Corporate Taxation and International Competition

by

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ABSTRACT

Countries around the world continue to tax corporate income at significant rates despite downward pressures from international competition. Average statutory corporate income tax rates fell from 46% in 1982 to 33% in 1999, though tax bases simultaneously broadened, as a result of which average corporate tax collections actually rose from 2.1% of GDP in 1982 to 2.4% of GDP in 1999. Two pieces of evidence point to the possibility that mobile capital has received favorable tax treatment in recent years as a result of tax competition. The first is the experience of American multinational firms, whose average effective foreign tax rates fell from 43% in 1982 to 26% in 1999. The second is the cross-sectional pattern of tax rate-setting: small countries, facing elastic supplies of world capital, taxed corporate income at significantly lower rates than did larger countries in 1982. Corporate tax rates in 1999 did not substantially differ between small and large countries, implying that large countries set their tax rates in response to the same competitive pressures that small countries have always faced.

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1.   Introduction.

It is a curious fact that many countries tax corporate income heavily despite the incentives that they face to reduce tax rates in order to attract greater investment, particularly investment from foreign sources. The volume of world foreign direct investment (FDI) has grown enormously since 1980, thereby increasing a country's ability to attract significant levels of new investment by reducing corporate taxation. The evidence indicates, however, that corporate tax collections are remarkably persistent relative to GDP, government revenues, or other indicators of underlying economic activity or government need. If this were not true – if corporate income taxation were rapidly disappearing around the world – then such a development might be easily explained by pointing to competitive pressures to attract foreign investment and retain domestic investment. Hence the question remains why growing international capital mobility has not significantly reduced reliance on corporate income taxation.

There are at least three possible resolutions of this puzzle, of which the simplest is that governments disregard underlying economic conditions, instead setting their tax policies based on noneconomic considerations, including the politics of the moment. If this is true then it would explain why greater international capital mobility has not been accompanied by sharp tax reductions around the world – though accepting such an explanation requires embracing a rather uncharitable view of government. Even when governments do not explicitly incorporate capital mobility in their deliberations over capital tax policies, capital mobility influences tax collections, tax revenue projections, and the observable experience of other countries. Hence governments must ignore all of these in order to fail to appreciate the consequences of their corporate tax policies. While it is perhaps difficult to put a firm lower bound on government

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ignorance, and therefore rule out such an explanation a priori, the available evidence points elsewhere.

The second possible explanation for continued high rates of corporate taxation in an era of significant international capital mobility is that governments do not have incentives to reduce their taxation of mobile capital. This might be the case if, for example, the volume, location, and performance of FDI were insensitive to taxation. A large body of evidence suggests, however, that exactly the opposite is the case: that international investment, and international tax avoidance, are strongly influenced by tax policies. Hence there is every reason to expect countries to benefit from tax reductions as capital becomes more internationally mobile.

The third possible explanation is that countries subtly distinguish between more-mobile and less-mobile capital, subjecting the former to lower rates of taxation than the latter. Such a strategy permits tax systems to collect significant revenue from less-mobile investments while affording highly mobile investments the benefits of reduced rates. This differentiation of tax burdens can be accomplished in any of several ways, of which the most obvious are negotiated tax reductions for certain investors. Other methods of favoring mobile investments include generous tax treatment of certain industries, and rules that permit multinational firms to avoid taxes by using carefully constructed transactions with affiliates in tax haven countries. While it might or might not be in a country's interest to continue taxing income earned by less-mobile investments, whose volume and performance is undoubtedly influenced by taxation, it is clear that, for any given average level of corporate taxation, reducing the relative burden on more mobile capital improves efficiency.

The evidence suggests that countries have responded to greater international capital mobility by reducing the relative (and absolute) taxation of international investors while

continuing to tax domestic investments at high rates. Statutory corporate tax rates fell noticeably since the early 1980s, but were accompanied by tax base broadening that maintained or even slightly increased overall average corporate tax burdens. Foreign investors, however, were increasingly relieved of corporate tax burdens, as evidenced by the foreign affiliates of American firms, which faced average foreign tax rates of 43% in 1982 but only 26% by 1999. In drawing attention to the divergent paths of corporate tax revenues and the income tax burdens of foreign subsidiaries of American multinational firms, Desai (1999) suggests that foreign tax practices are designed to distinguish between mobile and less-mobile capital, offering increasingly attractive terms to mobile capital.

The cross sectional pattern of corporate income taxation likewise displays aspects of increasing competition for mobile economic resources. Small countries generally face more elastic supplies of world capital than do large countries, since small countries are more likely to be price takers in world markets. As a result, the efficient source-based tax on mobile capital is lower for smaller countries, and indeed, the efficient capital income tax rate is zero for a very small country facing an infinitely elastic supply of world capital. The data reveal a change over time in the extent to which that country size is correlated with tax rates. In 1982, there was a strong positive correlation between tax rates and country size, but by 1999, this correlation had largely disappeared. Progressive elimination of the effects of country sizes on corporate tax rates is one of the implications of intensified international tax competition, since it is the ability to exploit market power that permits large countries to benefit from higher tax rates. Consequently, the evolution of corporate taxation in the period of globalization is properly understood as reflecting increased competition for mobile resources.

Section two of the paper reviews evidence of rising international capital mobility and the sensitivity of corporate activity to tax policies. Section three considers the implications of tax competition for international tax rate setting, and cross-country evidence of the evolution of corporate taxation. Section four analyzes the determinants of statutory and effective corporate tax rates in 1982 and 1999. Section five is the conclusion.

2.   Taxation and international capital mobility.

The potential economic impact of international tax differences increased significantly in the modern era due to the marked growth of FDI. Figure one plots annual ratios of total world outbound FDI to total world income, as reported by the World Bank's *World Development Indicators*. As the figure indicates, FDI increased rapidly in the 1980s and 1990s. While the evidence of growing FDI does not by itself demonstrate that tax policies influence the magnitude and performance of international investment, there is ample separate evidence that they do.[1]

The available evidence of the effect of taxation on FDI comes in two forms. The first is time-series estimation of the responsiveness of FDI to annual variation in after-tax rates of return. Implicit in this estimation is a *q*-style investment model in which contemporaneous average after-tax rates of return serve as proxies for returns to marginal FDI. Studies of this type consistently report a positive correlation between levels of FDI and after-tax rates of return at industry and country levels.[2] The implied elasticity of FDI with respect to after-tax returns is generally close to unity, which translates into a tax elasticity of investment of roughly -0.6. The estimated elasticity is similar whether the investment in question is American direct investment abroad or FDI by foreigners in the United States.

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[1] See Hines (1997, 1999) for further elaboration and critical analysis of many of the studies surveyed in this section. This section draws on material from Hines (forthcoming).

The primary limitation of aggregate time-series studies is that they are largely identified by yearly variation in taxes or profitability that may be correlated with important omitted variables. As a result, it becomes very difficult to identify the effects of taxation separately from the effects of other variables that are correlated with tax rates. Exceptions include Slemrod (1990), who distinguishes FDI in the United States by the tax regime in the country of origin, and Swenson (1994), who distinguishes investment by industry.

Other studies of investment location are exclusively cross-sectional in nature, exploiting the very large differences in corporate tax rates around the world to identify the effects of taxes on FDI. Grubert and Mutti (1991) and Hines and Rice (1994) estimate the effect of national tax rates on the cross-sectional distribution of aggregate American-owned property, plant and equipment (PPE) in 1982. Grubert and Mutti analyze the distribution of PPE in manufacturing affiliates in 33 countries, reporting a –0.1 elasticity with respect to local tax rates. Hines and Rice consider the distribution of PPE in all affiliates in 73 countries, reporting a much larger –1 elasticity of PPE ownership with respect to tax rates. Desai, Foley and Hines (2004a) report that high rates of indirect taxation have effects that are similar in sign and magnitude to high rates of corporate income taxation in depressing FDI by American firms in data for 1982, 1989, and 1994. Altshuler, Grubert and Newlon (2001) compare the tax sensitivity of aggregate PPE ownership in 58 countries in 1984 to that in 1992, reporting estimated tax elasticities that rise (in absolute value) from –1.5 in 1984 to –2.8 in 1992. Altshuler and Grubert (2004) offer evidence of a -3.5 tax elasticity of investment in a sample of 58 countries in 2000, suggesting a continued, and possibly increasing, responsiveness to foreign tax differences.[3]

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[2] See, for example, Hartman (1984), Boskin and Gale (1987), and Young (1988).
[3] Other cross sectional evidence is consistent with these findings. Hines (2001) compares the distribution of Japanese and American FDI around the world, finding Japanese investment to be concentrated in countries with which Japan has "tax sparing" agreements that reduce home country taxation of foreign income; the estimated FDI

One of the important issues in considering the impact of taxation on international investment patterns is the ability of multinational firms to adjust the location of their taxable profits. It is often attractive to use debt to finance foreign affiliates in high-tax countries and to use equity to finance affiliates in low-tax countries, thereby accumulating income where tax rates are low and deductions where tax rates are high.[4] The evidence is broadly consistent with these incentives. Hines and Hubbard (1990) find that the average foreign tax rate paid by subsidiaries remitting nonzero interest to their American parent firms in 1984 exceeds the average foreign tax rate paid by subsidiaries with no interest payments, while the reverse pattern holds for dividend payments. Grubert (1998) estimates separate equations for dividend, interest, and royalty payments by 3467 foreign subsidiaries to their parent American companies (and other members of controlled groups) in 1990, finding that high corporate tax rates in countries in which American subsidiaries are located are correlated with higher interest payments and lower dividend payout rates. Desai, Foley and Hines (2004b) report that, within groups of affiliates controlled by the same American parents, debt levels are significantly higher among affiliates located in countries with higher tax rates.

Contractual arrangements between related parties located in countries with different tax rates offer numerous possibilities for sophisticated tax avoidance. Evidence of tax-motivated income reallocation comes in several forms. Grubert and Mutti (1991) and Hines and Rice (1994) analyze the aggregate reported profitabilities of U.S affiliates in different foreign

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impact of "tax sparing" is consistent with estimated large tax elasticities of foreign investment. Hines (1996) compares the distributions of FDI within the United States of investors whose home governments grant foreign tax credits for federal and state income taxes with those whose home governments do not tax income earned in the United States. One percent state tax rate differences in 1987 are associated with ten percent differences in amounts of manufacturing PPE owned by investors from countries with differing home-country taxation of foreign-source income, and three percent differences in numbers of affiliates owned, implying a tax elasticity of investment equal to –0.6.

locations in 1982. Grubert and Mutti examine profit/equity and profit/sales ratios of U.S.-owned

manufacturing affiliates in 29 countries, while Hines and Rice regress the profitability of all

U.S.-owned affiliates in 59 countries against capital and labor inputs and local productivities.

Grubert and Mutti report that high taxes reduce the reported after-tax profitability of local

operations; Hines and Rice come to a similar conclusion, their data indicating that one percent

tax rate differences are associated with 2.3 percent differences in pretax profitability. Desai,

Foley and Hines (forthcoming) find that foreign affiliates whose parent companies have nearby

tax haven operations pay lower taxes as a fraction of sales than do other affiliates. While it is

possible that high tax rates are correlated with other locational and firm-specific attributes that

depress the profitability of foreign investment, competitive conditions typically imply that after-

tax rates of return should be equal in the absence of tax-motivated income reallocation. The

negative correlation of pretax profitability and local tax rates, together with the negative

correlation of tax payments and ownership of foreign tax haven affiliates, is suggestive of active

tax avoidance.

Harris et al. (1993) report that the U.S. tax liabilities of American firms with tax haven

affiliates are significantly lower than those of otherwise-similar American firms over the 1984-

1988 period, which may be indirect evidence of aggressive income reallocation by firms with tax

haven affiliates. Collins, Kemsley and Lang (1998) analyze a pooled sample of U.S.

multinationals over 1984-1992, finding a similar pattern of greater reported foreign profitability

(normalized by foreign sales) among firms facing foreign tax rates below the U.S. rate. And

Klassen, Lang and Wolfson (1993) find that American multinationals report returns on equity in

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[4] Hines (1994) identifies exceptions to this rule that stem from the benefits of limiting equity finance in affiliates located in countries with very low tax rates in anticipation of reinvesting all of their after-tax profits over long periods.

the United States that rose by 10 percent relative to reported equity returns in their foreign operations following the U.S. tax rate reduction in 1986.

Patterns of reported profitability are consistent with other indicators of aggressive tax-avoidance behavior, such as the use of royalties to remit profits from abroad and to generate tax deductions in host countries. Hines (1995) finds that royalty payments from foreign affiliates of American companies in 1989 exhibit a –0.4 elasticity with respect to the tax cost of paying royalties, and Grubert (1998) likewise reports significant effects of tax rates on royalty payments by American affiliates in 1990. Clausing (2001) finds that reported trade patterns between American parent companies and their foreign affiliates, and those between foreign affiliates located in different countries, are consistent with incentives to reallocate taxable income. Controlling for various affiliate characteristics, including their trade balances with unaffiliated foreigners, Clausing finds that ten percent higher local tax rates are associated with 4.4 percent higher parent company trade surpluses with their local affiliates, which is suggestive of pricing practices that move taxable profits out of high-tax jurisdictions. Swenson (2001) finds a similar pattern in the reported prices of goods imported into the United States, in which high unit tariff rates appear to be associated with unusually low prices.

Taken together, this evidence implies that the volume of FDI, and accompanying economic activity and corporate tax bases, is highly responsive to local tax policies. It follows that countries contemplating lowering their corporate income tax rates can reasonably expect to receive greater foreign investment as a consequence. The incentive to reduce corporate tax rates in order to attract FDI has increased since the early 1980s, as levels of world FDI rose sharply during that time. The next section considers some of the implications of these developments for tax rate setting around the world.

3.   International tax competition.

Greater mobility of corporate economic activity produces incentives to reduce tax rates, particularly in small countries that face the most elastic supplies of foreign capital. This section considers the implications of simple models of tax rate setting in open economies, and the available evidence of country reactions to these incentives.

3.1.   *Implications of capital mobility.*

Modern analysis of the corporate tax rate implications of international capital mobility dates to Diamond and Mirrlees (1971), who demonstrate that efficient taxation in a small open economy entails zero taxation of income earned by foreign investors. The explanation for their result is that any positive taxation distorts the economy more than would other tax alternatives, without shifting any of the tax burden to foreign investors.[5] If international capital flows are increasingly sensitive to tax rate differences, then incentives to reduce tax rates are presumably rising as well. The analysis also implies that countries that nevertheless persist in taxing income earned by foreign investors will have lower incomes than those that do not.

The Diamond and Mirrlees result is commonly thought to imply that small countries have the least to gain from attempting to impose taxes on foreign investment. Larger countries are able to extract some rents from foreign investors because prices in their economies need not respond to tax policies in a way that maintains unchanged the investors' after-tax profit margins. Possibly weighing against this is strategic competition among large countries, whose tax policies may be designed in a way that reflects their likely effects on the policies of other countries. Another consideration is that the inability to tailor tax and other policies perfectly might change

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efficient levels of corporate taxation from what they would be in the absence of other distortions.
For example, trade barriers may distort local prices and thereby influence the efficient taxation of
foreign direct investment. If countries are unable to impose corrective taxes or subsidies on
externality-producing activities of corporations, then modifications to corporate income tax rates
might serve as indirect remedies. Similarly, if personal income taxation cannot be tailored to
achieve efficient redistribution, then there may be circumstances in which efficient third-best tax
policies might include distortionary corporate taxes. Finally, large countries might have personal
income tax rates that differ from those in small countries. Efforts to align top personal and
corporate tax rates in order to prevent tax arbitrage would then produce correlations between
corporate tax rates and country sizes that stem from the determinants of personal income tax
rates rather than efficient taxation of inbound foreign investment.

Small countries are generally thought to face the most elastic corporate tax bases, and
therefore to have the strongest incentives to offer low corporate tax rates, despite possible
mitigating factors such as strategic behavior and distortions induced by other policies. While
there are few tests of the proposition that the supply of capital to small countries is more elastic
than the supply of capital to large countries, this is more than a matter of faith, since, in most
models, it follows as an implication of their relatively small domestic corporate tax bases.
Whether countries actually design their policies based on these assumed elasticities is another
matter.

3.2   Evidence of country reactions.

Numerous studies have called attention to the significance of falling rates of corporate
taxation around the world. Griffith and Klemm (2004) offer a recent survey of this literature,

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[5] See Gordon (1986) for an elaboration of this argument, and Gordon and Hines (2002) for a further exposition.

along with their own calculations showing that, while statutory corporate tax rates have declined, effective corporate tax burdens in OECD countries have remained roughly unchanged since the early 1980s. Thus, corporate tax revenues have remained constant, or even slightly risen, as a fraction of GDP in OECD countries. Corporate tax revenues as a fraction of total government tax revenues likewise remained roughly constant among OECD countries between 1980 and 2000. Keen and Simone (2004) note that the resiliency of corporate tax collections among OECD countries is not mirrored in the experience of developing countries, whose effective taxation of corporate income appears to have fallen between 1990 and 2001, due in part to the proliferation of tax holidays and other incentives directed at foreign investors.

The experience of American multinational firms, whose foreign investments and foreign profitability are highly concentrated in OECD countries, is very different than that suggested by the aggregate OECD data. Desai (1999) notes that foreign taxes paid by American firms began falling (as a fraction of income) in the mid-1980s, roughly coincident with passage of the U.S. Tax Reform Act of 1986. Altshuler and Grubert (2004) document a continued decline in average foreign tax rates faced by large controlled foreign corporations, a subset of the foreign affiliates of American firms. Since average effective foreign tax rates may reflect endogenous taxpayer behavior as well as official action by foreign governments, it is not always easy to identify the source of tax reductions. One of the benefits of U.S. data, however, is that they are collected on a consistent basis over time, using unchanging tax base definitions, so falling effective tax rates are likely to correspond to reductions in actual tax burdens. Desai (1999) draws the very plausible conclusion from these patterns that foreign governments responded to increasing capital mobility and the implications of U.S. tax rate reductions by lowering their effective taxation of American investors.

A number of studies probe the recent international experience for indications of the course of tax competition. Chennells and Griffith (1997) analyze tax rate setting among 10 OECD countries, reporting no evidence that smaller, more open, countries tax capital at lower rates than do larger countries. Devereux, Lockwood, and Redoano (2001) report indications of tax policy interdependence among these 10 countries, in that they tend to mimic each other's statutory tax rate changes, which might represent a form of tax competition, though it could alternatively reflect policy coordination. Devereux, Griffith and Klemm (2002) interpret the recent decline in statutory corporate tax rates together with roughly stable corporate tax collections as efforts on the part of governments to attract productive investments, and reported (taxable) income, from highly profitable multinational firms. Bretschger and Hettich (2002) revisit the relationship between country size and corporate tax rates in a panel of 14 OECD countries between 1967 and 1996, reporting that smaller countries have lower effective corporate tax rates, controlling for other considerations. And Altshuler and Grubert (2004) analyze changes in effective tax rates for foreign subsidiaries of American firms between 1992 and 2000, reporting that tax rates fell most sharply for subsidiaries located in small countries. Given the inclusion of other regressors, among them lagged tax rates, it is, however, difficult to interpret this finding in the context of theories of tax rate setting.

3.3.   Data.

Information on country tax policies and their determinants comes from several sources. Top national statutory corporate tax rates, reported by the World Tax Database maintained by the University of Michigan's Office of Tax Policy Research (http://www.otpr.org), include data for several decades and a large number of countries.   Comprehensive information on the tax

obligations of the foreign affiliates of U.S. multinational firms is included among the data

collected by the U.S. Bureau of Economic Analysis (BEA) on the basis of comprehensive

surveys of American multinational firms in 1982, 1989, 1994 and 1999. Companies owning

foreign affiliates with significant sales, assets, or net income are required to provide extensive

information concerning their operations, which is then aggregated by country and reported by

BEA. Information is unavailable for countries in which very few American firms have foreign

operations, since reporting would then threaten to undermine the confidentiality promised survey

respondents. In spite of these minor omissions, the BEA data are unique in their coverage and

accuracy, and therefore form the basis of the current analysis and much of what is known

anywhere about the operations of multinational firms. National economic information is

provided by the Penn World Tables, which compile national income account data on an

internationally comparable basis for a large number of countries.[6]

Statutory corporate tax rates reported by the World Tax Database display the significant

secular decline noted by other researchers. Using a matched sample of 68 countries, and

weighting observations by GDP, average statutory tax rates fell from 45.9% in 1982 to 32.9% in

1999. The decline in statutory tax rates was most pronounced in large countries, but even

unweighted average tax rates in this sample of countries fell from 41.3% in 1982 to 32.0% in

1999.

Effective taxes paid by American multinational firms to foreign governments fell over

this time period along with statutory tax rates. These tax rates are calculated using BEA data,

and are defined as the ratio of corporate income taxes paid by all affiliates in a country to total

pretax net income. In principle, this has the advantage of reflecting taxes that affiliates actually

pay, and thereby capturing the impact of tax holidays, tax credits, and tax base adjustments such

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[6] The BEA data are available at http://bea.gov; the Penn World Tables are available at http://pwt.econ.upenn.edu.

as those to depreciation rules and loss carryforwards and carrybacks. In practice, however, companies may have negative earnings, so this measure tends to overstate actual effective tax rates faced by profitable firms. Hence the effective tax rate is defined (as in Hines and Rice, 1994) as the (nonnegative) lesser of the statutory tax rate and the ratio of taxes paid to pretax income.

Effective tax rates exhibit more rapid declines than statutory tax rates over this time period. In 1982, the average effective tax rate (weighted by GDP) faced by American firms in 39 foreign countries was 42.6%, whereas the corresponding average rate in the same countries in 1999 was 26.2%.[7] Unweighted average effective tax rates likewise declined markedly, from 36.5% in 1982 to 23.9% in 1999. Table 1 summarizes the average changes in statutory and effective tax rates. From the information in the table it appears that, far from seeing some of the benefits of statutory tax rate reductions lost to tax base expansions, the foreign affiliates of American firms enjoyed even greater foreign tax reductions than they might have in the absence of other adjustments to their tax positions.

4.   Determinants of corporate taxation.

The ability to exploit market power affords countries opportunities to extract rents from foreign investors by imposing high rates of tax on corporate profits. The incentive to raise corporate tax rates is greater for large countries whose stock of corporate investment is less elastic with respect to taxation than is the case for small countries. The purpose of this section is to consider the extent to which tax policy experience corresponds to this prediction.

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[7] Data availability dictates the choice of 1999 and 1982 as the reference years for these tax rate calculations, but it is noteworthy that the world economy performed poorly in 1982, whereas many economies expanded rapidly in 1999. It is not clear what impact, if any, these business cycle conditions might have on measured effective tax rates facing

4.1. Statutory tax rates.

The evidence indicates that statutory tax rates were strongly positively correlated with country sizes in 1982, but that this positive correlation had largely disappeared by 1999. Figure 2 depicts average statutory corporate tax rates for 68 countries for which it was possible to obtain corporate tax rate, population, and GDP information for 1982. The two leftmost bars in the chart correspond to 1982, the first bar presenting average statutory corporate tax rates for countries in the half of the sample with below-median populations, and the second presenting average statutory corporate tax rates for countries with above-median populations. As the bars reveal, smaller countries taxed corporate income at lower rates in 1982 than did larger countries, which is consistent with theoretical predictions. By 1999, however, this pattern has largely disappeared. Statutory corporate tax rates are lower for both sets of countries in 1999, and in addition, the difference between large and small countries greatly narrowed.[8]

The average tax rates presented in Figure 2 are not adjusted to take account of differences in country incomes, and the simple division of the world into small and large countries is a bit crude from the standpoint of identifying the impact of country size on tax rates. Table 2 presents estimated coefficients from regressions in which the dependent variable is the statutory tax rate, and independent variables include powers of log population and log per capita GDP. The sample consists of 69 countries for which it is possible to obtain the necessary data. The estimated 0.030 coefficient on log population in the first column indicates that larger countries have higher statutory corporate tax rates; population doubling is associated with three percent higher rates in

American firms, though it is reassuring that effective tax rates exhibit the same secular trend as do statutory tax rates.

1982. Adding the log of per capita GDP as an explanatory variable, as in the regression reported

in column two, reduces the estimated effect of population only slightly to 0.028. The addition of

a second power of log GDP has little effect on the population coefficient, as indicated by the

regression reported in column four. And the introduction of a second power of log population, as

in the regressions reported in columns three and five, reveals a nonlinear, indeed nonmonotone,

effect of country size on corporate tax rates, the positive effect of country size on tax rates being

strongest among the larger countries.[9]

The sizeable positive impact of national population on statutory corporate tax rates that is

apparent in the 1982 data fails to materialize in 1999. Table 3 reports estimated coefficients

from regressions in which the dependent variable is the 1999 statutory corporate tax rate, and

independent variables are the 1999 values of the same variables used in the regressions reported

in Table 2. Thanks to greater data availability, the sample for the 1999 regression is

considerably larger (111 countries) than that used to analyze the determinants of tax rates in

1982. The estimated coefficients reported in Table 3 have the same signs as their counterparts in

Table 2, but are considerably smaller in magnitude, and are statistically insignificant, save for the

coefficients on log per capita GDP in the regressions reported in columns two and three. In

particular, the estimated 0.58 coefficient on log population reported in column two is less than

one fifth the size of the corresponding 1982 coefficient, and is statistically indistinguishable from

zero. To guard against the possibility that the 1999 results reflect mere differences in sample

composition, the regressions were re-run using 1999 data for the 68 countries appearing in the

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[8] Figure 2 presents average statutory tax rates weighted by GDPs. In 1982, small countries had an average tax rate of 38.9%, while the average for large countries was 43.7%. In 1999, the average small country tax rate was 31.1%, and the average large country tax rate was 33.8%.

[9] Appendix Table 1 presents means and standard deviations of variables used in the regressions. The regressions presented in Table 2 are parsimonious, and resolutely so, despite the temptation to add other explanatory variables including a standard measure of economic openness (the ratio of the sum of exports and imports to GDP).

1982 sample;[10] the results, which are reported in Appendix Table 2, are very similar to those reported in Table 3.

4.2. *Effective tax rates.*

Corporate tax obligations are the products not merely of statutory tax rates but also of specific rules by which tax bases are calculated. Figure 3 presents average effective foreign tax rates for American firms in 1982 and 1999, distinguished by sizes of host countries. The height difference of the two leftmost bars of Figure 3 indicates that American-owned affiliates in small countries faced substantially lower effective tax rates in 1982 than did American-owned affiliates in large countries. Effective tax rates were lower in 1999, as indicated by the two rightmost bars of Figure 3, and the difference between average rates in small and large countries greatly attenuated.[11]

Table 4 presents estimated coefficients from regressions explaining effective tax rates in 1982 as functions of the same independent variables as those used in the regressions presented in Table 2. The estimated 0.036 coefficient in column one indicates that affiliates in larger countries paid greater taxes for a given level of income, a population doubling being associated with 3.6 percent higher effective tax rates. The estimated effect of country size increases somewhat with the addition of controls for per capita GDP in the regressions reported in columns two and four, and does not exhibit important nonlinearities in the regressions reported in columns three and five.

Explanatory variables are restricted to population and GDP in order to estimate the effect of largely exogenous determinants of tax policies and to focus on the impact of country size independent of other policy choices.

[10] The 1999 data do not include information on Taiwan's GDP, so this observation is dropped from the regressions reported in Appendix Table 2.

[11] Figure 3 presents average effective tax rates weighted by GDPs. In 1982, American-owned affiliates in small countries had average effective tax rates of 31.7%, while the average tax rate of affiliates in large countries was

The positive and significant effect of country size on effective tax rates in 1982 is not repeated in data for 1999. Table 5 presents regressions estimating the determinants of effective tax rates in 1999. While the point estimates of the log population coefficients are positive in the regressions reported in columns one, two, and four, they are considerably smaller in magnitude than the corresponding coefficients in Table 4, and are not statistically significant. The regressions reported in columns three and five of Table 5 suggest the possibility of a nonlinear effect of country size on effective tax rates, one in which the impact of greater population declines as populations grow, turning negative for larger countries. This nonlinear pattern differs from that evident in the regressions in which the statutory tax rate is the dependent variable. The pattern also differs from the implications of most models in which countries impose corporate taxes designed to extract rents from inelastic investors, since such models typically imply that the effects of given changes in country size on tax rates should increase in magnitude as countries grow larger and thereby affect world prices to greater degrees.

4.3   Corporate tax bases.

One of the functions of the evidence presented in Tables 4 and 5 is to confirm that the disappearing effect of country size on statutory tax rates, implied by the regressions presented in Tables 2 and 3, is not merely an artifact of replacing narrow with broad tax bases, while reducing statutory tax rates, in larger countries. This leaves open the question of what happened to corporate tax bases in small and large countries in the period between 1982 and 1999. It is

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40.5%. In 1999, the average small country effective tax rate was 23.0%, and the average large country tax rate was 27.1%.

possible to examine directly this issue directly, and that is the purpose of the regressions presented in Tables 6 and 7.[12]

The dependent variable in the regressions presented in Table 6 is the ratio of the effective corporate tax rate for American firms to the statutory corporate rate. This is a measure of the corporate tax base, insofar as it applies to American firms, normalized by the U.S. accounting definition of foreign income. As the estimated 0.064 coefficient in the regression reported in column one of Table 6 indicates, the corporate tax base was broader in large countries in 1982 than it was in small countries. The effect of country size persists, and indeed increases slightly in magnitude, as controls are added for per capita GDP in the regressions reported in columns two and four. The 0.080 coefficient in column two implies that, controlling for per capita income, doubling the size of a country is associated with an eight percent greater corporate tax base. Based on the regressions reported in columns three and five, this effect of country size has little discernable nonlinearity. Total tax obligations are the product of tax rates and tax bases, and it appears that governments of large countries in 1982 used both higher tax rates and broader tax bases to tax corporations more heavily than did governments of small countries.

Table 7 reports the results of repeating these regressions using data for 1999. Point estimates of coefficients on log population in the regressions reported in columns one, two, and four are smaller, and associated standard errors larger, than in the 1982 regressions, making it impossible to reject the hypothesis that country size had no effect on corporate tax bases in 1999. The regressions reported in columns three and five suggest an anomalous nonlinear effect of population on corporate tax bases, in which the impact of greater country size diminishes and

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[12] It is worth noting that the paper's calculations of effective corporate tax rates and corporate tax bases are based on data on American multinational firms exclusively. Conceivably the experiences of investors from other countries might differ from those of American investors, due to national differences in the taxation of foreign income,

ultimately becomes negative as country populations grow. The pattern of corporate tax base

regressions in 1982 and 1999 is similar to the pattern of effective corporate tax rate regressions

for the same years, suggesting that whatever process was responsible for the correlation between

country size and corporate tax provisions that imposed heavy burdens in 1982 had largely

disappeared by 1999.

4.4. *Indirect taxes.*

Business activities generate government revenue from many taxes other than just

corporate income taxes, including payroll and personal income taxes levied on employees, sales

taxes, value added taxes, property taxes, excise taxes, and numerous others. Desai, Foley and

Hines (2004a) note that these indirect tax obligations generally exceed the corporate income tax

obligations of foreign affiliates of American multinational firms, and Christensen, Cline and

Neubig (2001) find the same to be true of firms in the United States. It is conceivable that, over

the 1982-1999 period, larger countries simply replaced corporate income taxes with higher rates

of indirect business taxes, thereby changing the tax mix without reducing effective rates of

taxation of business activity. The data do not, however, support such an interpretation.

Appendix Tables 3 and 4 present regressions in which the dependent variable is the ratio of

indirect tax payments by American multinational firms to corporate income tax payments.[13] This

ratio was not systematically related to country size in either the 1982 or the 1999 sample,

suggesting that the determinants of indirect tax rates are similar to the determinants of direct tax

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industrial composition of foreign investment, and other factors. It is not clear whether any of these differences
would affect measured correlations of tax rates and country sizes.
[13] Indirect tax payments are defined in the BEA data to include any type of tax other than income and payroll taxes,
as the BEA survey form asks for the sum of sales, value added, and excise taxes; property taxes; and import and
export duties. See Desai, Foley and Hines (2004a) for further discussion of this variable.

rates, a pattern that is consistent with the high correlation of the two taxes reported by Desai, Foley and Hines (2004a).

4.5   Total corporate tax collections.

Total corporate income tax collections are the product of corporate investment, corporate profitability, the corporate tax base, and statutory corporate tax rates. Given the complexity of the factors involved, the endogeneity of tax policies to economic conditions, and the endogeneity of corporate investment to corporate income tax rates, it is perhaps naïve to expect total corporate income tax collections to be related in a systematic way to country size. Appendix Tables 5 and 6 nonetheless present regressions in which the dependent variable is the ratio of corporate income tax collections to GDP for countries for which it is possible to obtain the necessary data. The regressions reveal no discernable impact of country size on corporate tax collections in either 1982 or 1999, though given the size of the associated standard errors, it is difficult to rule out many hypotheses on the basis of these results. Total corporate tax collections are the sum of revenues received from taxing inbound FDI and revenues from taxing income earned by domestic businesses. Hence the absence of a country size effect on total corporate tax collections is consistent with the possibility of very different determinants of tax burdens facing foreign and domestic investors, particularly for 1982.

5.   Conclusion.

The evidence points to a systematic change in the pattern of international tax rate setting during the period in which international capital mobility greatly increased. In 1982, large countries subjected corporate income to significantly higher rates of taxation than did small

countries, but by 1999, these differences were no longer so apparent. Statutory corporate tax rates fell around the world over the same years, while corporate tax bases broadened to compensate for the revenue effects of tax rate reductions – except for foreign investors, whose average effective tax rates fell dramatically.

This pattern of international tax rate setting suggests that tax competition stiffened substantially since the early 1980s. Countries that previously exploited their positions as capital importers and as leaders in setting tax rates by imposing high corporate tax rates increasingly found themselves competing with other jurisdictions to attract mobile investment. As a result, tax rates on mobile investment fell, though countries maintained their (higher) rates of tax on less-mobile domestic investment. This evolution of corporate tax policy is the logical outcome of greater competition between countries to attract investment, and if anything, intensified corporate tax competition should be expected to lead to further pressures for corporate tax rate reductions. Whether this is a welcome or a regrettable development may turn on the form that these future tax changes take.

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Figure 1
World Foreign Direct Investment as a Percent of World Product,
1970-2001

FDI/GDP
(percent)
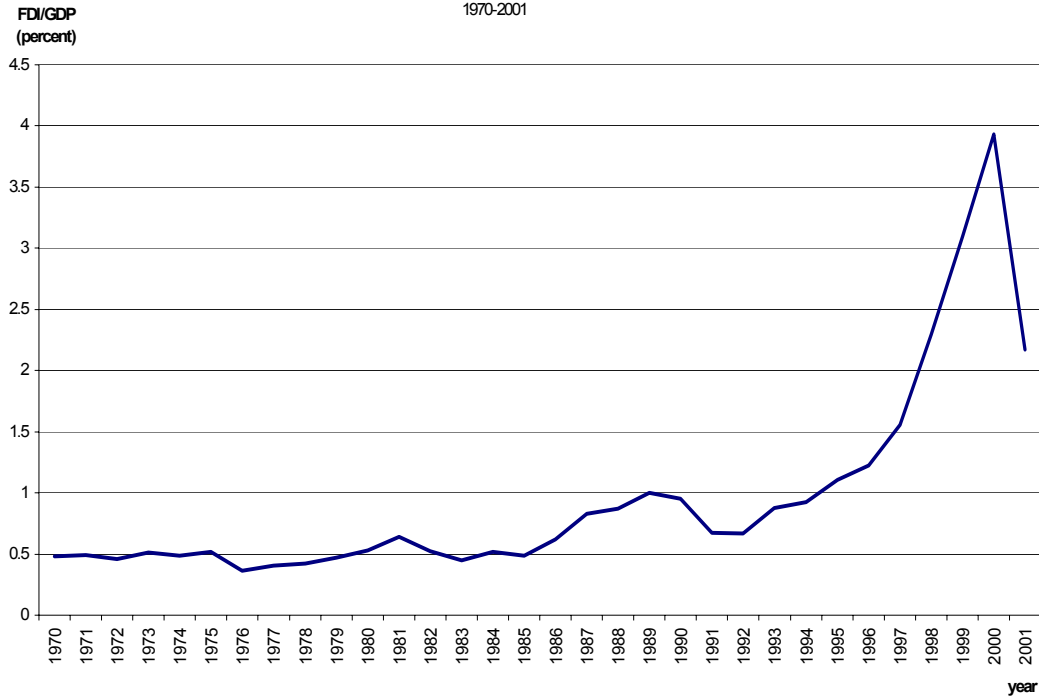
Note: the figure depicts annual ratios (measured in percent) of total world foreign direct investment to the sum of GDP for all countries.

Source: World Bank, *World Development Indicators*.

Figure 2

Statutory Tax Rates, by year and country size
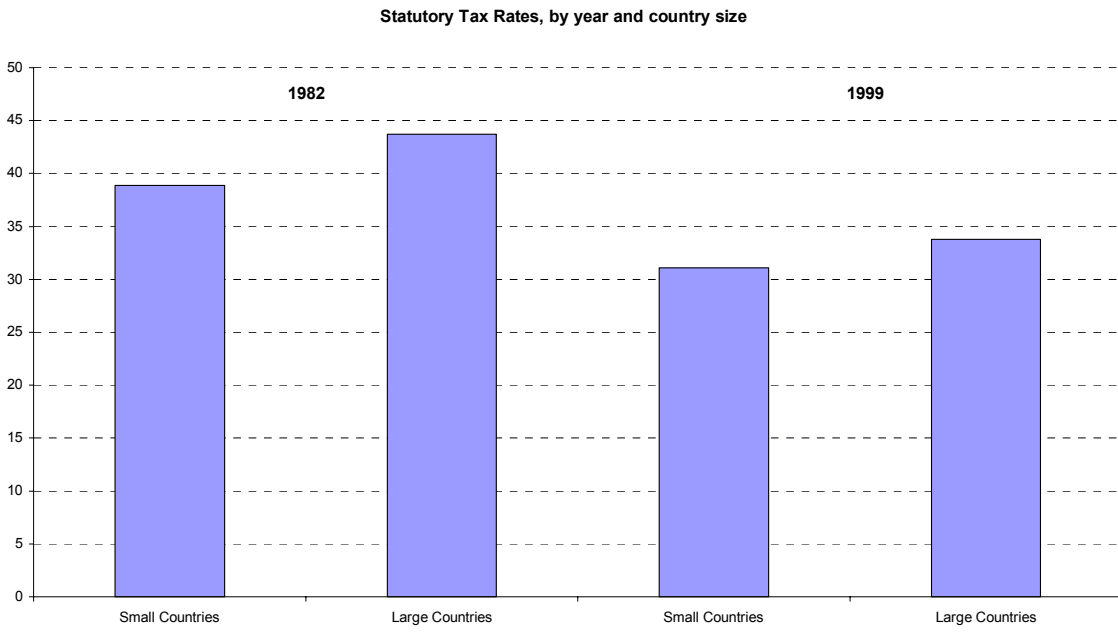
Figure 3

Effective Tax Rates, by year and country size
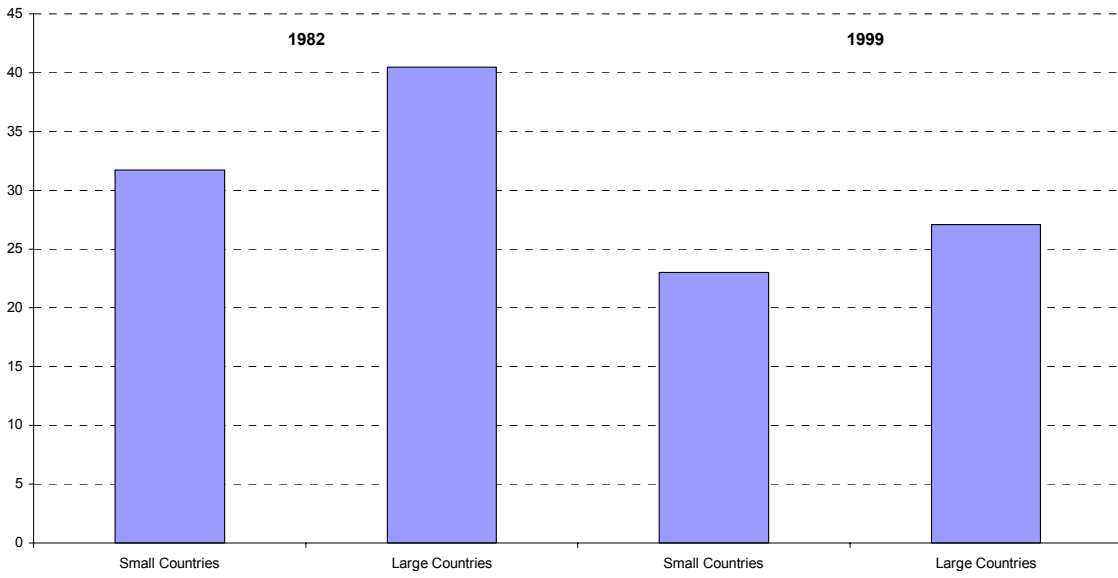
Table 1
Statutory and Effective Corporate Tax Rates

	1982	1999
Statutory corporate Tax rates		
Average weighted by GDP	45.9%	32.9%
Unweighted world average	41.3%	32.0%
Effective corporate tax rates on U.S. Multinationals		
Average weighted by GDP	42.6%	26.2%
Unweighted world average	36.5%	23.9%

Note: the table presents information for matched samples of countries in 1982 and 1999, 68 for which it is possible to calculate average statutory corporate tax rates, and 45 countries for which it is possible to calculate average effective corporate tax rates.

Table 2: Determinants of Top Statutory Corporate Tax Rates (1982)

	(1)	(2)	(3)	(4)	(5)
Constant	0.288	0.394	0.852	1.388	1.789
	[0.058]	[0.110]	[0.198]	[0.622]	[0.609]
Ln(Population 1982)	0.030	0.028	-0.193	0.027	-0.190
	[0.014]	[0.013]	[0.068]	[0.014]	[0.068]
Ln(Population 1982)^2			0.027		0.026
			[0.008]		[0.008]
Ln(Per capita GDP 1982)		-0.026	-0.028	-0.571	-0.548
		[0.026]	[0.026]	[0.351]	[0.350]
Ln(Per capita GDP 1982)^2				0.074	0.071
				[0.050]	[0.045]
Number of Observations	69	69	69	69	69
R-squared	0.05	0.06	0.11	0.09	0.13

Robust standard errors in brackets

Table 3: Determinants of Top Statutory Corporate Tax Rates (1999)

	(1)	(2)	(3)	(4)	(5)
Constant	0.288 [0.039]	0.411 [0.062]	0.567 [0.138]	0.815 [0.458]	0.971 [0.483]
Ln(Population 1999)	0.009 [0.010]	0.006 [0.009]	-0.071 [0.060]	0.005 [0.009]	-0.071 [0.060]
Ln(Population 1999)^2			0.010 [0.007]		0.010 [0.007]
Ln(Per capita GDP 1999)		-0.029 [0.013]	-0.031 [0.013]	-0.247 [0.242]	-0.249 [0.243]
Ln(Per capita GDP 1999)^2				0.029 [0.032]	0.029 [0.032]
Number of Observations	111	111	111	111	111
R-squared	0.01	0.04	0.06	0.05	0.07

Robust standard errors in brackets

Table 4: Determinants of Effective Corporate Tax Rates (1982)

	(1)	(2)	(3)	(4)	(5)
Constant	-0.236	-0.609	0.605	2.33	2.498
	[0.200]	[0.468]	[1.211]	[2.262]	[2.405]
Ln(Population 1982)	0.036	0.043	-0.112	0.039	-0.012
	[0.011]	[0.015]	[0.150]	[0.015]	[0.226]
Ln(Population 1982)^2			0.005		0.002
			[0.005]		[0.007]
Ln(Per capita GDP 1982)		0.029	0.034	-0.638	-0.582
		[0.028]	[0.029]	[0.505]	[0.566]
Ln(Per capita GDP 1982)^2				0.038	0.035
				[0.029]	[0.032]
Number of Observations	45	45	45	45	45
R-squared	0.15	0.17	0.19	0.21	0.21

Robust standard errors in brackets

Table 5: Determinants of Effective Corporate Tax Rates (1999)

	(1)	(2)	(3)	(4)	(5)
Constant	0.026	-0.317	-3.588	-1.023	-3.247
	[0.280]	[0.418]	[1.563]	[1.745]	[1.951]
Ln(Population 1999)	0.013	0.02	0.427	0.02	0.444
	[0.017]	[0.017]	[0.187]	[0.014]	[0.193]
Ln(Population 1999)^2			-0.012		-0.013
			[0.006]		[0.006]
Ln(Per capita GDP 1999)		0.025	0.015	0.185	-0.094
		[0.024]	[0.025]	[0.386]	[0.390]
Ln(Per capita GDP 1999)^2				-0.009	0.006
				[0.021]	[0.022]
Number of Observations	45	45	45	45	45
R-squared	0.03	0.05	0.16	0.06	0.16

Robust standard errors in brackets

Table 6: Determinants of Corporate Tax Bases (1982)

	(1)	(2)	(3)	(4)	(5)
Constant	-0.167	-1.003	-2.606	2.977	1.57
	[0.405]	[0.870]	[2.024]	[4.074]	[4.271]
Ln(Population 1982)	0.064	0.08	0.284	0.075	0.505
	[0.023]	[0.030]	[0.257]	[0.026]	[0.401]
Ln(Population 1982)^2			-0.006		-0.013
			[0.008]		[0.012]
Ln(Per capita GDP 1982)		0.065	0.058	-0.838	-1.303
		[0.045]	[0.049]	[0.910]	[1.005]
Ln(Per capita GDP 1982)^2				0.052	0.078
				[0.052]	[0.057]
Number of Observations	45	45	45	45	45
R-squared	0.15	0.19	0.19	0.2	0.23

Robust standard errors in brackets

Table 7: Determinants of Corporate Tax Bases (1999)

	(1)	(2)	(3)	(4)	(5)
Constant	0.047	-0.713	-10.792	-3.762	-10.433
	[0.849]	[1.217]	[4.847]	[4.928]	[5.464]
Ln(Population 1999)	0.045	0.059	1.313	0.058	1.331
	[0.051]	[0.051]	[0.591]	[0.039]	[0.541]
Ln(Population 1999)^2			-0.038		-0.038
			[0.018]		[0.016]
Ln(Per capita GDP 1999)		0.055	0.024	0.746	-0.09
		[0.070]	[0.072]	[1.090]	[1.093]
Ln(Per capita GDP 1999)^2				-0.038	0.006
				[0.061]	[0.061]
Number of Observations	45	45	45	45	45
R-squared	0.04	0.05	0.18	0.06	0.18

Robust standard errors in brackets

Appendix Table 1
Means and Standard Deviations of Regression variables

Variable	Mean	Standard deviation
Statutory corporate tax rate, 1982	0.412	0.095
Statutory corporate tax rate, 1999	0.320	0.060
ln(population), 1982	9.45	1.62
ln(population), 1999	9.71	1.64
ln(per capita GDP), 1982	8.70	0.94
ln(per capita GDP), 1999	8.92	1.07
Effective corporate tax rate, 1982	0.341	0.224
Effective corporate tax rate, 1999	0.224	0.127
Effective corporate tax rate/ statutory corporate tax rate, 1982	0.897	0.249
Effective corporate tax rate/ statutory corporate tax rate, 1999	0.781	0.329
Indirect corporate tax revenue/ direct corporate tax revenue, 1982	3.75	3.90
Indirect corporate tax revenue/ direct corporate tax revenue, 1999	2.89	2.57
Corporate tax revenue/GDP, 1982		
Corporate tax revenue/GDP, 1999		

Appendix Table 2: Determinants of Top Statutory Corporate Tax Rates (1999)
Sample restricted to countries in 1982 sample

	(1)	(2)	(3)	(4)	(5)
Constant	0.292	0.326	0.452	0.508	0.663
	[0.042]	[0.061]	[0.172]	[0.439]	[0.486]
Ln(Population 1999)	0.007	0.006	-0.054	0.006	-0.057
	[0.010]	(0.010)	[0.075]	[0.010]	[0.076]
Ln(Population 1999)^2			0.007		0.007
			[0.009]		[0.009]
Ln(Per capita GDP 1999)		-0.008	-0.009	-0.106	-0.119
		[0.012]	[0.012]	[0.230]	[0.234]
Ln(Per capita GDP 1999)^2				0.013	0.015
				[0.031]	0.031]
Number of Observations	68	68	68	68	68
R-squared	0.01	0.01	0.02	0.01	0.02

Robust standard errors in brackets

Appendix Table 3: Determinants of Indirect/Direct Tax Revenue (1982)

	(1)	(2)	(3)	(4)	(5)
Constant	7.307	-6.516	-38.145	-55.235	-63.744
	[7.405]	[13.255]	[29.352]	[72.798]	[77.951]
Ln(Population 1999)	-0.207	0.073	4.118	0.122	2.649
	[0.426]	[0.497]	[3.577]	[0.521]	[7.547]
Ln(Population 1999)^2			-0.123		-0.077
			[0.108]		[0.230]
Ln(Per capita GDP 1999)		1.005	0.847	12.141	9.451
		[0.683]	[0.727]	[16.301]	[18.349]
Ln(Per capita GDP 1999)^2				-0.641	-0.492
				[0.937]	[1.047]
Number of Observations	40	40	40	40	40
R-squared	0.01	0.03	0.04	0.05	0.05

Robust standard errors in brackets

Appendix Table 4: Determinants of Indirect/Direct Tax Revenue (1999)

	(1)	(2)	(3)	(4)	(5)
Constant	2.408	2.026	-19.22	-74.154	-70.119
	[3.978]	[11.487]	[21.102]	[36.491]	[43.311]
Ln(Population 1999)	0.028	0.037	2.638	-0.068	-0.876
	[0.237]	[0.349]	[2.596]	[0.331]	[4.530]
Ln(Population 1999)^2			-0.077		0.024
			[0.079]		[0.134]
Ln(Per capita GDP 1999)		0.026	-0.02	17.67	18.272
		[0.663]	[0.695]	[8.174]	[8.940]
Ln(Per capita GDP 1999)^2				-0.987	-1.02
				[0.456]	[0.497]
Number of Observations	41	41	41	41	41
R-squared	0	0	0.01	0.11	0.11

Robust standard errors in brackets

Appendix Table 5: Simple Effective Corporate Income Tax Rate (1982)
(Revenue as a fraction of GDP)

	(1)	(2)	(3)	(4)	(5)
Constant	5.19	9.18	15.66	-44.12	-42.46
	(3.62)	(4.70)	(13.53)	(24.60)	(27.82)
Ln(Population 1982)	-0.46	-0.53	-3.79	-0.47	-6.16
	(0.86)	(0.85)	(5.65)	(0.81)	(5.87)
Ln(Population 1982)^2			0.41		0.72
			(0.68)		(0.73)
Ln(Per capita GDP 1982)		-0.96	-1.01	28.34	33.57
		(0.87)	(0.93)	(14.14)	(17.25)
Ln(Per capita GDP 1982)^2				-3.98	-4.71
				(1.94)	(2.36)
Number of Observations	50	50	50	50	50
R-squared	0.0088	0.0216	0.0296	0.0704	0.0933

Robust standard errors in brackets

Appendix Table 6: Simple Effective Corporate Income Tax Rate (1999)
(Revenue as a fraction of GDP)

	(1)	(2)	(3)	(4)	(5)
Constant	1.00	-3.57	-4.86	1.15	0.40
	(1.48)	(1.65)	(6.00)	(12.13)	(13.67)
Ln(Population 1999)	0.34	0.42	1.03	0.43	1.20
	(0.36)	(0.34)	(2.82)	(0.34)	(2.70)
Ln(Population 1999)^2			-0.07		-0.09
			(0.34)		(0.33)
Ln(Per capita GDP 1999)		1.08	1.09	-1.44	-1.89
		(0.40)	(0.40)	(6.46)	(6.12)
Ln(Per capita GDP 1999)^2				0.33	0.39
				(0.88)	(0.83)
Number of Observations	63	63	63	63	63
R-squared	0.0264	0.1232	0.1244	0.1249	0.1268

Robust standard errors in brackets