Using instrumented tax rates had little effect on our coefficient estimates but increased our standard errors significantly. In fact, column 3 shows that neither elasticity was significantly different from zero at standard levels. These results suggest that the statutory rates do not adequately capture the variation in the component of effective tax rates that explain location choices.

Table 4 shows the results of a series of experiments in which we restrict the sample in different ways. To test whether outliers played a significant role in our regressions we restricted the sample to include only countries with populations greater than 1 million (56 countries), eliminated countries for which the difference of three year average effective tax rates was greater than 0.35 and less than -0.10 (3 countries), and deleted countries for which the difference in the log of the capital stocks between 1992 and 1984 was greater than 2 or less than -0.5 (this eliminates the 5 countries in which capital stocks grew more than 700 percent or contracted by more than 40 percent). Column one shows that our main findings are not the result of activities in tax havens. The elasticities and difference between them change little in magnitude or statistical significance. Removing countries with large changes in average effective tax rates from the sample decreases the magnitude and significance of the tax coefficients, although the 1992 elasticity and the difference between the two elasticities remain significant at the five percent level or better (see column 2). Countries experiencing large changes in the real capital stocks of U.S. manufacturing affiliates have an impact on the magnitude of our tax elasticity estimates and the difference between them. However all three coefficients are still significant at the ten percent level or better.

Finally, in the last column we report results from the "linked" panel which contains the same parents in both years. This panel contains about two-thirds of the parents in our unlinked data. Both

the 1984 and 1992 elasticities and the difference between them are large and statistically highly significant in this panel.

4. Conclusion

Measuring the extent to which host country taxes affect the allocation of multinationals' foreign direct investment across foreign jurisdictions has been an active area of research in international taxation. The most recent studies indicate that taxes exert a strong influence on location decisions. Our estimates using two years of data from the Treasury tax files provide additional evidence that the foreign investment of manufacturing firms is sensitive to differences in host country tax rates. Unlike previous estimates, however, we control for any (permanent) differences in non-tax features of countries that may be correlated with host country tax rates.

Our estimates with country fixed effects produce tax elasticities that are large in magnitude and generally precisely estimated. Our basic estimates yield an elasticity of real capital to after-tax rates of return of close to three in 1992 and about 1.5 in 1984; both are significant at standard levels. Comparing these elasticities to those estimated from a model in which the two years of data are simply pooled together without controlling for country fixed effects shows the importance of taking these effects into account. Both the 1984 and 1992 elasticities increase in magnitude and in significance.

The increase of more than one in the estimated elasticities from 1984 to 1992 also suggests that the allocation of real capital held in manufacturing affiliates abroad by manufacturing parents may have become more sensitive to differences in host country taxes in recent years. This would be consistent with increasing international mobility of capital and globalization of production.

Controlling for fixed effects is again important, since the difference between the 1984 and 1992 elasticities is statistically significant when country fixed effects are taken into account, but not otherwise.

References

Altshuler, Rosanne and T. Scott Newlon. 1993. "The Effects of U.S. Tax Policy on the Income Repatriation Patterns of U.S. Multinational Corporations." In *Studies in international taxation*, ed. A. Giovannini, G. Hubbard, and J. Slemrod, 77-115. Chicago: University of Chicago Press.

Boskin, Michael J. and William G. Gale. 1987. "New results on the effects of tax policy on the international location of investment." In *The effects of taxation on capital accumulation*, ed. Martin Feldstein, 201-19. Chicago: University of Chicago Press.

Gordon, Roger. 1986. "Taxation of investment and savings in a world economy." *American Economic Review* 76: 1086-1102.

Grubert, Harry. 1997a. "Taxes and the division of foreign operating income among royalties, interest, dividends and retained earnings," forthcoming, *Journal of Public Economics*.

Grubert, Harry. 1997b. "Tax planning by companies and tax competition by governments: Is there evidence of changes in behavior?." Mimeograph.

Grubert, Harry and John Mutti. 1991. "Taxes, tariffs and transfer pricing in multinational corporation decision making." *Review of Economics and Statistics* 33: 285-293.

Grubert, Harry and John Mutti. 1997. "Do taxes influence where U.S. corporations invest?" Mimeograph.

Grubert, Harry, William Randolph and Donald Rousslang. 1996. "The response of countries and multinational companies to the Tax Reform Act of 1986." *National Tax Journal* 49(3): 341-358.

Hartman, David G. 1981. "Domestic tax policy and foreign investment: Some evidence," NBER Working Paper no. 784. Cambridge, Mass.: National Bureau of Economic Research.

Hartman, David G. 1985. "Tax policy and foreign direct investment." *Journal of Public Economics* 26: 107-21.

Harris, David G. 1993. "The impact of U.S. tax law revision on multinational corporations' capital location and income-shifting decisions," *Journal of Accounting Research* Supplement 31: 111-140.

Hines, James R., Jr. 1997. "Tax policy and the activities of multinational corporations." In *Fiscal policy: Lessons from economic research*, ed. Alan J. Auerbach. Cambridge: MIT Press.

Hines, James R., Jr. and Eric M. Rice. 1994. "Fiscal paradise: Foreign tax havens and American business," *Quarterly Journal of Economics* 109: 149-182.

International Monetary Fund 1984 and 1992. *International Monetary Fund International Financial Statistics*. Washington, DC: IMF.

Price Waterhouse. 1992 and 1984. *Corporate taxes: A worldwide summary*. New York.

Newlon, T. Scott. 1987. "Tax policy and the multinational firm's financial policy and investment decisions." Ph.D. dissertation, Princeton University.

World Bank. 1987. *World development report*. Washington, D.C.

Table 1

Global Decline in Average Effective Tax Rates, 1980-1992

(Average Effective Tax Rates for Manufacturing in 58 Countries)

Year	Mean	Standard Deviation
1980	.321	.115
1982	.340	.131
1984	.339	.134
1986	.303	.133
1988	.306	.155
1990	.245	.119
1992	.234	.113

Table 2

The Effect of Taxes on the Location of Real Capital Abroad by U.S. Manufacturing Companies

Results for cross-section, pooled, and fixed effects regressions

	Log of capital 1992	Log of capital 1984	Log of capital	Difference in log of capital
Log (1-Ave ETR for 1988-92)[a]	2.68** (.720)[e]			
Log (1-Ave ETR for 1980-84)[b]		1.32 (.874)		1.24** (.324)
Log (1-Ave ETR)			2.21** (.691)	
Log (1-Ave ETR)*YEAR84[c]			-.795 (.768)	
Difference in log (1- Ave ETR)				2.77** (.744)
TRADE[d]	-.719** (.200)	-.638* (.320)	-.630** (.183)	
TRADE*log(1-Ave ETR for 1988-92)	-1.14** (.445)			
TRADE*log(1-Ave ETR for 1980-84)		-.752 (.464)		
TRADE*log(1-Ave ETR)			-.707** (.306)	
Difference in TRADE*log(1-Ave ETR)				-.496 (.440)
Log GDP, 1992	1.08** (.104)			
Log GDP, 1984		1.18** (.172)		
Log GDP			1.08** (.091)	
Difference in log GDP				.580** (.163)
Log population, 1992	-.223** (.111)			
Log population, 1984		-.314 (.193)		
Log population			-.230** (.105)	
Difference in log population				-.317** (.139)

Table 2 continued

Regional dummies				
North America	2.04**	1.82**	1.97**	
	(.269)	(.303)	(.194)	
Latin America	1.18**	1.16**	1.14**	
	(.253)	(.344)	(.213)	
Asia	.289	.159	.200	
	(.306)	(.330)	(.219)	
EEC	.410	.644*	.531**	
	(.341)	(.383)	(.260)	
YEAR84			-.346	
			(.334)	
Constant	4.01**	3.32**	3.86**	.782**
	(.539)	(.731)	(.512)	(.188)
Adjusted R^2	.860	.755	.826	.327
Number of observations	58	58	116	58
1992 Elasticity	2.68**		2.21**	2.77**
	(.720)		(.691)	(.744)
1984 Elasticity		1.32	1.42*	1.53**
		(.847)	(.741)	(.722)

Notes:
**indicates significance at the 5 percent level.
*indicates significance at the 10 percent level.
[a]Equal to the country average effective tax rate averaged over 1988, 1990, and 1992.
[b]Equal to the country average effective tax rate averaged over 1980, 1982, and 1984.
[c]YEAR84 = 1 for 1984.
[d]The trade regime variable runs from 0 (most open) to 3 (most restrictive). See text for details.
[e]White-corrected standard errors are in parentheses.

Table 3

Sensitivity of Results of Regressions in Differences to Changes in the Measure of Tax Rates

Dependent variable = Log of capital in 1992 - log of capital in 1984

	OLS	OLS	IV
	(1)	(2)	(3)
Tax variables are lagged effective tax rates (ETR)			
$Log(1\text{-}ETR_{1990}) - log(1\text{-}ETR_{1982})$	2.40** (.825)[a]		
$Log(1\text{-}ETR_{1982})$	.869** (.424)		
$Trade*[log(1\text{-}ETR_{1990}) - log(1\text{-}ETR_{1982})]$	-.874** (.401)		
Tax variables are statutory tax rates (t)			
$Log(1\text{-}t_{1992}) - log(1\text{-}t_{1984})$		1.87** (.734)	2.49 (1.58)[b]
$Log(1\text{-}t_{1984})$		1.07** (.319)	1.27** (.591)
$Trade*[log(1\text{-}t_{1992}) - log(1\text{-}t_{1984})]$		-.840** (.352)	-.539 (.576)
Log GDP_{1992} - log GDP_{1984}	.445** (.165)	.490** (.150)	.560** (.184)
Log $Population_{1992}$ - log $Population_{1984}$	-.227* (.129)	-.248** (.096)	-.316 (.297)
Constant	.775** (.196)	1.02** (.204)	.847** (.277)
Adjusted R^2	.309	.315	.265
Number of observations	58	58	58
1992 Elasticity	2.40** (.825)	1.87** (.734)	2.49 (1.58)
1984 Elasticity	1.53** (.640)	.795 (.585)	1.21 (1.54)

Notes:

**indicates significance at the 5 percent level.

*indicates significance at the 10 percent level.

[a]White-corrected standard errors are in parentheses.

[b]Standard errors in this column are not White-corrected.

Table 4

Sensitivity of Results of Regressions in Differences to Changes in Sample Selection

Dependent variable = Log of capital in 1992 - log of capital in 1984

	Include only countries with populations greater than 1 million	Include only countries with changes in AETRs between .35 and -.10	Include only countries with changes in log of capital stocks between 2 and -.5	Include only parent companies in both 1984 and 1992 files[c]
$\log(1\text{-}AETR_{1988\text{-}92})^{a} - \log(1\text{-}AETR_{1980\text{-}84})^{b}$	2.78**	2.48**	2.00**	2.41**
	(.746)	(.870)	(.574)	(.676)[d]
$\log(1\text{-}AETR_{1980\text{-}84})$	1.19**	1.20**	.855**	.873**
	(.346)	(.355)	(.258)	(.406)
$Trade*[\log(1\text{-}AETR_{1988\text{-}92}) - \log(1\text{-}AETR_{1980\text{-}84})]$	-.507	-.544	-.130	-.119
	(.441)	(.531)	(.283)	(.444)
$\log GDP_{1992} - \log GDP_{1984}$	.585**	.558**	.605**	.454**
	(.165)	(.173)	(.135)	(.152)
$\log Population_{1992} - \log Population_{1984}$	-.310	-.304**	-.311**	-.276
	(.200)	(.137)	(.144)	(.181)
Constant	.759**	.795**	.679**	.651**
	(.141)	(.210)	(.160)	(.214)
Adjusted R^2	.314	.293	.404	.251
Number of observations	56	55	53	58
1992 Elasticity	2.78**	2.48**	2.00**	2.41**
	(.746)	(.870)	(.574)	(.676)
1984 Elasticity	1.59**	1.28	1.06*	1.54**
	(.737)	(.808)	(.607)	(.608)

Notes:

**indicates significance at the 5 percent level.

*indicates significance at the 10 percent level.

[a]Equal to the country average effective tax rate averaged over 1988, 1990, and 1992.

[b]Equal to the country average effective tax rate averaged over 1980, 1982, and 1984.

[c]This column excludes the CFCs of parents that were not in both the 1984 and 1992 samples. This screen eliminated about one-third of our parent companies.

[d]White-corrected standard errors are in parentheses.

Appendix Table 1A
Country Average Effective Tax Rates by Year

	1980	1982	1984	1986	1988	1990	1992
Canada	0.3907	0.3594	0.3720	0.3850	0.3434	0.3159	0.3538
Mexico	0.4346	0.3805	0.3589	0.3011	0.3291	0.3177	0.2766
Costa Rica	0.2718	0.3984	0.3184	0.3465	0.3189	0.0969	0.1203
El Salvador	0.2635	0.2427	0.3138	0.2899	0.3194	0.2342	0.2168
Guatemala	0.3620	0.3183	0.2087	0.2906	0.3845	0.2838	0.1828
Honduras	0.3735	0.3980	0.4396	0.3815	0.4615	0.3538	0.4187
Panama	0.1527	0.1125	0.2599	0.0763	0.0622	0.0603	0.0918
Dominican Republic	0.2234	0.3345	0.3099	0.3287	0.0936	0.1582	0.1196
Jamaica	0.3767	0.3497	0.3245	0.3508	0.3387	0.2744	0.2621
Argentina	0.2121	0.1185	0.0377	0.1134	0.2434	0.0483	0.1539
Brazil	0.3077	0.3004	0.3140	0.2892	0.3297	0.2335	0.1289
Chile	0.3181	0.4124	0.3849	0.1167	0.0900	0.0470	0.0978
Columbia	0.3100	0.3110	0.3534	0.3526	0.2581	0.2929	0.2912
Ecuador	0.1639	0.1895	0.2453	0.2300	0.2851	0.1008	0.1714
Peru	0.4170	0.4887	0.4876	0.4131	0.5914	0.1483	0.1544
Uruguay	0.1837	0.2318	0.3099	0.0809	0.2762	0.1926	0.1897
Venezuela	0.2796	0.2826	0.3376	0.2990	0.3630	0.2211	0.1973
Bermuda	0.0904	0.0841	0.0333	0.0221	0.0099	0.0482	0.0706
Belgium	0.4023	0.3457	0.3724	0.3789	0.2895	0.2235	0.2594
Denmark	0.3503	0.2244	0.3583	0.4288	0.4478	0.3181	0.3104
France	0.3958	0.4511	0.4367	0.3955	0.3775	0.2977	0.2283
Ireland	0.0800	0.0295	0.0293	0.0342	0.0261	0.0324	0.0579
Italy	0.2861	0.3368	0.3739	0.3623	0.3396	0.3505	0.3256
Luxembourg	0.3363	0.4036	0.4957	0.3380	0.4313	0.2871	0.2160
Netherlands	0.2997	0.2623	0.1962	0.2012	0.2480	0.2107	0.1789
United Kingdom	0.2749	0.2713	0.3224	0.3713	0.2664	0.2126	0.1929

(Appendix table 1A continued)

	1980	1982	1984	1986	1988	1990	1992
Portugal	0.2867	0.3263	0.2519	0.2421	0.2664	0.2849	0.2530
Spain	0.1947	0.2615	0.2836	0.2757	0.2277	0.2669	0.2533
West Germany	0.4409	0.5049	0.5034	0.4793	0.3281	0.3242	0.2893
Greece	0.1947	0.3541	0.3422	0.2247	0.2488	0.2570	0.3338
Austria	0.3548	0.2868	0.3933	0.2347	0.7289	0.2859	0.3258
Finland	0.4354	0.4701	0.4331	0.3558	0.2214	0.3187	0.1584
Norway	0.2860	0.4188	0.3747	0.3618	0.1703	0.1352	0.2904
Sweden	0.4004	0.5075	0.5734	0.5550	0.5166	0.2024	0.1669
Switzerland	0.2206	0.2121	0.2062	0.1838	0.1126	0.1538	0.1387
Turkey	0.5839	0.5628	0.4194	0.4378	0.4223	0.3164	0.2295
Kenya	0.4106	0.4662	0.4683	0.4592	0.4899	0.4010	0.3585
Nigeria	0.4052	0.4006	0.3131	0.4391	0.2855	0.2676	0.1301
Zimbabwe	0.3312	0.3943	0.5231	0.1984	0.5262	0.4092	0.1203
South Africa	0.2767	0.3703	0.5021	0.2886	0.4361	0.4175	0.4183
Israel	0.1814	0.1687	0.0960	0.3299	0.2016	0.0820	0.1021
India	0.5629	0.5691	0.5764	0.4029	0.3919	0.3118	0.4364
Indonesia	0.3651	0.3478	0.3695	0.3476	0.2632	0.3105	0.3516
Malaysia	0.1314	0.1355	0.1717	0.2674	0.0758	0.1394	0.0814
Pakistan	0.5365	0.6144	0.4559	0.4397	0.4761	0.4430	0.4367
Philippines	0.3405	0.3345	0.3618	0.3499	0.3499	0.3257	0.3347
Singapore	0.1705	0.1734	0.0842	0.0256	0.0402	0.0537	0.0565
Thailand	0.3843	0.3254	0.3194	0.2828	0.3134	0.1795	0.2465
China	0.2352	0.2059	0.1640	0.0073	0.1170	0.0529	0.0573
Hong Kong	0.1338	0.1422	0.2032	0.0936	0.1390	0.1178	0.1011
Japan	0.4571	0.5134	0.5265	0.5050	0.5693	0.5201	0.5027
South Korea	0.3112	0.4347	0.2062	0.2986	0.3489	0.4477	0.2575

(Appendix table 1A continued)

	1980	1982	1984	1986	1988	1990	1992
Australia	0.3715	0.4071	0.4070	0.3718	0.3426	0.3451	0.3222
New Zealand	0.4306	0.4064	0.3926	0.4380	0.3702	0.2094	0.2867
Morocco	0.5226	0.5029	0.5421	0.4041	0.4908	0.3460	0.4094
Sri Lanka	0.3643	0.5563	0.2963	0.5465	0.5164	0.4409	0.4054
Zambia	0.4495	0.3950	0.4728	0.3799	0.0842	0.2804	0.2793
Egypt	0.3181	0.3181	0.3239	0.2169	0.1310	0.1948	0.1638

Source: Calculated from the Form 5471 information from the Treasury tax files.

Appendix Table 1B
Real Capital Stock by Year

	Capital Stock (in millions)	
	1984	1992
Canada	15,276	36,573.3
Mexico	3,293	6,821.4
Costa Rica	60.5	143.5
El Salvador	11.3	61.5
Guatemala	117.9	77.3
Honduras	56.9	86.9
Panama	259.4	630.2
Dominican Republic	12.5	25.5
Jamaica	15.6	47.6
Argentina	1,536.7	2,101.7
Brazil	5,091.2	11,288.7
Chile	103.1	984.6
Columbia	429.2	975.5
Ecuador	91.3	101.9
Peru	255.7	108.2
Uruguay	78.5	136.4
Venezuela	946.2	1,138.0
Bermuda[a]	132.3	533.2
Belgium	2,017.6	6,288.6
Denmark	254.3	725.9
France	5,631.0	19,710.1
Ireland	470.4	1,513.2
Italy	2,871.4	12,983.0

	Capital Stock (in millions)	
	1984	1992
Luxembourg	225.3	710.6
Netherlands	3,735.1	10,566.1
United Kingdom	12,632	32,970.4
Portugal	201.1	912.5
Spain	4,153.8	7,207.5
West Germany	15,176.3	28,909.4
Greece	90.2	270.7
Austria	477.3	834.8
Finland	78.3	290.5
Norway	131.4	785.2
Sweden	385.7	2,290.5
Switzerland	935	2,489.0
Turkey	125	584.2
Kenya	54.7	37.9
Nigeria	58.3	61.5
Zimbabwe	43.8	30.6
South Africa	1,023.7	464.2
Israel	197.8	504.3
India	221.5	361.6
Indonesia	138.2	279.6
Malaysia	493.5	1,587.0
Pakistan	63.7	118.1
Philippines	368.5	699.1

(Appendix table 1B continued)

	Capital Stock (in millions)	
	1984	1992
Singapore	719.8	3,598.9
Thailand	183.9	1,385.3
China	206.7	494.2
Hong Kong	242.6	635.6
Japan	8,053.9	14,918.9
South Korea	258.1	1,721.3
Australia	4,174.4	8,314.9
New Zealand	1,315.9	605.1
Morocco	30.2	69.2
Sri Lanka	10	11
Zambia	10.7	15.1
Egypt	25.7	96.3

Source: Form 5471 information from the Treasury tax files.

Appendix Table 2

Tax Rate Regression Showing Noise in 1984 Effective Tax Rate

	Dependent variable:	
	Effective tax rate 1986	Effective tax rate 1990
Independent variables:		
Effective tax rate 1980	.297 (.199)	.037 (.194)
Effective tax rate 1982	.426 (.197)	.288 (.195)
Effective tax rate 1984	.157 (.145)	-.019 (.144)
Effective tax rate 1986		.140 (.133)
Effective tax rate 1988		.289 (.095)
Constant	.010 (.034)	.011 (.032)
Adjusted R^2	.604	.553
Number of observations	58	58

(Standard errors are in parentheses.)

Appendix Table 3

Means and Standard Deviations for Variables in the Difference Regressions

Variable	Mean	Standard Deviation
log capital, 1992 - log capital, 1984	0.812	0.684
log(1 - Ave ETR for 1980, 1982, 1984)	-0.421	0.178
log(1 - Ave ETR for 1988, 1990, 1992)	-0.315	0.159
log(1-Ave ETR for 1988, 1990, 1992) - log(1-Ave ETR for 1980, 1982, 1984)	0.106	0.126
log population, 1992 - log population, 1984	0.153	0.255
log GDP, 1992 - log GDP, 1984	0.660	0.484
TRADE	1.16	1.15
TRADE*[log(1-Ave ETR for 1988-1992) - log(1-Ave ETR for 1980-1984)]	0.155	0.270