ALTERED STATES: TAXES
AND THE LOCATION OF
FOREIGN DIRECT INVESTMENT
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ABSTRACT

This paper examines the effect of taxation on foreign investment and on business location

within the United States. The idea is to *compare* the inter-state distribution of investments from

certain foreign countries (those with foreign tax credit systems) *with* the distribution of

investments from other countries. Investors from countries with foreign tax credit systems

receive home-country tax credits for income taxes paid to US states, so they are less likely than

are other investors to avoid investing in high-tax states. The results indicate that 1% differences

in state corporate tax rates are associated with 7-9% differences between the investment shares

of foreign tax credit investors and the investment shares of all others, suggesting that state taxes

significantly influence the pattern of foreign direct investment in the US.

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1. Introduction.

One of the striking economic events of the 1980s was the sudden appearance, in the early part of the decade, of a large volume of foreign direct investment (FDI) in the United States. This development raised a number of important conceptual and policy questions, all of them linked, ultimately, to the source of the FDI surge. One explanation frequently offered is that the 1981 US tax change greatly encouraged foreigners to invest in America. If it is true that tax changes are partly responsible for the FDI inflow, then the US tax reforms currently under consideration in Congress (and elsewhere) are likely to carry important implications for future patterns of FDI. Unfortunately, rather little is known about the magnitude of the effect of taxation on foreign direct investment.

This paper examines the effect of state tax rates in the US on the location of foreign direct investment within the US. Foreign investors in the United States pay state taxes on their investment income at (roughly) the same rates that US investors pay on theirs. Due to a complicated interaction of foreign and domestic tax rules, investors from certain foreign countries receive home-country credits for their income taxes paid in the US, and consequently have little or no incentive to avoid American tax obligations. The idea behind this paper is to compare the pattern of their, effectively untaxed, investments in the US with the pattern of investments from other countries (including investments by Americans) that one expects to be influenced by the tax system.

The results suggest that state tax rates have an important impact on the location of FDI in the United States. All other things equal, it appears that a 1% change in a state tax rate is associated with a difference of 8% in the share of manufacturing investment from taxed and untaxed investors. While it is not quite correct to extrapolate this figure to conclude that a 5% change in the rate of taxation in a state (or the US) would reduce investment from some sources by 40%, the estimated effect is nevertheless large and important in the context of evaluating the impact of tax changes.

This paper examines two related issues: the first is the effect of international taxation on FDI, and the second is the effect of subnational taxation on business location. Both issues are considered simultaneously, by exploiting the rather small differences between US states in the tax rates they impose on profits earned within their boundaries. Previous researchers have had difficulty finding *any* effect of state taxation on business location. There are various explanations for the apparent absence of a tax effect, but the simplest explanation has to do with the difficulty of controlling for important unobservables in statistical studies of the standard variety. For example, both New York and California have high tax rates, and they both have high levels of investment; the high tax rates are not responsible for the high investment levels (indeed, the high levels of inelastic investment may be responsible for the high tax rates), but do not excessively discourage investment either, since those states include locations (e.g., Manhattan and Silicon Valley) that are very attractive to investors *in spite of* the high tax rates. As long as the unobservable attributes of states are roughly the same for all investors, then it is possible to compare the behavior of effectively untaxed foreign investors to the behavior of other investors that are influenced by tax rates, in order to identify the impact of taxation on investment location. In such a setting, even small tax rate differences may yield significant differences in observed investment patterns, since other important considerations are (by assumption) held constant.

Section 2 of the paper describes the tax systems that countries and states use to tax domestic and foreign firms within their borders, and reviews the findings of earlier research on the effect of taxation on business location, both internationally and within the US between various states. Section 3 presents the model of investment that is used in the statistical work, and describes the data that are available on tax rates and the allocation of investments between states. Section 4 presents the results of the estimation, and section 5 is the conclusion.

2. Taxes and Business Location: National and International.

The recent growth in the importance of foreign direct investment in the United States is illustrated by Figure 1, which plots the ratio of FDI to total Gross Private Domestic Investment (GPDI) in the US for the years 1960-1991.[1] FDI in the US was negligible relative to GPDI until the mid-1970s, growing significantly by the early 1980s and remaining high until the 1990s. Many observers note that the years of largest large jumps in the FDI ratio - 1981 and 1986 - were also years of important tax changes in the United States. Whether those tax *changes* are able to explain the FDI movements is unclear - just as it is unclear what factor is responsible for the recent drop in the FDI ratio. But in order to understand the role that tax policy might play in influencing foreign investments, it is necessary to examine the rules that govern the taxation of international income.

International Tax Systems

The general principle that governs international business taxation is that firms are subject to taxation in the countries in which they locate their activities, as well as in their countries of origin. Consequently, a firm from the United Kingdom that operates a subsidiary in the United States is required to pay corporate taxes (on its US profits) to the US, and in addition, to pay taxes to the UK.

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[1] The US Commerce Department recently changed its historical series of FDI in the US; the revised figures, from which Figure 1 was constructed, are reported in Murad (1992). The items defined to be components of FDI were changed somewhat after 1981, making the 1960-1981 series not perfectly comparable to the 1982-1991 series, but the general pattern of significantly increased FDI is the same regardless of (reasonable) definition. Gross Private Domestic Investment is not the only possible natural scaling variable for the FDI ratio - other alternatives include GDP, GNP, and NNP - but all yield roughly the same picture.

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There is an obvious problem that such international tax systems can create: firms may be double taxed, perhaps prohibitively, on their foreign investments.[2] Governments are aware of this problem, and pursue different methods of alleviating double taxation.

One method of reducing international double taxation is to offer a foreign tax credit for taxes paid to foreign governments. Several OECD countries use this system, including the United States, the UK, and Japan. Numerous other countries, including Australia, Canada, France, Germany, the Netherlands, and Switzerland, effectively exempt the foreign earnings of their firms from domestic taxation.[3] Governments that use foreign tax credit systems require their own firms to pay taxes on their earnings in foreign countries, but permit the firms to take credits against their home-country tax liabilities for taxes paid to their host foreign governments. Consider, for example, a UK investment in the United States that earns $100 in profits, and is taxed by the US at the statutory US corporate tax rate of 34%. The corporate tax rate in the UK is 40%. The firm pays $34 to the US government, and has an obligation of $40 to the UK government (40% of $100), but the UK government would grant a foreign tax credit equal to $34, making the firm's net tax obligation to the UK government equal to $6 ($40-$34).

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[2]In addition to greatly reducing the incentive to invest, double taxation may also create the problem that corporations have incentives to change their countries of residence in order to escape home-country taxation of foreign earnings. Governments are aware of these incentives, and often design tax laws to make it very difficult for corporations to leave their home countries. See Hines (1991) for an analysis of these issues.

[3]Strictly speaking, not all of these countries exempt all foreign income from home-country taxation. For example, Canadian and German investments in the US are effectively exempt from home-country taxation by virtue of the terms of US income tax treaties with those countries. The earnings of Swiss branches in the US are exempt from home-country taxation, but profits earned by US subsidiaries of Swiss corporations are subject to home-country taxation without the ability to claim foreign tax credits for US taxes paid. (Some of the Swiss tax provisions vary by canton.) There are many relevant details of the tax systems of all of the exemption countries listed, but, as a general matter, their systems can be summarized as effectively exempting from home-country taxation almost all of the income earned by US affiliates of their resident corporations.

In practice, foreign tax credit systems contain a vast number of complications that modify the simple structure on which they are based. It is, for example, common for home countries to defer their own taxation of foreign profits until those profits are effectively repatriated from the foreign location in which they were earned. This system appears to give certain investors incentives to delay repatriation of their profits earned in low-tax foreign jurisdictions, though the basis of this incentive is somewhat subtle, in that repatriation taxes are inevitable for most investors.[4] In the analysis that follows, I abstract from this complication and other complications of foreign tax credit systems.

Effects of International Taxes

There exists a small body of work that analyzes the effect of international taxation on foreign direct investment. Examples include the time-series investment studies of Hartman (1981, 1984), Newlon (1987), Boskin and Gale (1987), and Slemrod (1990a, 1990b). Additionally, Hines and Rice (1990) consider the effect of taxation on the cross-sectional distribution of capital and labor employed by US multinationals in foreign countries.

As a general matter, these investigations are somewhat disappointing from the standpoint of identifying the effect of taxes on the capital and labor demands of multinational firms. One likely explanation is that the cross-sectional variation in national tax rates and tax systems is correlated with countless observable and unobservable national differences in economic variables that influence

[4]See Hartman (1985) for an analysis of repatriation incentives for investors from foreign tax credit countries; he finds that the repatriation tax itself does not influence the pattern of income repatriations for a mature foreign subsidiary. For an analysis of the repatriation pattern of a subsidiary over its whole lifetime, including its immature period, see Sinn (1990) and Hines (1992). The behavior of US subsidiaries is consistent with the view that multinationals adjust their repatriation patterns in order to reduce their tax liabilities: Hines and Hubbard (1990) find that 84% of the controlled foreign corporations of US multinationals repatriated none of their foreign income with dividend payments in 1984, and that the 16% that did pay dividends had particularly favorable tax situations.

investment and labor demand.[5] Furthermore, time-series variations in tax rates may not be adequate to identify the effects of taxes, since tax rates change infrequently and tax changes may be endogenous to unobservable economic conditions that affect factor demands. The history of estimating time series equations for domestic US investment is unpromising for the enterprise of performing the same kind of estimation internationally.

State Taxes

There remains a source of tax variation that may be more useful th⁻ₐ cross-sectional and intertemporal differences in national tax rates. The source is the state corporate income tax in the United States. State corporate income taxes vary in rates and design between different states. Five states currently exempt corporate income from direct taxation, while 45 tax corporate income at rates that range from 3.4% to 12%.

A state's corporate income tax applies only to income that is earned within the taxing state. A considerable degree of complication attends the calculation of within-state income for tax purposes. Most states use some variant of the "Massachusetts formula" to determine taxable income for state tax purposes.[6] Under the classical version of this formula, corporations allocate their US taxable profits between the states in which they operate, based one-third each on sales, capital in place, and labor compensation in each state.

Foreign firms face these tax systems, with two complications. The first complication is that some states, over some time periods, impose taxes on the basis of worldwide rather than US-based

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[5]Another possibility is that tax policy does not affect FDI, or else has only a trivial effect, as Glickman and Woodward (1989) and Graham and Krugman (1991) suggest in their surveys of FDI in the United States.

[6]It is noteworthy that Massachusetts is one of only 13 states that tax corporate income without using the "Massachusetts formula".

profits. This practice is controversial from a legal and constitutional standpoint, and is the practice of

only a handful of states.[7] The second complication is that foreign investors from foreign tax credit

countries (e.g., Japan and the United Kingdom) can credit state corporate income taxes against their

home-country tax liabilities. Other types of state taxes, such as sales taxes, are not creditable.

Effects of State Taxes

Analysts typically find little or no effect of subnational taxes on the location of business

activity. See, for example, Carlton's (1983) study of the determinants of new firm locations, in

which high tax rates appear not to discourage new firms. Others, including Newman (1983), Bartik

(1985), Helms (1985), and Papke (1987, 1991) offer evidence that is consistent with the view that

taxes significantly influence the location choices of new businesses, but the bulk of the studies

surveyed in Wasylenko (1981, 1991) report little in the way of strong support for the view that state

taxes have important effects on business location within the US.[1]

It may not be altogether surprising that it has been difficult for analysts to identify a strong

effect of subnational taxes on business activity. There are numerous attributes that make locations

attractive and unattractive for business, many of which are imperfectly, if at all, observable to the

econometrician. Furthermore, it is not clear what correlation one might expect between tax rates and

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[7]These states apply formulas to allocate *worldwide* corporate income to their state tax bases. Some argue that this method of state taxation is inconsistent with US income tax treaties and the US Constitution's limitation on the rights of states to regulate foreign commerce; the issue has been under court review for most of the last 15 years. As matters stand currently, only Alaska, California, Montana, and North Dakota impose worldwide unitary tax systems, and all but Alaska make its use optional for taxpayers. See McLure (1984) for an economic analysis of the impact of such tax systems.

[1]All studies in this area encounter the problem of selecting the appropriate specification, time frame, and lag structure (if necessary) in which to conduct the analysis. Newman and Sullivan (1988) survey some of this literature, concluding that the modelling and estimation limitations of existing studies make it difficult to reject the hypothesis that taxes influence business location, or for that matter many other hypotheses, from the available information.

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business activity. If higher business taxes represent part of a fiscal package that includes greater

spending on infrastructure and other items that benefit business, then higher taxes might be correlated

with enhanced business activity.[9] Or if state income is correlated with business activity, and the

demand for public goods has greater than unit income elasticity, then business activity will be

associated with high tax rates - possibly including high business tax rates.

Interaction of Foreign Taxes and State Taxes

All foreign investors pay state taxes in the US, but investors from foreign tax credit countries

are eligible to claim credits for income taxes paid to US states. Under certain circumstances,[10] these

investors should behave as though state taxes are inconsequential, since they provide offsetting

reductions in home-country tax liabilities. Consequently, if state-specific unobservables influence all

investors similarly, then foreign tax credit investors are likely to express a relative preference for

investments in high-tax states. Given the generally low rates of state corporate income taxes, one

might expect the tax effect on interstate allocation of foreign business activity to be small.[11] But

state tax systems exhibit considerable variation, and the recent boom in foreign direct investment -

one that was accomplished largely by merger and acquisition - offers certain foreign investors

arbitrage opportunities if state taxes have important effects on investors.

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[9]Helms (1985) offers some evidence that supports this hypothesis.

[10]Foreign investors receive full and immediate home-country tax credits as long as they do not
have excess foreign tax credits, and are either unwilling or unable to exploit deferral opportunities.
These conditions are likely to be satisfied by some foreign investors and not others. Foreign
investors who do not receive contemporaneous home-country tax credits often have the ability to
claim them later, or to carry their credits back against earlier years' tax obligations.

[11]Indeed, Coughlin, Terza, and Arromdee (1991) do not find state tax rates to exert a significant
effect on the location of foreign direct investment within the US. But this study does not distinguish
investments by country of origin, and does not include state fixed effects.

The view that state taxes might channel certain foreign business activity into high-tax states is similar to the argument of Scholes and Wolfson (1991) that the Tax Reform Act of 1986 encouraged foreign direct investment through its effects on tax base definitions. Scholes and Wolfson point out that the abilities of foreign investors to exploit tax arbitrage are enhanced when the tax system moves, as it did in the 1986 Act, toward broad-based definitions of taxable income. One limitation of the Scholes and Wolfson hypothesis is that it is difficult to test with the aggregate time-series data that are available.[12]

3. Data and Estimation.

This section describes the model to be estimated and the data used to test the model. Particular aspects of the available data (and of the behavior that they reflect) require the estimation strategy to be sensitive to the possibility of zero investment from certain foreign countries in certain (generally small) states.

Model and Estimation

In order to estimate the effect of state taxes on foreign direct investment, it is necessary to specify a model of investment behavior. Bearing in mind the possible heterogeneity of investors and their motivations, I consider the following reduced-form model of desired investment (I^*_{ij}) by investors from country i in state j:

$$I^*_{ij} = \alpha_i \gamma_j + \beta_j s_i \gamma_j (\tau_i - \overline{\tau}) + \gamma_j \epsilon_{ij} \tag{1}$$

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[12]Swenson (1989) offers some evidence in support of the Scholes and Wolfson hypothesis, but Auerbach and Hassett (1991) find the hypothesis to be inconsistent with other data.

in which α_i is a constant (for all j), reflecting the general size of business activity in state i; α_i is assumed to be unobservable, and is measured in (1) as a share, so $\Sigma_i \alpha_i = 1$. The variable s_i in (1) is also assumed to reflect the size of business activity in state i; the reason that s_i differs from α_i is that s_i is assumed to be observable (e.g., the fraction of the US population residing in state i) while α_i may have unobservable components (e.g., the productivity of the local workforce, the quality of the "business climate", etc.); it is possible, though not necessary, that $\alpha_i = s_i$. γ_j is a constant for country j, τ_i is the tax rate in state i, ϵ_{ij} is a residual with zero mean, and $\underline{\tau}$ is the average state tax rate in the US, weighted by shares s_i:

$$\underline{\tau} = \sum_{k=1}^{50} \tau_k s_k \qquad (2)$$

The idea that underlies the specification in (1) is that the volume of desired investment in a state depends on the interaction between the proclivity of investors from country j to invest in the United States [γ_j] and the general desirability of state i, itself a function of tax [$\beta_j s_i (\tau_i - \underline{\tau})$] and nontax [$\alpha_i$] factors. The tax variable is constructed to have zero mean, and the inclusion of s_i is intended to capture the insight that a 1% change in the California tax rate is likely to have a bigger effect than would a 1% change in the Vermont tax rate, simply because California is economically larger and therefore has a larger capital stock.[13]

In order to estimate (1), it is convenient to transform it by dividing both sides by γ_j, yielding:

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[13]The reason that (1) does not impose $\alpha_i = s_i$ is that the goal is to estimate the β_j coefficients. The small number of foreign countries for which FDI data are available makes it difficult to identify the α_is with precision, so interacting β_j with α_i would introduce additional uncertainty in the β_j estimates. The point of interacting β_j and s_i is simply to capture the economic sizes of different states, for which several different measures of s_i might be appropriate (cf. fn. 26).

$$I^*_{ij}/\gamma_j \;=\; \alpha_i + \beta_j s_i(\tau_i - \underline{\tau}) + \epsilon_{ij} \qquad\qquad (3)$$

There remains an econometric (and economic!) difficulty that arises if the residual ϵ_{ij} in (3) is sufficiently negative to make (I^*_{ij}/γ_j) take a negative value. It is not possible for investors to own negative amounts of property, plant and equipment (PPE); some countries' investors do, however, own zero amounts of PPE in certain states. One straightforward interpretation of (3) in such instances is that countries demand negative PPE, but this demand takes the form of zero ownership level, since various market features make it infeasible to own negative amounts of capital.

As a consequence, the observable analogue of (3) is:

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\begin{aligned}
I_{ij} \;=\;& \alpha_i + \beta_j s_i(\tau_i - \underline{\tau}) + u_{ij} \\
& \text{with } u_{ij} = \epsilon_{ij} \quad \text{if } \epsilon_{ij} \geq -[\alpha_i + \beta_j s_i(\tau_i - \underline{\tau})] \\
& \phantom{\text{with } } u_{ij} = -[\alpha_i + \beta_j s_i(\tau_i - \underline{\tau})] \quad \text{otherwise}
\end{aligned}
\qquad (4)
$$

in which I_{ij} is the (observed) volume of investment by country j in state i, divided by a country-specific constant γ_j. An additional adjustment is necessary in order to put (4) into a form that is conveniently estimable. The "true" residual ϵ_{ij} in (4) is assumed to be drawn from a distribution with zero mean, but the fitted residual u_{ij} will generally have positive mean, since large negative values of ϵ_{ij} are likely to generate censored values of u_{ij}. The importance of this consideration is made clear by constructing a new variable, σ_{ij}, defined as the share of country j's total US investment located in state i: $\sigma_{ij} = I_{ij}/(\Sigma_k I_{kj})$. Dividing the left and right sides of (4) by $(\Sigma_k I_{kj})$, and imposing (2) and the restriction $\Sigma_i \alpha_i = 1$ yields:

$$\sigma_{ij} = \alpha_i/(1 + \eta_j) + \beta_j s_i(\tau_i - \underline{\tau})/(1 + \eta_j) + u_{ij}/(1 + \eta_j)$$

$$\text{with } u_{ij} = \epsilon_{ij} \text{ if } \epsilon_{ij} \geq -[\alpha_i + \beta_j s_i(\tau_i - \underline{\tau})]$$

$$u_{ij} = -[\alpha_i + \beta_j s_i(\tau_i - \underline{\tau})] \quad \text{otherwise} \tag{5}$$

in which $\eta_j = \Sigma_k u_{kj}$ is the mean value taken by u_{ij} for country j. Taking η_j to be close to zero, and taking s_i to be roughly equal to α_i, a first-order Taylor approximation to the value of the first term on the right side of (5) transforms the equation to:

$$\sigma_{ij} \approx \alpha_i - c_j s_i + \beta'_j s_i(\tau_i - \underline{\tau}) + u'_{ij} \tag{6}$$

in which c_j is a country-specific constant equal to η_j, $\beta'_j = \beta_j/(1 + \eta_j)$, and $u'_{ij} = u_{ij}/(1 + \eta_j)$. The residual u'_{ij} is subject to the same truncation rule as indicated in (5), but now also has zero mean for all j (i.e., $\Sigma_k u'_{kj} = 0, \vee$ j). The idea that underlies the empirical work is to estimate variants of (6), using observable variables for s_i. It is then possible to obtain consistent (but slightly inefficient) estimates of β_j by estimating the c_j variables in (6) without the restriction that $c_j = \eta_j$; this simplifies the estimation, and is the strategy pursued in the empirical work.

Tax Rates

In order to tax the income a corporation earns in a state, it is necessary to define the income of the corporation, or, in the case of a corporation that earns some of its income from operations outside the state, that *portion* of the corporation's income that is attributable to the state. Most states employ roughly the US federal income definition for taxing their resident corporations. There are some variations, of course: as of 1987, three states did not permit firms to use the same depreciation methods provided by the Internal Revenue Code in calculating capital cost allowances, ten states

imposed (very moderate) minimum taxes on resident corporations, seven states permitted corporations to deduct their federal income tax liabilities in calculating state taxable income, and there were numerous other idiosyncratic variations. In the empirical work that follows, I take the state tax rate to be the top statutory rate on taxable corporate income in the state, correcting for federal deductibility.[14] Some experimentation with adjusting the state corporate tax rate for features such as alternative depreciation allowance formulas produced results that were virtually identical to those obtained using statutory rates.

There is an additional complication that arises in taxing corporations with income in more than one state. If the corporation's operations are determined to be *unitary*, then it is necessary to allocate income between states using one method or another.

The idea that underlies the concept of taxing a unitary business is that, if a firm has chemical operations in New Jersey and Wyoming, then it is necessary to identify the part of its total income that is properly taxed (at 9%) by New Jersey, and the part of its total income earned in Wyoming (and therefore untaxed, since Wyoming has no state corporate income tax). If there is an intimate connection between the New Jersey and Wyoming operations (as might be the case if they transfer chemicals between plants, if they advertise together, etc.), the chemical business is said to be *unitary*.[15]

States determine their own shares of the profits of unitary businesses by using rather *ad hoc* formulas that are intended to approximate the "true" income of the firm originating within their boundaries.[16] The most common formula allocates a unitary corporation's income to the state's

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[14]Gordon (1988) provides data on state tax rates and allocation formulas.

[15]If the business is non-unitary, then each operation is taxed based on separate accounting.

[16]There is a lively question about whether there exists such a thing as the "true" income attributable to activities in any one location when production processes exhibit nonconstant *ex post* returns to scale. For tax purposes, however, it is necessary to use some rule to allocate income. See

taxing jurisdiction one-third each on the basis of the state's share of the corporation's national sales, capital in place, and labor compensation. The 13 states that do not use this formula use variants in which the three factors (sales, capital, and labor compensation) are given weights other than one-third each.

In order to identify the effect of state allocation formulas on firms' incentives, consider the marginal investment decision of a corporation facing a three-factor formula. Denote by T_j the sum of all state corporate tax obligations of an investor from country j. Standard allocation formulas provide that:

$$T_j \ = \ \pi_j \ \{ \ \Sigma_i \ \tau_i \ [\theta_{Ki}(K_{ij}/K_j) \ + \ \theta_{Li}(L_{ij}/L_j) \ + \ \theta_{si}(S_{ij}/S_j)] \} \tag{7}$$

in which π_j is the firm's taxable income and τ_i is the state corporate income tax rate in state i. Prices of capital, labor, and sales units are normalized to unity. The term in square brackets in (7) reflects the allocation of a unitary corporation's tax base for purposes of state corporate income taxation. The parameter θ_{Ki} equals the fraction of state i's allocation formula that is determined by shares of capital employed, while θ_{Li} is the fraction determined by labor compensation shares, and θ_{si} is the sales fraction (hence, $\theta_{Ki} + \theta_{Li} + \theta_{si} = 1$, ∀ i). The variable K_j equals the total value of capital employed in the US by country j's firms: $K_j = \Sigma_h K_{hj}$; similarly, $L_j = \Sigma_h L_{hj}$ and $S_j = \Sigma_h S_{hj}$.

Differentiating (7) with respect to K_{ij} yields:

$$\partial T_j/\partial K_{ij} \ = \ (\pi_j/K_j)\{\theta_{Ki}\tau_i - t_{Kj}\} \ + \ (\partial \pi_j/\partial K_{ij})t_j \tag{8}$$

Hines (1990) for a discussion of these issues and a description of an income-allocation rule that yields efficient *ex ante* and *ex post* incentives. See Gordon and Wilson (1986) for an analysis of some of the distortions created by current state income-allocation formulas.

in which t_{Kj} is the average share-weighted tax on capital factors, $t_{Kj} = \Sigma_h \tau_h \theta_{Kh}(K_{hj}/K_j)$, and t_j is the average tax rate paid to all states, $t_j = \Sigma_h \tau_h [\theta_{Kh}(K_{hj}/K_j) + \theta_{Lh}(L_{hj}/L_j) + \theta_{Sh}(S_{hj}/S_j)]$. Assuming that the firm sets its after-tax marginal product of capital $[\partial\pi_j/\partial K_{ij} - \partial T_j/\partial K_{ij}]$ equal to a country-specific cost of capital λ_j, the firm's first-order condition for capital allocation from (7) and (8) becomes:

$$(\partial\pi_j/\partial K_{ij})(K_j/\pi_j) = \mu_j + \tau_i\theta_{Ki}/(1-t_j) \tag{9}$$

in which μ_j is a country-specific constant equal to $(\lambda_j K_j/\pi_j - t_{Kj})/(1-t_j)$. Of course, the variables t_{Kj} and t_j are themselves endogenous to all of the states' tax rates and the firm's capital allocation decisions in response to the tax rates. The importance of equation (9) is that it indicates that marginal investment decisions undertaken by investors from country j, when taxed as unitary businesses, are influenced by the state tax rate (τ_i) *interacted with* the state capital allocation share (θ_{Ki}).[17] In the empirical work that follows, I take a unitary investor's effective tax rate in a state to be proportional to $\theta_{Ki}\tau_i$, and measure this rate by dividing it by the modal value of θ_{Ki}, which is 0.33. Consequently, apportioned tax rates used in the regressions equal $3\theta_{Ki}\tau_i$.

Investment Data

The Bureau of Economic Analysis (BEA) of the US Commerce Department collects extensive information on the activities of foreign firms in the United States. BEA collects data from all significant foreign-owned businesses in the United States, and reports the distribution of factor

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[17]Firms make two types of decisions that influence the allocation of capital between states: they decide in which states to invest, and (simultaneously) decide how much capital to locate in each of the chosen states. Equation (9) describes the second type of decision for a unitary business. The first type of decision, which is more inframarginal in nature, is most likely (for firms in industries characterized by common capital/sales/employment ratios) to be influenced by statutory tax rates, even if businesses are unitary.

employment by state, distinguished by foreign investing country. Because individual firm reports are

confidential, these series are available only on an aggregate basis (separately for each foreign

country).

BEA conducts comprehensive benchmark surveys of foreign direct investment in the United

States on a periodic basis, the last survey covering the year 1987. (The previous benchmark survey

covered 1980.) The benchmark surveys are then updated annually, based on extrapolations from

smaller samples of foreign investing firms. Data for 1987 offer an opportunity to test the model

described earlier in this section, since 1987 is also the year of the latest industrial census in the US

and therefore allows some comparison of foreign and domestic investment patterns using more

comprehensive data than the annual updates provide. The disadvantage of using data for 1987 is that

the passage of the Tax Reform Act of 1986 significantly changed many firms' incentives to invest in

the US, particularly during 1987, which was a transition year for the tax changes introduced in the

Act. Nevertheless, the Tax Reform Act of 1986 did not affect state taxation directly (except through

tax base definitional changes), and the infrequency of changes in individual state tax rates suggests

that the allocation of capital in 1987 represents something like an equilibrium distribution in response

to prevailing state tax rates.

BEA provides data on the gross book value of Property, Plant and Equipment (PPE) used by

foreign-owned US affiliates.[18] In addition, BEA reports the value of PPE used by those affiliates in

their manufacturing activities. The statistical work that follows uses only the manufacturing PPE

figures, in an attempt to attenuate the usual difficulties that arise in interpreting investment patterns in

heterogeneous industries. The BEA data also include the number of foreign-owned affiliates with

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[18]An affiliate is defined to be foreign-owned if one or more foreign investors own at least 10%
each.

nonzero PPE in manufacturing; data on numbers of affiliates are available for each state,

distinguished by investing country.[19]

Table 1 offers two measures of the relative importance of different foreign investors in the

United States. The first column reports recent (yearend 1991) figures for FDI in the US, while

column three reports the stock of foreign-controlled manufacturing PPE in the US as of fiscal year

1987. The entries in the columns differ because they cover different years, different industries (FDI

is more inclusive than just manufacturing) and represent different ownership concepts. Both measures

(FDI and manufacturing PPE) tell the same story, however: the major investing countries in the US

are Australia, Canada, France, Germany, Japan, the Netherlands, Switzerland, and the United

Kingdom.

BEA provides usable state-by-country detail for all eight of these major investing countries,

and only for these eight countries. The empirical work that follows analyzes the behavior of investors

from seven of these countries; it excludes the Netherlands. The reason that Dutch investment is

excluded from the study has to do with the role of Dutch base companies in international tax

avoidance, and the resulting difficulty of identifying the home countries (for tax purposes) of

Netherlands-controlled US investments. Because the Netherlands exempts foreign income, and has

the world's most extensive network of low- and zero-tax-rate bilateral treaties, investors from many

countries route their investments in the US (and elsewhere) through Dutch corporations established to

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[19]It is worth noting that foreign-controlled PPE reported by BEA need not equal the foreign
ownership share of PPE, since 20% foreign ownership of a company with $30 million of PPE
represents $30 million of foreign-controlled PPE but only $6 million of FDI. BEA's reporting period
is the fiscal year that ends in 1987. There is no attempt made to adjust book values for inflation and
other market value changes, but this may not represent a serious problem, since a large part of the
FDI in the US took place in the 1980s.

take advantage of the treaty provisions negotiated by the Netherlands.[20] In theory, data reported by

BEA identifies the ultimate beneficial owner of foreign-controlled PPE, but in practice, the large

capital stocks reported for various tax havens (including the Netherlands) suggest that one cannot

know for sure which country owns the capital attributed to countries with special tax-avoiding

clienteles.[21] Since investors from foreign tax credit countries who invest in the US through Dutch

base companies are still eligible to claim credits against home-country tax liabilities for state taxes

paid in the US, it is not clear what effect state taxes should have on Netherlands-controlled US

investments. The simplest procedure is to exclude Dutch investments from the sample.

Together, the seven remaining countries account for 78% of the manufacturing PPE

controlled by foreign investors in the US in 1987. Of the 350 (7 x 50) state-by-country observations,

33 indicate zero manufacturing PPE in 1987. In addition, BEA suppresses 78 state-by-country

observations for confidentiality reasons, presumably in order not to identify the activities of any one

firm to its competitors and to others.[22] There is no clear pattern to the suppressions, other than a

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[20]See Giovannini (1989) for an analysis of the role of Dutch conduit companies in reducing the taxation of foreign direct investment income. In a recent article designed for tax practitioners, Reynolds and Shapiro (1993) explain that "the extensive use of Dutch entities by third-country residents to make US investments and conduct US operations" is part of the motivation for a proposed revision of the US - Netherlands tax treaty.

[21]Lipsey (1992) documents some of the statistical anomalies created by tax-motivated routing of foreign direct investment in the US through tax havens, including the Netherlands. Many studies of country-level determinants of foreign direct investment in the US find Netherlands investments to be outliers, possibly for this reason. See, for example, Klein and Rosengren (1992, pp. 19-20).

[22]The suppressed observations often represent small countries investing in small states, but need not. It is sometimes difficult to identify the rationale that underlies BEA's choice of which cells to suppress; what is clear is that it is not as simple a matter as suppressing all cells with two or fewer affiliates. For example, BEA does not report Canadian-controlled manufacturing PPE in Minnesota in 1987, despite the presence (according to BEA) of 72 Canadian manufacturing affiliates with PPE there; similarly, BEA does not report manufacturing PPE for the 49 German-controlled manufacturing affiliates with PPE in Colorado in 1987. This is not to suggest that BEA is not behaving responsibly in suppressing these data items; on the contrary, BEA is likely to be executing its mandate perfectly well, but in the course of so doing, creates some econometric difficulties for investigators.

general tendency to suppress observations in cells with a small predicted amount of PPE.
Consequently, in the empirical work I treat the suppressed observations in two ways: first as though
they represent observations of zero PPE, and second by excluding them from the sample. The results
change very little between these two treatments.

The 1987 Census of Manufactures provides state-level data on the gross book value of
depreciable assets owned by all manufacturing establishments in the US. There is no adjustment
made for inflation and other price changes. Coverage differs somewhat from the PPE series reported
by BEA, since nondepreciable assets such as inventories are included in PPE; furthermore, US-owned
investment in the US is not quite as concentrated in recent years as is foreign-owned investment in the
US, so the differences between book and market values may be more pronounced for the capital
stocks reported in the Census of Manufactures than for the PPE ownership reported by BEA. The
Census of Manufactures data include foreign-owned depreciable manufacturing PPE, so the foreign
stock of PPE in each state in 1987 is subtracted from the Census figures in order to obtain the US-
owned portion of each state's manufacturing capital. For comparison purposes, the Census reports
the gross book value of depreciable assets owned by all manufacturing establishments in the US to be
$921.7 billion in 1987, while BEA reports the gross book value of manufacturing PPE controlled by
foreigners to be $129.0 billion in 1987.

4. Estimation Results.

This section analyzes the correlation between the state pattern of foreign ownership of
manufacturing PPE in 1987 and the tax incentives facing different investors. By all measures, the
data are consistent with a sizable effect of state tax rates on investment patterns. One very rough way
to examine the effect of state taxes is to divide the US states into two groups, high-tax and low-tax

states, and to compare the average proclivities of exemption investors and foreign tax credit investors to own PPE in either group of states.

Figure 2 illustrates this comparison for the case in which the high-tax states are taken to be the 25 states with the highest tax rates, and the low-tax states are the other 25 states.[23] The bars in the figure are constructed from data on a state's share of an investing country's PPE ownership relative to the state's share of total US population. The darkly-shaded bars represent averages of these ratios in low-tax states, while the lightly-shaded bars represent average ratios in high-tax states. The two bars on the left describe the behavior of investors from exemption countries (Australia, Canada, France, Germany, and Switzerland), while the two bars on the right describe the behavior of investors from foreign tax credit countries (Japan and the UK).[24]

There is a noticeable difference between the average investment patterns of different foreign investors. Both groups of foreign investors appear to invest in low-tax states more than in proportion to their populations, and to invest in high-tax states less than in proportion to their populations, but the difference is much more pronounced for exemption investors, as the theory of tax avoidance predicts. Of course, Figure 2 is a rather imprecise illustration of the effect of taxation on investment, since the figure obscures the effect of within-group heterogeneity of state tax rates.

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[23]The 25 high-tax states have statutory corporate tax rates greater than or equal to 7.0%, while the 25 low-tax states have statutory corporate tax rates less than or equal to 6.75%.

[24]The problem of data suppression complicates the method of constructing the bars pictured in Figure 2. Each bar is constructed first by calculating country averages based on non-suppressed data in the appropriate cells. For example, one component of the leftmost bar in Figure 2 is France's ratio of its PPE share to population in the 25 lowest-tax states. BEA suppresses data on French-owned manufacturing PPE in six of these states, so the numerator of the ratio is calculated by dividing total French PPE in the 19 states for which data are available by total French-owned PPE in the US; the denominator of the ratio is the fraction of US population represented by the 19 states. The bar in Figure 2 then represents an unweighted average of this ratio for all five exemption countries. This method of constructing the bars still encounters the problem that the data suppressions are not random, which is likely to reduce the apparent differences between the behavior of investors from exemption and foreign tax credit countries.

Figure 3 illustrates a similar calculation, in which the low-tax states are rather arbitrarily defined to be the five states with no corporate income tax, and the high-tax states are the twelve states with tax rates over 8.8%.[25] Here, the comparison is considerably more dramatic: investors from exemption countries own PPE in low-tax states more than in double proportion to the states' populations, while they own PPE in high-tax states less than in proportion to their populations. By contrast, investors from foreign tax credit countries exhibit a lower ratio of PPE share to population share in the low-tax states than they do in the high-tax states. Again, this behavior is consistent with the influence of tax incentives on PPE ownership, but the figure does not precisely measure the effect of taxation.

Table 3 reports the results of estimating (6) on the sample of seven investing countries, taking σ_{ij} to be the share of country j's investment located in state i, and s_i to equal state i's share of the US population.[26] The estimation imposes the restriction that the β'_js of exemption countries equal each other, and the β'_js of foreign tax credit countries equal zero. The first two columns of Table 3 report the result of regressing (6) on the sample of 350 observations, taking PPE observations suppressed by BEA to be zeros. In estimating the regressions reported in Panel A, state corporate tax rates were used under the assumption that firms did not qualify as unitary businesses and therefore did not use state formulas to allocate their incomes.

The regression reported in column one of Table 3 suggests that foreign investors from exemption countries are considerably more responsive to state tax rates than are investors from

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[25]The low-tax states in Figure 3 are: Nevada, South Dakota, Texas, Washington, and Wyoming. The high-tax states are (in descending order of tax rates): Iowa, Connecticut, North Dakota, Arizona, West Virginia, California, Minnesota, Arkansas, Ohio, Vermont, New York, New Jersey, and Maine.

[26]Table 2 presents summary statistics of the variables used in the regressions. The regressions reported in Tables 3-8 and Table 10 were also run using other observable measures of s_i, including state i's share of total US investment and state i's share of total Japanese investment. The results were almost identical to those obtained by setting s_i equal to population shares.

foreign tax credit countries. A 1% tax rate increment is associated with an 8.2% smaller share of

PPE ownership by exemption investors than by foreign tax credit investors. The estimates presented

in the second column of Panel A reveal that this tax effect exhibits significant nonlinearity, making

tax rate differences more consequential if tax rates are low than if they are high. Columns 3 and 4 of

Panel A describe the regressions run with only the non-suppressed observations; the results are

similar to those reported in columns 1 and 2, with the difference that the linear tax effect is stronger

(a 1% tax rate increment is associated with a 9.6% smaller share of PPE ownership by exemption

investors) and the nonlinearity less pronounced. Panel B of Table 3 presents the same regressions

reported in Panel A, with the difference that state tax rates in Panel B are adjusted for the

apportionment formulas that apply to unitary businesses. The results are very similar to those

obtained in Panel A using statutory state tax rates.

Table 4 presents additional estimates of (6) in which data on US-owned PPE is included, and

the United States is treated as an exemption country (since US investors cannot claim tax credits for

state taxes paid). The estimated coefficients are smaller in magnitude, but otherwise similar, to their

counterparts reported in Table 3. For example, the regression reported in column one of Panel A

indicates that a 1% tax rate increment is associated with a 7.1% smaller share of PPE ownership by

exemption investors than by foreign tax credit investors. Of course, the US data are not perfectly

comparable to foreign data, which may account for some of the difference between the results

reported in Tables 3 and 4. In addition, there is reason to believe that foreign-owned corporations in

the US are audited more intensively than are equivalent US-owned corporations, thereby effectively

subjecting foreigners to higher tax rates and making inter-state tax differences greater for them than

for US-owned corporations.[27]

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[27]The IRS follows a policy of not disclosing the audit intensity of different categories of
taxpayers. It is, however, widely believed that foreign-owned corporations have always faced heavier
auditing than have US-owned corporations; in addition, the GAO (1992) reports that IRS resources

There are several possible sources of misspecification in the estimates reported in Tables 3 and 4. One potential problem is that it is not clear how to treat the observations deleted by BEA; a second is that the Tobit procedure relies on the validity of the assumption that the residuals follow a homoskedastic normal distribution in order to generate unbiased estimates of the coefficients in (6). Both of these problems are addressed, after a fashion, by the regressions reported in Panel A of Table 5. These regressions repeat the method used in Panel A of Table 3, with the difference that the observations are limited to the 15 states with over $3 billion of foreign-owned PPE in 1987.[29] The idea is that the treatment of deletions is likely to be less important in these regressions than in regressions using the whole sample, since BEA deletes fewer observations in larger states. Furthermore, regressions using data from only the largest states may encounter fewer problems related to heteroskedasticity than do regressions using the whole sample.

The estimated coefficients reported in Panel A of Table 5 are slightly larger in magnitude but otherwise similar to those reported in Panel A of Table 3. Hence it appears that the results reported in Table 3 are robust to this particular choice of a subsample. Other, more parametric, treatments of the potential misspecification problems are available. If heteroskedasticity takes the form that variances are proportional to state sizes, then (6) can re-run with observations weighted by the inverse root of state population shares. Panel B of Table 5 presents the results of this procedure, which have the same pattern as the estimates reported in Panel A of Table 3. In three out of the four regressions described in Panel B of Table 5, the estimated coefficients are smaller in magnitude than the

devoted to auditing foreign-owned corporations greatly increased in the late 1980s.

[29]The states are (in alphabetical order): Alabama, California, Georgia, Illinois, Louisiana, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, and Virginia. BEA deletes only 12 observations of PPE owned in these states by investors from the seven investing foreign countries. The selection of the sample of 15 states on the basis of total foreign-owned PPE can bias the coefficient estimates reported in Panel A of Table 5, but only under special circumstances, since the regressions are based on the *differences* in the behavior of two groups investing in the same states.

corresponding coefficients in Panel A of Table 3. The tax rate coefficient is significantly different from zero in three out of the four regressions. These regressions should be interpreted with caution, however, since the heteroskedasticity specification is untested.

Truncation and censoring imply that OLS estimates of (6) are generally biased. Nevertheless, Table 6 reports the results of various OLS specifications of (6), in order to explore the consequences of relaxing some of the parametric assumptions necessary to obtain consistent estimates of (6). The first two columns of Table 6 describe regressions run on the whole sample, while columns 3 and 4 describe regressions run only on observations that BEA did not delete and that reported nonzero PPE. The coefficient estimates in Table 6 are significantly larger in magnitude than the corresponding coefficients reported in Table 3. It is, of course, hard to know quite what to make of the OLS results, given all of the missing observations and zero observations, but they do suggest that the sizable estimated tax effects reported in Table 3 do not arise simply from some quirks in the model used to estimate (6).

Table 7 reports the results of estimating (6) with σ_{ij} defined to be state i's share of country j's total *number of manufacturing affiliates*. The idea is to use a left-side variable that does not raise the censoring and truncation complications that PPE does; the regressions are performed using OLS.[29] The results reported in Table 7 indicate that there is a significant negative effect of state tax rates on the number of manufacturing affiliates, though the estimated coefficients are considerably smaller in magnitude than the coefficients presented in Table 3. The estimates in the linear equations (presented in column 1 of Panel A and Panel B) imply that 1% higher tax rates are associated with 3% smaller

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[29]All seven investing foreign countries had positive numbers of manufacturing affiliates in all 50 states in 1987. Only one Australian-owned manufacturing affiliate owned PPE in Vermont in 1987, but otherwise, the smallest country-by-state cells contain three or more affiliates. Data on numbers of affiliates appear to exhibit no bunching near zero. The number of affiliates is, of course, restricted to integer values, making the share of numbers of affiliates something other than a perfectly continuous variable. This complication is ignored in the course of estimating the model by OLS.

shares of affiliates from exemption countries than from foreign tax credit countries. The smaller magnitudes of these estimated tax coefficients relative to those in Table 3 may reflect, in part, the measurement error introduced by using numbers of firms as an indicator of business activity. The magnitudes are also consistent with a view that tax policy influences the volume of local business capital at two margins: by influencing the number of local firms, and by influencing the average capitalization of local firms. The equations with nonlinear tax terms, presented in column 2 of Table 7, are of a different character than those that appear in Table 3, with positive (and insignificant) coefficients on the linear tax terms and negative (and significant) coefficients on the tax rate squared, implying that the effect of taxation on affiliate ownership is stronger at higher tax rates.

The regressions reported in Tables 3-7 impose the restriction that the β'_js of countries that exempt foreign income equal each other, and that the β'_js of the foreign tax credit countries equal zero. Table 8 presents regressions in which the β'_js are estimated without restriction. Of course, the presence of state dummy variables requires that one country's β'_j be omitted from each regression; Switzerland is the omitted country in the regressions presented in columns 1 and 3, and the United States is the omitted country (and US data are included) in the regressions presented in columns 2 and 4. The pattern of the results in Table 8 is consistent with the prior restrictions: the exemption countries (with the exception of Switzerland) have estimated β'_js that are significantly more negative than the foreign tax credit countries.[30] Indeed, investors from the exemption countries appear to avoid high-tax states to a greater degree than US investors do, which the theory does not predict, and

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[30]This restriction on the estimated βs is intended to permit a simple, aggregate, interpretation of the tax effects that emerge from estimating (6). Likelihood ratio tests reject (at the 95% level) the equality of the β_js imposed in estimating the equations presented in Tables 4-6. The equality restrictions may fail for any of a number of reasons, including heterogeneity of factor demand schedules and the possibility that foreign tax credit investors in the US differ in their abilities to exploit deferral and cross-crediting opportunities, making their US investments taxed to different degrees.

may simply reflect differences in data measurement and coverage, and the degree of tax enforcement to which foreign investors are subject.

It is possible that, despite the apparent robustness of the estimated tax effect to changes in model specification, some kind of spurious correlation is responsible for the results presented in Tables 3-8. For example, Japanese and UK firms might, for reasons unrelated to taxation, invest in industries that happen to be concentrated in high-tax states in the US. Unfortunately, BEA provides country-by-state PPE information only for all affiliates and for manufacturing affiliates; the regressions reported in Tables 3-8 use the latter. Some information is available on the industrial use of capital by manufacturing affiliates, distinguished by country of (foreign) owner; furthermore, BEA provides state-level data on the industrial distribution of (total) foreign-owned manufacturing capital. But even at this level of aggregation (which is less refined than 2-digit SICs), not enough information is available to adjust the regressions reliably for the industrial differences of foreign investors.[31] Consequently, it is impossible to reject the hypothesis that the apparent tax effects are the product of industrial happenstance, though there is no particular reason to accept that hypothesis.

Tables 9 and 10 explore the role of special investment incentives in influencing the ownership of local capital. States have grown increasingly willing to concede everything from property and income tax abatements to exemptions from local environmental regulations in order to attract new businesses.[32] These incentives are difficult to compare quantitatively, but Rangan (1991) offers one

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[31]BEA distinguishes eight industrial categories of PPE use by manufacturing affiliates: petroleum, food and kindred products, chemicals and allied products, primary and fabricated metals, machinery, other manufacturing, wholesale trade, and other industries. Of the 56 possible reporting cells for the seven foreign countries investing in these eight industries, BEA deletes 19 observations (34%). Of the 400 possible reporting cells for total foreign investments in these eight industries in the 50 states, BEA deletes 143 observations (36%). Restricting attention to the 15 largest states analyzed in the regressions reported in Table 5 offers little improvement, since BEA deletes 26 industrial observations of the 120 possible reporting cells (22%).

[32]See Milward and Newman (1989) and Wilson (1989) for surveys of the types of incentives offered and empirical estimates of their impact on local business activity.

measure.[33] Taking the local corporate tax rate to be exogenous to local fiscal incentives, the

regressions reported in Table 9 indicate that higher-tax states are the most likely to offer special

incentives.

State nontax business incentives, if made available to all investors, should be reflected in the

state constant terms estimated (but not reported) in the regressions presented in Tables 3-8. The

earlier regressions are misspecified, however, if important state incentives take the form of income

tax abatements that are of little value to foreign tax credit investors.[34] Table 10 presents estimates of

the same regressions reported in Table 3, with Rangan's measure of local incentives added to the

right side and interacted with a dummy variable for exemption investors. The estimated tax

coefficients do not differ significantly from those reported in Table 3, though the estimated

magnitudes of the nonlinear tax terms fall noticeably, probably reflecting the nonlinear correlation of

state tax rates and number of incentives offered.

5. Conclusions.

The results reported in section four indicate that high state tax rates have a significantly

negative effect on local investment. Investors who cannot claim credits for state tax payments appear

to reduce their investment shares, relative to foreign tax credit investors, by about 7-9% for every 1%

rate of taxation. This result appears, in one form or another, in a variety of specifications using

various subsets of the available data.

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[33]Rangan (1991) sums the number of investment incentives offered by states between 1983 and
1986 in five categories - pollution incentives, financial, tax, special, and other - measured by the
trade journal *Site Selection and Industrial Development*. He includes only those categories of
incentives offered by at least two of Alabama, Kentucky, and Pennsylvania (which he describes as
"superpowers" in the competition to attract foreign investment with innovative devices), and excludes
incentives offered by more than 40 states.

[34]Recall that investors from foreign tax credit countries cannot claim credits for property taxes,
user fees, and other payments that do not qualify as income taxes.

This estimated tax effect is quite large in magnitude, and it is worth considering whether one should take it literally to mean that if, say, Virginia were to lower its corporate tax rate from 6% to 5% it could attract 8% more investment. Such a response seems unlikely to materialize in the short run, or even in the long run. The reason has to do with the nature of equilibrium in local capital markets. One effect of state taxation may be to change the pattern of asset ownership without changing (to the same degree) the pattern of real investments. Since all of the regressions reported in this paper represent *comparisons* between one country's investment patterns and another's, the regressions record a significant effect of taxation even if a 1% rise in the local tax rate merely has the effect of encouraging German investors to sell their local assets to UK investors.

That said, it is hard to imagine that wholesale asset ownership shifts occur without influencing the pattern of real investments. Since foreign direct investment is generally a highly-taxed activity, it makes economic sense for firms to undertake such activity because they have the ability to exploit fixed assets or other sources of economic rent. Consequently, tax and other considerations that influence ownership patterns are also likely to influence real investment patterns, though perhaps not with the same magnitude that they influence ownership.

It is not possible, with the use of cross-sectional data, to test directly whether tax factors were an important part of the explanation for the boom in FDI in the United States in the 1980s. It is, however, possible to test for the effect of tax rates on FDI patterns within the US, and here the evidence is consistent with a very important effect of taxes on FDI. Of course, many aspects of the international economy changed at the end of the 1970s, the US tax system being just one. But the lesson of investor reactions to state taxes in the US is that even small variations in local tax rates may have an important effect on capital flows, and by implication, on the economy as a whole.

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Figure 1

FOREIGN DIRECT INVESTMENT IN THE US

PERCENTAGE OF US GPDI

PERCENT

YEAR
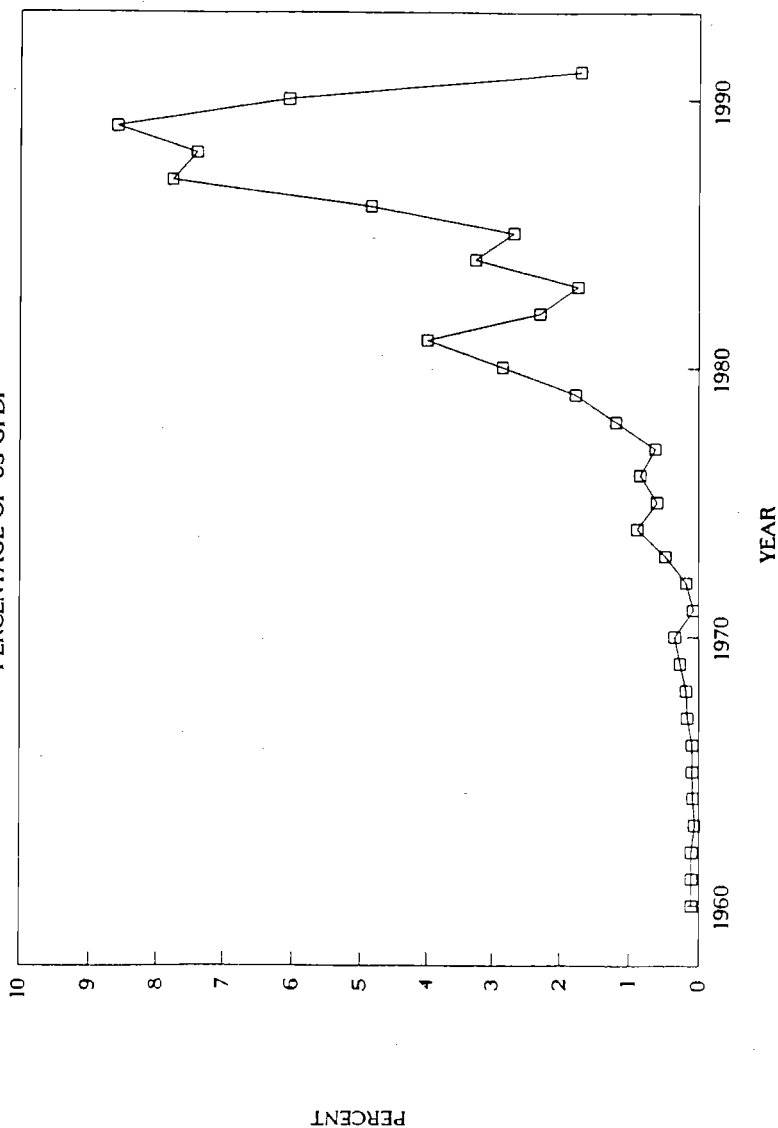
Figure 2

Investment-to-Population Ratios in 25 High-Tax States v. 25 Low-Tax States
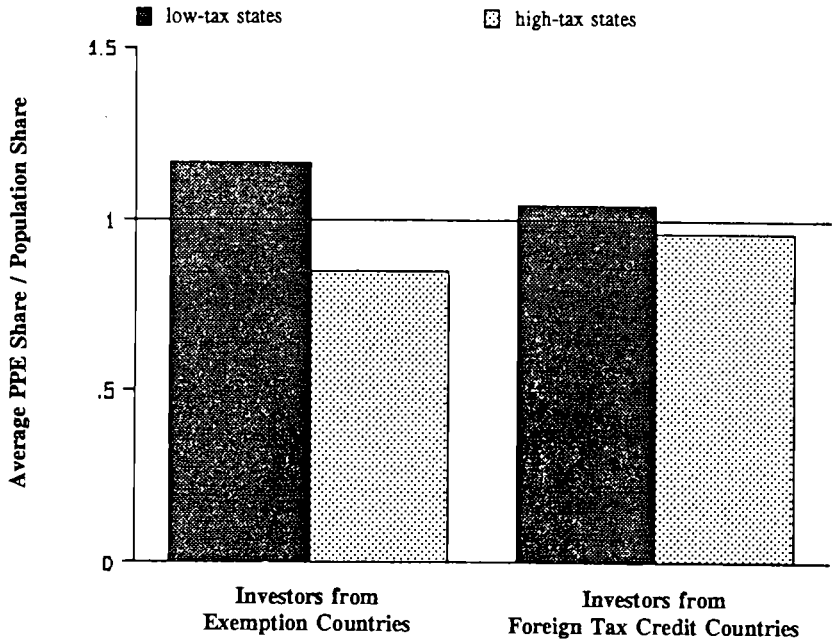
Figure 3

Investment-to-Population Ratios in Highest-Tax States v. Zero-Tax States
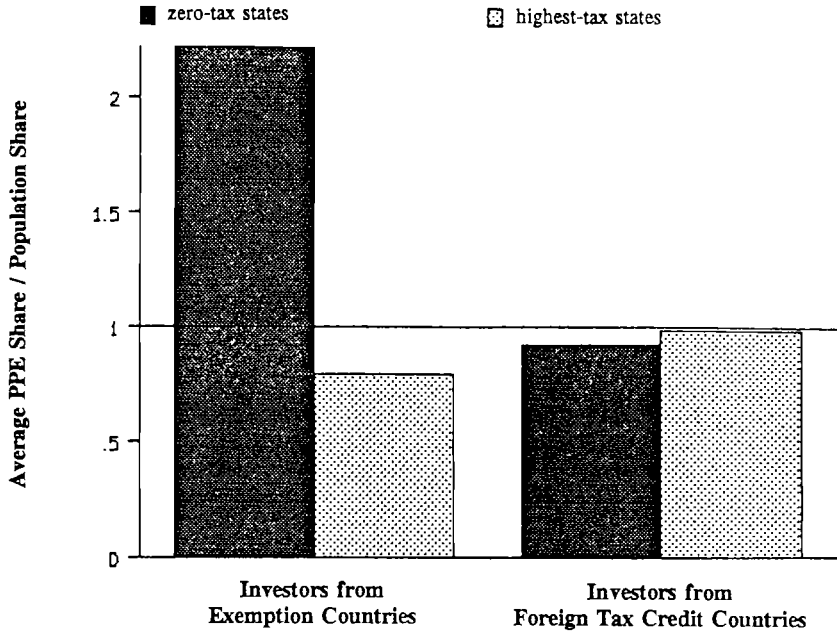
Table 1

Foreign Investments In the United States, By Country of Origin

Country	Foreign Direct Investment (1991)		Manufacturing PPE (1987)	
	1991 $	% of foreign total	1987 $	% of foreign total
Australia	$ 6.63 b	1.63 %	$ 2.21 b	1.71 %
Belgium	3.65	0.90	2.00	1.55
Bermuda	1.32	0.32	0.08	0.01
Canada	30.00	7.36	28.20	21.87
Denmark	1.22	0.30	0.14	0.11
France	22.74	5.58	11.26	8.73
Germany	28.17	6.91	16.03	12.43
Hong Kong	1.27	0.31	0.26	0.20
Ireland	1.29	0.32	1.86	1.44
Italy	2.86	0.70	0.84	0.65
Japan	86.66	21.26	12.94	10.03
Netherlands	63.85	15.67	11.94	9.26
New Zealand	0.13	0.03	1.30	1.01
Sweden	5.60	1.37	2.41	1.87
Switzerland	17.59	4.32	8.50	6.59
United Kingdom	106.06	26.02	20.90	16.21
Total Other Foreign	28.54	7.00	8.10	6.28

Source: Scholl et al. (1992) and US Department of Commerce (1990). The first column reports yearend 1991 stocks of FDI (on a historical-cost basis) by country; the third column reports gross book values of foreign-controlled manufacturing property, plant and equipment as of yearend 1987. Dollar amounts are billions of current dollars.

Table 2

State Tax and Investment Share Variables

Variable	Mean	Standard Deviation	n
Tax	0.0624	0.0303	50
Tax^2	0.0048	0.0035	50
Tax [Apportioned]	0.0595	0.0340	50
Tax^2 [Apportioned]	0.0047	0.0043	50
Incentives	43.296	12.068	50
Capital Share (Includes US)	0.02	0.0396	400
Capital Share (Foreign Only)	0.02	0.0416	350
Affiliates Share (Foreign Only)	0.02	0.0184	350

Note: The Tax variable is the statutory state corporate income tax rate in 1987; Tax [Apportioned] is the state corporate income tax rate as adjusted according to state apportionment formulas in effect in 1987. The variable Incentives is the number of special state investment incentives, measured with the methodology described in Rangan (1991). Capital Share is each state's share of the total US manufacturing property, plant and equipment investment of each investing country. There are eight investing countries in the sample: Australia, Canada, France, Germany, Japan, Switzerland, the United Kingdom, and the United States. Data for the US are excluded in the calculation of the Capital Share (Foreign Only). Affiliates Share is each state's share of the total number of affiliates for each of the seven foreign investing countries.

Table 3

State Taxes and State Investment Shares, Foreigners Only, 1987

Dependent Variable: Share of Total Investment in State

	Whole Sample		Missing Observations Excluded	

Panel A: Statutory State Tax Rates

Tax	-8.2098	-38.8719	-9.5688	-31.1751
	(2.3321)	(8.5401)	(2.0690)	(7.6883)
Tax^2		236.1780		166.7614
		(63.7311)		(57.4221)
∂	0.0234	0.0230	0.0206	0.0204
	(0.0009)	(0.0009)	(0.0008)	(0.0008)
log L	465.505	469.900	536.494	539.034
n	350	350	272	272

Panel B: Apportioned State Tax Rates

Tax [Apportioned] ·	-8.3722	-36.1252	-9.4003	-28.7759
	(2.2631)	(8.1009)	(2.0127)	(7.3407)
Tax^2 [Apportioned]		212.0093		148.3548
		(59.8372)		(54.3139)
∂	0.0233	0.0228	0.0206	0.0204
	(0.0009)	(0.0009)	(0.0008)	(0.0008)
log L	466.350	470.398	536.999	539.230
n	350	350	272	272

Note: Data on US-owned affiliates are excluded from the sample. Country dummies (interacted with state sizes) and state dummies are included (but not reported) in each regression. The columns report coefficients from Tobit regressions in which the dependent variable is the state's share of each country's manufacturing FDI. Standard errors are in parentheses.

Table 4

State Taxes and State Investment Shares, Foreign and American Firms, 1987

Dependent Variable: Share of Total Investment in State

	Whole Sample		Missing Observations Excluded	
Panel A: Statutory State Tax Rates				
Tax	-7.0594	-30.2279	-8.1942	-24.6380
	(2.0956)	(7.7360)	(1.9027)	(7.0890)
Tax^2		178.7081		127.0157
		(57.7213)		(52.9224)
$\hat{\partial}$	0.0215	0.0213	0.0195	0.0194
	(0.0008)	(0.0008)	(0.0007)	(0.0007)
log L	599.116	602.143	677.196	678.909
n	400	400	322	322
Panel B: Apportioned State Tax Rates				
Tax	-7.2462	-28.5078	-8.2033	-22.7688
[Apportioned]	(2.0292)	(7.3330)	(1.8451)	(6.7522)
Tax^2		162.8536		111.6954
[Apportioned]		(54.2409)		(49.9820)
$\hat{\partial}$	0.0215	0.0212	0.0194	0.0193
	(0.0008)	(0.0008)	(0.0007)	(0.0007)
log L	599.965	602.848	678.002	679.472
n	400	400	322	322

Note: Data on US-owned affiliates are included in the sample. Country dummies (interacted with state sizes) and state dummies are included (but not reported) in each regression. The columns report coefficients from Tobit regressions in which the dependent variable is the state's share of each country's manufacturing FDI. Standard errors are in parentheses.

Table 5

State Taxes and State Investment Shares, Foreigners Only, Adjusted for State Sizes, 1987

Dependent Variable: Share of Total Investment in State

	Whole Sample		Missing Observations Excluded	

Panel A: 15 Large States Only (Unweighted)

Tax	-10.0962	-51.3186	-10.8270	-37.6144
	(4.0424)	(15.6556)	(3.1486)	(12.2658)
Tax²		321.8982		209.9766
		(118.9701)		(93.3146)
$\hat{\sigma}$	0.0384	0.0379	0.0298	0.0294
	(0.0022)	(0.0022)	(0.0015)	(0.0015)
log L	134.596	136.413	151.718	153.224
n	105	105	93	93

Panel B: Weighted by Inverse State Sizes

Tax	-5.4671	-38.9187	-7.6153	-26.5032
	(3.5120)	(11.7421)	(3.2164)	(10.9452)
Tax²		270.8152		153.0765
		(91.1067)		(85.0866)
$\hat{\sigma}$	0.1436	0.1418	0.1296	0.1291
	(0.0055)	(0.0054)	(0.0050)	(0.0050)
log L	19.123	21.5184	95.3000	95.7598
n	350	350	272	272

Note: Data on US-owned affiliates are excluded from the sample. Country dummies (interacted with state sizes) and state dummies are included (but not reported) in each regression. The columns report coefficients from Tobit regressions in which the dependent variable is the state's share of each country's manufacturing FDI. Standard errors are in parentheses.

Table 6

State Taxes and State Investment Shares, Foreigners Only, 1987: OLS Results

Dependent Variable: Share of Total Investment in State

	Whole Sample		Missing Obs. and Zeros Excluded	
Panel A: Statutory State Tax Rates				
Tax	-12.2800	-50.1893	-13.0609	-43.7959
	(2.9588)	(10.7757)	(3.5205)	(13.0447)
Tax^2		293.6323		238.2515
		(80.3889)		(97.4692)
Adj. R^2	.585	.602	.605	.616
n	350	350	239	239
Panel B: Apportioned State Tax Rates				
Tax [Apportioned]	-11.5655	-46.3156	-12.5233	-40.4558
	(2.8744)	(10.2649)	(3.4285)	(12.5271)
Tax^2 [Apportioned]		267.1444		215.2115
		(75.8760)		(92.9201)
Adj. R^2	.584	.599	.604	.614
n	350	350	239	239

Note: Data on US-owned affiliates are excluded from the sample. Regressions are performed by OLS, in spite of the data censoring problem in the regressions reported in columns 1 and 2, and the truncation problem in the regressions reported in columns 3 and 4. State dummies are included (but not reported) in each regression. The columns report coefficients from OLS regressions in which the dependent variable is the state's share of each country's manufacturing FDI. Standard errors are in parentheses.

Table 7

State Taxes and Shares of Total Affiliated Establishments, 1987

Dependent Variable: State Share of Total Affiliates

Panel A: Statutory State Tax Rates

Tax	-3.1596	3.8511
	(0.7179)	(2.6396)
Tax^2		-54.3027
		(19.6918)
Adj. R^2	.930	.931
n	350	350

Panel B: Apportioned State Tax Rates

Tax [Apportioned]	-3.1398	1.6980
	(0.6951)	(2.5175)
Tax^2 [Apportioned]		-37.1911
		(18.6084)
Adj. R^2	.930	.931
n	350	350

Note: Data on US-owned affiliates are excluded from this sample. The dependent variable is a country's ratio of the *number* of affiliates its investors own in a state to the total *number* of US affiliates they own. Regressions are performed by OLS. State dummies are included (but not reported) in each regression. Standard errors are in parentheses.

Table 8

State Tax Effects by Investing Country, 1987

Dependent Variable: Share of Total Investment in State

	Whole Sample		Missing Observations Excluded	
Australia*Tax	-10.0590	-6.5896	-13.1188	-7.4542
	(3.6125)	(3.5229)	(3.2593)	(2.8462)
Canada*Tax	-12.7105	-9.2188	-12.4881	-9.3543
	(3.5771)	(3.4954)	(3.1437)	(2.7509)
France*Tax	-10.9146	-7.4004	-11.6914	-8.6540
	(3.5801)	(3.4983)	(3.1657)	(2.7684)
Germany*Tax	-11.1517	-7.7411	-11.3754	-8.2554
	(3.5793)	(3.4975)	(3.1456)	(2.7543)
Japan*Tax	0.4847	3.8620	1.7018	5.1414
	(3.5761)	(3.4944)	(3.1396)	(2.7458)
Switzerland*Tax	***	3.5784	***	2.6022
		(3.4986)		(2.7544)
UK*Tax	-2.4343	1.1881	-1.7838	1.1974
	(3.5739)	(3.4924)	(3.1350)	(2.7416)
US Investment Used as Excluded Category	No	Yes	No	Yes
$\hat{\sigma}$	0.0212	0.0207	0.0185	0.0163
	(0.0008)	(0.0008)	(0.0007)	(0.0005)
log L	470.777	605.897	541.309	687.894
n	350	400	272	322

Note: Country dummies (interacted with state sizes) and state dummies are included (but not reported) in each regression. The columns report coefficients from Tobit regressions in which the dependent variable is the state's share of each country's manufacturing FDI. Data on US investment in US states are used in columns 2 and 4; these data are not used in columns 1 and 3, in which Swiss investments are the excluded category. Standard errors are in parentheses.

Table 9

Special Investment Incentives and State Tax Rates

Dependent Variable: Number of State Investment Incentives

Constant	32.1781 (3.5627)	30.7159 (4.5577)	30.3951 (3.6276)	26.5511 (4.8408)
Tax	178.1641 (51.4645)	256.2103 (158.5842)	166.1062 (50.8069)	346.2441 (159.3017)
Tax^2		-711.1341 (1365.526)		-1667.0160 (1397.9120)
Population Share			126.7730 (71.4529)	156.3722 (75.3404)
Adj. R^2	.183	.171	.218	.225
n	50	50	50	50

Note: The columns report coefficients from OLS regressions in which the dependent variable is the state's number of special investment incentives, measured using the methodology described in Rangan (1991). Standard errors are in parentheses.

Table 10

State Taxes, Special Incentives, and State Investment Shares, 1987

	Dependent Variable: Share of Total Investment in State			
	Whole Sample		Missing Observations Excluded	

Panel A: Statutory State Tax Rates

Tax	-6.6731	-35.1167	-8.1758	-24.1863
	(2.3870)	(11.1714)	(2.1216)	(10.1746)
Tax^2		210.1498		118.2771
		(80.9572)		(73.8126)
Incentives	-0.0224	-0.0055	-0.0200	-0.0102
	(0.0084)	(0.0106)	(0.0076)	(0.0098)
$\hat{\sigma}$	0.0231	0.0229	0.0205	0.0204
	(0.0009)	(0.0009)	(0.0008)	(0.0008)
log L	468.150	470.093	539.459	539.823
n	350	350	272	272

Panel B: Apportioned State Tax Rates

Tax [Apportioned]	-7.2657	-29.4311	-8.4185	-17.3447
	(2.2624)	(10.7824)	(2.0145)	(9.8997)
Tax^2 [Apportioned]		165.1437		66.5022
		(78.8195)		(72.4532)
Incentives	-0.0242	-0.0096	-0.0224	-0.0164
	(0.0082)	(0.0107)	(0.0074)	(0.0099)
$\hat{\sigma}$	0.0230	0.0228	0.0204	0.0203
	(0.0009)	(0.0009)	(0.0008)	(0.0008)
log L	469.346	470.661	540.753	540.759
n	350	350	272	272

Note to Table 10: Data on US-owned affiliates are excluded from the sample. Country dummies (interacted with state sizes) and state dummies are included (but not reported) in each regression. The columns report coefficients from Tobit regressions in which the dependent variable is the state's share of each country's manufacturing FDI. The "Incentives" variable takes zero value in all states for foreign tax credit investors. Standard errors are in parentheses.