Taxes and Growth in a Financially Underdeveloped Country: Explaining the Chilean Investment Boom*

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Abstract

This paper argues that taxation of retained profits is particularly distortionary in economies with poorly developed financial markets. In such economies, a tax on retained profits reduces the investment of financially constrained firms, investment that has marginal product greater than the after-tax market real interest rate. Contrarily, a tax on distributed profits primarily reduces the investment of financially unconstrained firms. We argue that a 1984 – 1986 reduction in the tax rate on retained profits was a main cause of Chile's investment and growth boom that began in the mid-1980's. We test this theory using both data from Chilean national accounts and panel data on the investment behavior of "constrained" and "unconstrained" firms in Chile from 1982 to 1992.

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1 Introduction

Countries that are poor or growing slowly have low savings and investment rates; countries that are rich or growing rapidly have high savings and investment rates. While economists agree on the centrality of factor accumulation for economic development, there is much less agreement on what policies cause factor accumulation and growth.[1] While analysis of differences in growth and output per worker across countries has found many policies to be helpful in predicting development, causation is difficult to establish given the limited amount of data.[2] Robust results beyond the main stylized facts are few. In this paper, we add to what is known about growth from the comparison of countries by studying the policies and growth of one country, Chile, in greater detail.

We choose Chile for three reasons. First, the performance of the Chilean economy since the early 1980's has been quite remarkable: Chile's GDP per capita has grown by 5.6 percent a year since the mid 1980's (Figure 1*a*). While not as impressive as the growth miracles of the Asian developing economies during the postwar period, Chile's strong performance is nearly unique among the developing economies in the Western hemisphere. As Figure 1*b* shows, at the heart of the impressive growth is a savings and investment boom on the order of ten percent of GDP. Second, we choose Chile because it pursued a number of policy reforms likely to have increased investment and economic growth. We use national accounts data to build an understanding of Chilean growth but, given that we are studying one economic boom, we cannot reasonably test our theory on aggregate data. This leads to the third and perhaps most important reason that we choose Chile. Chile has some of the best microdata available among developing economies. This allows us to test the cross-sectional implications of our theory, and add to the evidence on the links between policies and growth provided by aggregate data.

To summarize our argument, the direct cause of the strong Chilean growth is a corporate tax reform that cut the corporate tax rate on retained profits from nearly 50 percent to 10 percent, over the period 1984 to 1986. The aggregate data provide three pieces of evidence in support of this explanation for the Chilean investment boom. First, following the tax reform, Chile's investment rate increased by 10 percent of GDP in five years – reaching 25 percent of GDP by 1989 – and has

[1] See for example Mankiw, Romer and Weil (1992), Young (1992), Barro and Sala-i-Martin (1995) chapter 12, Klenow and Rodriguez-Clare (1997), Hsieh (1999), and Bernanke and Gurkaynak (2001).

[2] "You can back the Summers and Heston data set out of published results using it." – anonymous.

remained at high levels since. From the perspective of timing, this tax reform occurs at the beginning of the investment boom while other reforms such as trade liberalization and the privatization of the public pension system significantly predate the boom.[3] While Chile did experience an investment boom from 1976 to 1981 financed by large current account deficits, the lending boom and following collapse are common to many countries in Latin America over this time period.[4] As shown Figure 2*a*, only the later investment boom is particular to Chile, since the rest of Latin America stagnated during the 1980's due to the debt crisis.[5] Second, as also shown in Figure 1*b*, the investment boom led the saving boom, rather than the reverse, consistent with a causal role for the corporate tax reform. Finally, the composition of the savings boom also favors the tax explanation. As shown in Figure 2*b*, business saving increased after the tax reform, while private saving and public saving remained largely unchanged. Firms responded to the reduction in the tax on retained profits by retaining more profits, and importantly did not decrease borrowing to offset this change.[6]

More broadly, taxing retained earnings is particularly harmful in an economy with poorly developed financial markets and with otherwise favorable macroeconomic policies and conditions, such as Chile in the mid 1980's. When some firms are credit constrained, taxation of retained profits is more distortionary than taxation of dividends, and reduces investment and slows convergence and growth. Taxation of retained profits reduces the investment of those firms with productive activities that are unable to raise sufficient external funds to undertake these investments at the unconstrained-efficient levels. By taxing retained profits, the government removes internal funds from some firms where the value of these resources exceed the real interest rate. Thus taxing retained earnings has a larger welfare loss than the loss associated with the typical distortionary taxation of capital. By reducing the profits tax rate on retained earnings, the Chilean government increased the internal funds of

[3]From a theoretical perspective, there is also the question as to whether any increase in saving caused by the privatization of the pension system would lead to an increase in investment in a small open economy such as Chile.

[4]The consensus view of these booms are that they were unsustainable lending booms driven by some combination of poorly-regulated financial liberalization and a surge in capital inflows driven by external factors. See for example Diaz-Alejandro (1984).

[5]We use Argentina, Brazil, Columbia, Mexico, and Venezuela as the countries in the "rest of Latin America."

[6]The flip side of the lack of an increase in corporate debt is the lack of an increase in active saving by households. This is consistent with cash constrained firms being owned by liquidity constrained households. If liquidity constraints and cash constraints were not important, a reduction in the retained profits tax rate might merely result in a shift in the composition of savings from household to corporate savings, with no effect on aggregate savings.

credit constrained firms leading to an investment boom and subsequent growth.

To test our theory and evaluate its importance, we turn to annual, plant-level data covering all Chilean manufacturing firms with more than 10 employees. We divide firms into those that are more and less likely to face financing constraints and compare the investment behavior of these two types of firms through the tax reform. We find that the plants that exhibit a high correlation of cash flow and investment before the reform increase their investment significantly more in the reform and to some extent following the reform as compared to similar firms that have low correlations of cash flow and investment. We also find some evidence that plants that previously had low short-term reserves increased their investment more during and to some extent following the reforms. Finally, we find no evidence that plants that pay rent or smaller plants benefitted disproportionately from the reform, but we also note that the small plant versus large plant distinction is less likely to measure the degree of financial constraints facing a plant in Chile, as compared to the United States.

Previous research has typically pointed to other market-oriented reforms undertaken by Chile, particularly the liberalization of the trade regime, the liberalization and deepening of financial markets, and the privatization of public pension system, rather than to corporate tax reform as the underlying cause of Chile's boom.[7] To be clear, our argument is not that these other reforms are irrelevant for growth in general. It is possible that this set of political and economic reforms raised Chile's steady-state level of output per person, although we do not evaluate this claim. We argue that the reduction in the tax on retained profits directly increased the accumulation of capital and economic growth. One interpretation is that the tax reform lead to rapid rather than slow convergence towards this higher steady-state. In applying this lesson to financially underdeveloped economies more broadly, it is important to note that taxing retained earnings is highly distortionary only when there are productive investment opportunities.

Our research is broadly related to three previous literatures. First, previous work generally finds that differences in tax rates (broadly defined) do not account for much difference across countries in the accumulation of capital.[8] Second, our analysis is closely related to studies of tax policy and

[7]See, for example, Edwards (1996), Gallego and Loayza (2000), Morandé (1996), and Pavcnik (1999).

[8]Barro, Mankiw, and Sala-i-Martin (1995) and Parente and Prescott (1999) present models in which investment rates are affected by tax policy. However, Easterly and Rebelo (1993) show that the effect of tax policy on growth is difficult to isolate empirically in a cross-country context. Cooley and Ohanian (1997) argue that Britain's poor economic performance in the postwar period is due to its high taxes on capital income.

investment in the United States using panel data on firms.[9] Finally, there is also a large literature on the importance of financial constraints in the United States, both in explaining firm-level investment and on how small shocks can result in large output changes.[10] To the extent that financial constraints on firms are still important in developed economies, our analysis suggests that taxation of retained profits may be quite distortionary even in the United States.

The outline of the paper is as follows. The next section models the effect of taxes on retained profits when some firms are constrained from borrowing as much as they would like to invest at market interest rates. Section 3 describes the 1984 tax reform in Chile and presents evidence about its impact from Chilean national accounts data. Section 4 details our use of the annual plant-level data from the Chilean manufacturing census. Our main results on the effect of the tax reform on investment by type of plant are contained in Section 5. Section 6 discusses alternative explanations for Chile's investment boom, and a final section concludes.

2 Investment and taxes on retained earnings

In this section, we consider a two-period model of investment in which firms choose capital to maximize profits. Firms face credit constraints and those with low internal funds are constrained from borrowing to invest at the optimal rate. We demonstrate that taxes on retained earnings are particularly harmful in this environment.

We set the tax structure in our simple model to mimic the structure of Chile's taxation of profits, dividends, and retained earnings, as described in detail in the next section. There are three taxes levied on capital income: profits tax (τ_p), retained profits tax (τ_r), and dividend income tax (τ_d). The retained profits and the dividend income tax rate are defined as the tax rate net of the profits tax; the effective tax rate on retained profits is therefore $\tau_p + \tau_r - \tau_p \cdot \tau_r$ and that on dividends is $\tau_p + \tau_d - \tau_p \cdot \tau_d$.

The economy is small and open so that the interest rate is fixed. We assume that foreign investors

[9] See for example the study of U.S. tax reforms in Cummins, Hassett, and Hubbard (1994).

[10] See Hubbard (1998), Bernanke and Gertler (1995), and Bernanke, Gertler, and Gilchrist (1999) for reviews. Most close to our own work, Calomiris and Hubbard (1995) use a firm's reaction to the retained profits tax of 1936 – 37 in the United States to identify liquidity constrained firms and then study their subsequent investment behavior. We reverse this process.

require an after tax return of $R^f = 1 + (1 - \tau_d) r$ where r is the pre-tax real interest rate in the economy.

The economy is populated by two-period-lived family firms. Firms invest at date 1 and consume at date 2 and maximize the present value of after-tax dividends. There are two types of firms: those who at date 1 have few internal funds, $Y_1 = Y_1^{lc}$ (who will be liquidity constrained); and those who at date 1 have significant internal funds, $Y_1 = Y_1^{nlc} > Y_1^{lc}$ (who will not be liquidity constrained). These internal funds are profits from previous activity, and are subject to taxation as such. These resources can be converted into date 2 income either by paying a dividend, or by using these internal funds to buy capital (I^I) in the "family" firm.

$$(1 - \tau_p) Y_1 = \frac{I^I}{1 - \tau_r} + d_1 \tag{2.1}$$

Internal funds invested are subject to taxation as retained earnings. Both dividends and investment are constrained to be weakly positive.

In addition to investing internal funds, the entrepreneur can borrow to finance investment in the family firm, I^B, which she repays in the second period at the market interest rate r. To capture financial constraints in a simple manner, we assume that the maximum amount the firm can borrow is limited to the amount of collateral creditors can seize in the event of a default and that this amount is the entrepreneurs' internal funds. Thus, investment financed by borrowing, I^B, cannot be greater than after-tax internal funds.

$$I^B \leq (1 - \tau_r)(1 - \tau_p) Y_1 \tag{2.2}$$

For a firm investing as much as it can, $I^B = I^I = (1 - \tau_r)(1 - \tau_p) Y_1$.

The family firm produces output net of materials and labor costs in the second period of $Y_2 = F(K) = F(I^B + I^I)$. Firms have access to the same production function regardless of type. Capital depreciates completely.

Finally, we assume that

$$(1 - \tau_r)\left(1 + (1 - \tau_p)\left(F'\left[2(1 - \tau_p)(1 - \tau_r) Y_1^{lc}\right] - 1\right)\right) > 1 + r \tag{A1}$$

$$F'\left[(1 - \tau_r)(1 - \tau_p) Y_1^{nlc}\right] < 1 + r \tag{A2}$$

which imply: (A1) that the entrepreneur with internal funds Y_1^{lc} cannot borrow sufficient to finance the unconstrained optimal amount of investment; and (A2) that the entrepreneur with Y_1^{nlc} can borrow the unconstrained optimal amount without hitting the financing constraint.

Firms maximize the present discounted value of after-tax dividends subject to the budget constraint and collateral constraint.

$$\begin{aligned} &Max_{I^B, I^I, d_1} \ (1+(1-\tau_d)r)(1-\tau_d)d_1 \\ &+(1-\tau_d)\left[F(I^B+I^I)-(1+r)I^B-\tau_p\left(F(I^B+I^I)-I^I-I^B-rI^B\right)\right] \\ &\text{subject to (2.1) and (2.2).} \end{aligned} \tag{2.3}$$

The first expression in equation (2.3) is the after-tax value in the second period of dividends paid in the first period. The second term is the after tax value of dividends paid in the second period. The dividends in the second period are after-tax profits, which are output less debt repayment less the profits tax and firms can write off depreciation and interest payments.

For an entrepreneur with sufficient internal funds, the optimal amount of capital is determined by the first order condition for debt I^B and the marginal product of capital equals the domestic real interest rate:

$$F'\left[I_d^* + I_f^*\right] = 1 + r. \tag{2.4}$$

where I_d^* and I_f^* are the optimal choices of I_d and I_f. The marginal product of capital of an unconstrained firm is set higher than the world rate of return due to the tax on dividends. Since interest costs are tax deductible, the choice of capital stock is not affected by profit taxes or taxes on retained earnings.[11] The unconstrained firm pays its first-period profits out as dividends if the wealth of the entrepreneur is higher saving the dividends outside the firm $(1-\tau_d)(1+(1-\tau_d)r) > (1-\tau_p)(1-\tau_r)(1+r)+\tau_p(1-\tau_r)$. This condition is met, for example, when dividends and profits are taxed similarly and retained profits are taxed.

[11]Because we have specified only the one constraint in capital markets, unconstrained firms are able to choose their capital structure as dictated by tax incentives. Thus ,they borrow to finance all new investment. In fact, informational, incentive or bankruptcy constraints seem to cause firms to limit their debt finance and in practice profits taxes are likely to distort capital accumulation. We abstract from these posibilities to keep out model simple and because our focus is not on the corporate profits tax. We do not mean to maintain that distortions from this source are not important.

The investment strategy of the entrepreneurs with few internal funds is to borrow and retain earnings so as to invest as much as possible. Equation (2.2) binds, $I_f^* = I_d^* = (1-\tau_p)(1-\tau_r)Y_1^{lc}$, and the marginal product of capital exceeds the market rate

$$(1-\tau_r)\left(1+(1-\tau_p)\left(F'\left[I_d^*+I_f^*\right]-1\right)\right) > 1+r. \tag{2.5}$$

Since the investment of liquidity constrained firms is constrained to be low, these firms have an after-tax marginal product of capital that exceeds the market interest rate.

There are two important implications of equations (2.4) and (2.5). The distortionary effect of dividend and profits taxes on the capital stock differ for liquidity constrained and non-constrained firms. The tax on retained profits does not affect the capital stock of firms that do not face binding liquidity constraints. Since they have access to capital markets, these firms are able to make up for a reduced level of internal funds (due to the retained profits tax) by borrowing more from external capital markets. However, dividend taxes distort the choice of capital stock of unconstrained firms, by raising the market real interest rate.

In contrast, a tax on retained profits does reduce the investment and capital stock for constrained firms. Since the capital stock of liquidity constrained firms is limited by their available cash flow, taxes on retained profits, by reducing the amount of internal funds available to the firm, decrease capital stock of these firms **one for one.** Dividend taxes affect the after-tax second-period income of liquidity-constrained entrepreneurs, but do not affect the capital stock because liquidity-constrained entrepreneurs are already investing their entire first period endowment income in their firms' capital stock.

We note three points about robustness. First, we model the heterogeneity across entrepreneurs as due to differences in internal funds. But the same implications follow if instead entrepreneurs have similar limited levels of internal funds and differ by the productivity of their projects. Then the entrepreneurs who are constrained are those who desire to invest the most – those with the most productive investment opportunities. Second, we have not been explicit about product markets. It is necessary that the size of unconstrained firms be limited by economies of scope (so there is diminishing returns in $F(.)$) or by demand, such as through monopolistic competition. Finally, in a multi-period model, a tax on retained profits reduces optimal investment for an unconstrained firm since the firm can postpone the tax burden of dividends by postponing paying out profits. However,

the impact remains significantly less than on the investment behavior of a constrained firm because it affects the marginal return to investment from the optimal level rather than a tightening of a binding constraint.

In sum, for firms that face liquidity constraints, taxes on retained earnings remove cash from inside credit-constrained firms where it is more valuable. In contrast, dividend taxes only distort the investment decisions of firms at their unconstrained optimal capital stocks.

From our model we can use a back of the envelope calculation to gauge the magnitude of the increase in capital stock that we expect to result from a cut in the tax in retained profits. The aggregate importance of a tax on retained profits depends on whether a significant number of firms are credit constrained. As a rough benchmark, suppose that half of the firms (weighted by their ex-post capital stock) in a developing country are credit constrained and are investing all their internal funds. The share of profits (before taxes) to value added can be approximated by the capital share, 30 percent. If the tax on retained profits falls from 50% to 10%, as happened in Chile, then the cash flow available to a firm increases from 15 percent to 27 percent of value-added. If our theory is correct and credit-constrained firms invest the additional cash flow, this tax policy change results in a 6 percentage point increase in the investment share of GDP $(12 \times 1/2)$, which is slightly more than half of the increase in the investment share of GDP in Chile since the mid 1980's.

3 The 1984-1986 corporate tax changes

In this section, we turn from our general argument concerning taxation of retained earnings back to the particular case of Chile. This section describes the major features of the corporate tax reform, the corresponding personal tax changes, and presents aggregate evidence on the resulting tax revenues and corporate debt policies.

The Chilean tax system prior to 1984 was based upon the idea that households and firms should be treated similarly in the tax code. Thus the same tax rate applied to retained and distributed earnings. The personal and corporate tax codes were structured so that profits paid to the owner and profits paid to the firm were taxed at the same rates.

More specifically, in the period prior to 1984, the tax code treated capital income in Chile as follows:

- Corporate profits: taxed at a 10 percent rate.
- Retained profits (net of the corporate profits tax):
  - taxed at the personal income tax rate of the owners (from 0 to 58 percent) for limited-liability corporations (Sociedad Limitadas);
  - taxed at a 40 percent rate for publicly traded companies (Sociedad Anonimas).
- Dividends (net of the corporate profits tax): taxed at the personal income tax rate (ranging up to 58 percent).[12]
- Capital gains (realized): taxed as dividends (if owned by an individual) or corporate profits (if owned by a firm).[13]

The effective tax rate on retained profits was quite high under this tax regime. Retained profits of publicly traded companies were first taxed at 10 percent (the corporate profits tax) and the residual net of the 10 percent tax was then taxed at 40 percent, for an effective tax rate of 46 percent on retained profits. The tax treatment of retained profits of limited liability corporations was similar, except that the residual net of the 10 percent corporate profits tax was taxed at the marginal income rate of the owner of the firm. This yields an effective tax rate on retained profits of $0.1 + 0.9\tau$ (τ is the marginal income tax rate of the owner of the firm) for limited liability corporations. In 1980, the average marginal income tax rate of individuals who paid taxes on dividends and retained profits was 43 percent, which translates into a typical effective tax rate of almost 50 percent on retained profits.[14]

In January 1984, the Chilean government enacted a significant tax reform. While the reform altered both the personal and corporate tax codes, the largest change was the near-elimination of

[12]This is the tax rate on dividends of limited liability firms, but the dividends tax for shareholders of publicly traded companies (Sociedades Anonimas) is slightly more complicated. There were two taxes on dividends of publicly traded companies. First, dividends were taxed at 40 percent. Second, dividends net of the 40 percent tax was taxed at the personal income tax rate minus 0.4. The tax rate on dividends (net of the corporate profits tax) is therefore $0.6*\tau + 0.16$, where τ is the personal income tax rate. If the personal income tax rate is 40 percent, the dividends tax rate is equal to the personal income tax rate (and equal to the dividend tax rate for limited liability corporations).

[13]Capital gains on assets held for less than a year were not taxed prior to 1984.

[14]Calculated from Servicio de Impuestos Internos (1980), pg. 44.

the tax on retained profits that had paralleled the tax on dividends. The effective tax on retained profits was lowered to 10 percent, effective immediately for limited liability corporations but phased in over three years for publicly traded companies.[15] The tax reform did not alter the tax on corporate profits (10 percent) and left the tax treatment of capital gains largely unchanged.[16] As to the taxation of dividends, the tax reform widened personal income tax brackets and lowered marginal income tax rates. Table 1 describes the personal income tax rates before and after the tax reform. In addition to the cut in income tax rates, the tax reform also provided a credit for corporate taxes paid that reduced the basis for the payment of the dividend tax. That is, the tax on dividends was lowered to $\tau - 0.1$, which results in an effective tax on dividends of $0.01 + 0.9\tau$. Table 2 summarizes the effective tax rate on dividends and retained profits before and after the tax reform.

It is worth asking how the cut in income tax rates is likely to have impacted the Chilean economy. The cuts in personal tax rates have two main effects on incentives. First, to the extent that the cuts in marginal tax rates on labor income were perceived as permanent (as they turned out to be), then the changing tax rates provide no incentive to substitute labor intertemporally. Instead, a wealth effect would reduce labor supply while a substitution effect from leisure to consumption would increase labor supply. Based on observed wage levels and hours of work across countries and over time, if either effect dominates, it is the wealth effect, so that if anything this reform should reduce labor supply. This is hardly an alternative explanation for the observed boom in savings. The one caveat to this argument is that lower tax rates on labor income also increase the incentive to accumulate human capital. It is possible that the investment boom occurred to take advantage of the higher expected future human capital levels. We know of no evidence that supports this hypothesis.

Second, the reduction in the taxation of dividend income increases the incentive to save and accumulate capital. Might this aspect of the reform then have caused some of the observed boom? Empirically, it seems unlikely since, as noted in the introduction, Chile experienced an investment boom at the time of the reform. Saving rose only slowly and Chile borrowed significantly from abroad until 1988 when saving roughly equalled investment. Given the weak observed link between capital

[15]The retained profits tax rate for publicly-traded companies was lowered to 30 percent in 1984, 15 percent in 1985, and 0 thereafter.

[16]The 1984 tax reform removed the tax exemption on capital gains held for less than a year, but otherwise did not change the tax treatment of capital gains.

income taxation and economic growth and the small changes that Chile actually implemented at this time, the changes in personal tax rates are unlikely to have significant contributed to the Chilean economic boom.

Turning back to the corporate tax code, while the rates were stable from 1986 to 1990, the tax on retained profits was eliminated entirely for the tax year 1991. Also in 1991, the effective tax on distributed profits was lowered by ten percent. Following 1991, both taxes were increased by 15 percent so that retained profits were taxed at a 15 percent rate during the 1990's.

Before proceeding to describe our analysis of microdata, we first document that the change in corporate taxation had large effects on the composition of saving, corporate balance sheets and tax revenues. First we reiterate three points shown in Figures 1*b* and 2*b*. Saving and investment in Chile increased from an average rate of 15 percent from 1960 to 1983, to an average rate of 25 percent in the first half of the 1990's. During this time, the bulk of the increase in saving was business saving rather than household saving. Finally, the increase in investment precedes the increase in saving, so that Chile ran large current account deficits through much of the 1980's.

We first examine the change in the debt to asset ratio for firms during this period, which we can observe only for publicly traded companies. Since publicly traded companies by definition have significant access to capital, they are much less likely than the typical firm to be credit constrained. In response to the large change in the incentives due to the reduction in the tax on retained earnings, an unconstrained firm should increase its retention of profits relative to payment of dividends.[17] As Figure 3*a* shows, this occurred. Following the reforms, publicly traded firms retained more earnings and reduced debt, but this occurs only after a significant lag. The reaction is consistent with our view that this tax reform had a significant effect on incentives. The lag is consistent with publicly traded firms using their retained profits at first to increase investment and capital, and, once near their new optimal levels of capital, to reduce debt. Only once debt is significantly reduced do these firms pay the additional tax costs to distribute profits.[18]

[17]There is also a slight reduction in the tax rate on dividends. The optimal response of an unconstrained firm is to increase its capital stock in response to slightly lower tax rate on dividends and pay more dividends. Thus the impact of dividend taxation is to reduce debt to capital ratios. Clearly the tax on retained earnings is the more important change.

[18]Note that, as in the United States, despite the favorable tax treatment of retained versus distributed profits, firms maintain fairly high levels of debt.

Figure 3*b* shows the impact of the tax reform and investment boom on real tax revenues collected on capital income, both from the personal income tax and the corporate profits tax.[19] The tax revenues from the category that includes retained profits declines from 250 million 1996 pesos in 1984 to less than 100 million 1996 pesos in 1987. At the same time, the revenues collected from the corporate income tax, the ten percent tax on all firm profits, rises starting in 1984 as firms invest and grow. From 1989 on, excepting the year 1990 when the profits tax was set to zero for a year, the increase in taxes collected through the general profits tax has more than replaced the lost revenues on retained profits.[20] Figure 3*b* suggests that Chile was able to reduce the tax on retained earnings and increase tax revenues.

Having described the tax reform in theory and practice, we turn to evidence on investment by Chilean manufacturing plants in the next section.

4 The Chilean Manufacturing Census

The main data for our analysis are from the Chilean Manufacturing Census (Encuesta Nacional Industrial Anual) conducted annually by the Chilean government statistical office (Instituto Nacional de Estadistica). The survey covers all manufacturing plants in Chile with more than ten employees and has been run annually since 1979. In addition to working with the raw data files, we also use some data from an extract from this survey compiled by the World Bank under the direction of James Tybout.

The advantages of the Chilean Manufacturing Census (CMC) for our purposes are its near universal coverage, annual frequency, and the wealth of information contained about each plant. We combine the information available in the annual surveys from 1979 to 1996 with the World Bank extract which covers only 1979 to 1986. The main unit of our analysis is a plant in a given year. The survey contains information on a wide variety of plant characteristics such as industry (4 digit $ISIC$), factor inputs, energy use, days of production, sales, and so forth. Of particular interest, plants report investment, employment and production on an annual basis. Stock values on the book value of fixed assets are collected in 1980, 1981, and annually since 1992.[21] The CMC data for year

[19] Figure 3*b* displays taxes collected during a year rather than the taxes collected on activity during a year.

[20] In 1990 the tax was cut to zero for a year to help stabilize the economy.

[21] There is a "book value of assets" measure reported in 1986 and 1987. The 1986 and 1987 numbers are implausibly

t are collected in surveys conducted in the beginning of year $t+1$. The data contain the value of flow variables over the entire year t and the value of stock variables as of the end of period t.[22]

The main dependent variable in our analysis is the investment to capital ratio. We focus on machinery and equipment and vehicles, and exclude buildings.[23] In the World Bank extract, the reported book value of capital stock has a monetary adjustment factor (in addition to being deflated to be made real) and is also adjusted to account for some depreciation. Since the documentation is unclear as to how these adjustments are derived, we construct two separate data extracts: one that is based on the reported book value of capital as reported in the raw survey data for 1980 (1981 if 1980 is missing or zero); the other that is based on the "net," "inflation adjusted" capital stock as reported in the World Bank extract for 1980 (1981 if 1980 is missing or zero).[24]

Turning to the construction of our investment series, the CMC contains information on four main categories of capital investment: buildings; machinery and equipment; vehicles; and, after 1986, land.[25] The CMC contains information on five types of investment: purchases of new capital, purchases of used capital, production of capital for own use, improvements in own capital by third parties, and sales of capital. Our measure of investment, to which our capital measure corresponds, is the sum of all five types of investment in machinery and equipment and vehicles. There are a large number of plants that report zero investment from purchases, production, improvements, and sales for all varieties of capital goods and it is not clear how many of these zeros constitute missing data

small (i.e. less than 5 percent of investment) and we do not use them.

[22]The survey questionnaires do not directly ask for asset information, but according to the instructions of the survey, plants are supposed to provide a copy of their balance sheets (that they are required to keep for tax purposes). These sheets are the source of the asset information, including the book value of capital, contained in the Survey.

[23]We exclude buildings because the book value of capital in 1980 and 1981 only lists land and buildings together while investment data until 1987 do not include land at all. That is, in 1980 or 1981 we construct capital stock using reports on book value of fixed assets in machinery and equipment, furniture, and vehicles and then distribute the amount reported in "other fixed assets" across the three categories (machinery, vehicles and real estate) in the proportion that each category is of the sum of the three. From 1992 on, the reported asset types are: land; buildings; machinery and equipment; and vehicles. Thus when we use a measure of book capital in this later period we simply sum the latter two categories.

[24]"Net" and "inflation adjusted" are the terms used in the Wold Bank documentation.

[25]In 1987 and 1988 investment in land is reported under "other" investment; after 1988, land is its own investment category. Prior to 1987, investment in land is not included in the survey; notably it is not included in investment in real estate (whereas in this period land is included in capital stock in real estate).

and how many constitute actual zero investment. If we treat these reports as legitimate, we find declining capital stocks and investment rates significantly below aggregate levels. We thus create two investment series that treat zero investment by plants in quite different manners. By analyzing both series, we ensure that our conclusions are robust to at least two quite different assumptions on the validity of zero reported investment. First, we set investment (and thus subsequent capital stocks) to missing if there is zero reported investment in all categories and types for two consecutive years. Second, and more conservatively, we set investment to missing only when the World Bank extract considers it missing. This treats the vast majority of zero investment reports as legitimate zeros and treats all such reports after 1986, the last year of the World Bank extract, as legitimate.[26]

We use a machinery price index to deflate both investment and fixed assets in both employed categories: machinery and equipment, and vehicles.[27] We deflate the reported book values of capital stock by the average deflator for year t and year $t+1$ since the reported book values refer to end of year values and the deflators provide a price index for the entire year. Flow variables such as investment are simply deflated by year t price deflators. From here on, our notation refers to real variables.

The capital stock is constructed from the 1980 and 1981 reports of book capital and later stocks are calculated by iterating forward using investment and the capital accumulation equation

$$K_{j,t} = (1 - \delta_j)K_{j,t-1} + I_{j,t} \tag{4.1}$$

where j indexes either machinery and equipment or vehicles and the timing follows from the fact that investment during year t adds to the capital reported for end of year $t-1$ to capital stock at the end of year t. We use the depreciation rates: 10% for machinery and equipment, and 20% for vehicles.[28] In this procedure, the data are cleaned in three ways. First, in some rare cases, we infer that the capital stock becomes negative, and we reset these stocks to zero.[29] Second, when a plant

[26]It should be noted that investment can be negative due to sales of capital and we treat negative reported investment as legitimate.

[27]Capital stock in "other assets" is distributed across categories in the construction of K by category and and the deflation is done after this distribution.

[28]These are the same rates used in the World Bank extract.

[29]Since capital is a denominator such an observation is not used in analysis. Since we drop extreme outliers when not doing robust estimation, some cases close in time to this observation with unreasonably low capital stocks are also not used.

disappears from the sample for only one year, we assume that it was merely missed in the survey for a year and carry its capital stock forward over the missing year without adjustment.[30] Finally, plants absent for more than one year are considered to have become too small to be in the survey or to have gone bankrupt, and any future observations on such a plant are dropped.

Our key dependent variable is investment during year t divided by capital at the start of the year (the end of the previous year):

$$\left(\frac{I}{K}\right)_{i,t} \equiv \frac{\sum_j I_{j,t}}{\sum_j K_{j,t-1}}$$

Table 3 provides a set of statistics on the number of plants, and the mean, standard deviation, and median of investment to capital ratios by year and by sample for the four data extracts that result from our different treatments of initial capital stock and when investment is denoted as missing. The four samples we consider are: A) the capital stock initialized as the reported book value and investment set to missing if it is zero in two consecutive years; B) the capital stock initialized from World Bank extract and investment set to missing if it is zero in two consecutive years; C) the capital stock initialized as the reported book value and investment set to missing if it is missing in the World Bank extract; D) the capital stock initialized from World Bank extract and investment set to missing if it is missing in the World Bank extract. The subsequent analysis presents results from samples A and B – those that set investment to missing more readily since in general results from samples C and D are quite similar. Where there are differences, they are noted.

On the basis of observed plant characteristics before 1983, the sample of plants is divided into thirds: those for whom internal funds are likely to be important, those for whom the observed characteristics suggest a middle range of financial constraint; and those for whom internal and external funds are likely to have similar importance. The characteristics upon which plants are split are described in the subsequent section with the results from each split.

A nontrivial number of plants, about 20 percent, switch industry codes at some point during the period over which they are observed. We treat these as legitimate. We find many plants are in the survey for only 1996 or for only 1979, and we simply do not use these plants. We consider investment to capital ratios greater than three or less than minus one to be mis-coded or mis-reported and so treat them as missing observations. Finally, we drop all plants that leave the sample prior to 1984.

[30] That is we assume that investment roughly equalled depreciation during the ommitted year.

5 Evidence from Chilean Manufacturing Plants

This section presents comparisons of the investment behavior of plants that are likely and unlikely to be having trouble raising external funds for productive investment. Our main measure of the likelihood of a plant being credit constrained is the correlation of cash flow and investment for a given plant in the period before the reforms.[31] We measure cash flow as the reported net profits of a firm. The argument for this measure is standard. Plants that are credit constrained rely more heavily on internal funds to finance operations and so are unable to maintain investment when cash flow drops significantly. Thus, the size of the correlation of cash flow and investment provides a good measure of the degree to which a plant relies on internal funds to finance investment. Our exact measure is the correlation between the ratio of net profits to capital and the ratio of gross investment to capital over the period 1980 to 1982, where we use the 1980 capital stock in place of the unavailable 1979 stock. While we choose this period due to our limited sample, we suspect that this is a good time period for observing which plants are credit constrained since 1982 was a large, temporary downturn. Plants able to maintain some investment or avoid selling off capital in this deep recession are the most likely to have had owners with deep pockets, access to borrowing, or significant internal funds.

We divide our sample of plants into thirds based on our measure of the correlation of profits and investment. We expect the group with the highest correlations to be the most likely to be credit constrained and to benefit the most from the reduction in the tax on retained profits. We call these plants "constrained," the middle third "possibly constrained" and the third of plants with the lowest correlation "unconstrained," however these terms do not imply that we believe this split to be perfect. Given this crude measure there are surely plants that are constrained in the unconstrained sample and vice versa. This should lead any estimates of the impact of the tax reform to be biased towards zero. Following these results we present evidence from several alternative or complementary

[31] Our identification strategy is the reverse of that of Calomiris and Hubbard (1995). Calmaris and Hubbard (1995) identifies firms as credit constrained or not based on their response to a 1937 surtax imposed on retained earnings. Firms that retain profits despite between 7 and 27 percent additional taxes on such retained profits are called credit constrained. Constrained plants are found to display a higher correlation between investment and cash flow than firms that do not retain profits in the face of this tax. In contrast, we identify credit constraints by sensitivity to cash flow prior to the tax change, and then examine whether constrained plants display a greater response to the tax change.

divisions of plants.

We begin by running the regression:

$$\ln\left(\frac{I}{K}\right)_{i,t} = \alpha_i + \gamma_t + C_i \mathrm{D}_t \beta_C + LC_i \mathrm{D}_t \beta_{LC} + \varepsilon_{i,t} \tag{5.1}$$

where α_i is a plant-specific fixed effect, γ_t is a year-specific fixed effect, C_i is an indicator of whether a plant is deemed constrained, LC_i is an indicator variable for whether a plant is likely constrained, D_t is a row-vector of indicator variables for years after the tax reform begins, and $\varepsilon_{i,t}$ captures other factors that impact plant's investment choices as well as measurement error in K and I. The column-vectors β_C and β_{LC} measure the differential investment activity of plants during and after the tax reform relative to their previous investment rates and relative to the contemporaneous investment choices of plants deemed unlikely to be constrained. We use all available data on plants from 1982 to 1992.

Table 4 presents our main results. The first and third column show the results from estimating equation (5.1) on sample A and sample B respectively. Plants with high correlation of investment and profits through the boom-bust period of $1980-1982$ show rapid and large increases in investment rates following the tax cuts. Constrained plants on average raise their investment rates by over seven percentage points during the three years of the reform. These estimates control for the average investment rate of a given plant and for the average investment rate in each year. Following the investment boom at the time of the reform, the relative investment rates of constrained firms decline slowly over time, although this effect is less present for sample A than sample B. Turning to the plants with medium correlations of profits and investment, those that we deem possibly constrained, we also find a significant boom among these plants, again after controlling for both time and plant effects.

We find similar results for samples C and sample D, and do not report these results. Throughout the remainder of the paper we limit ourselves to reporting results for sample A and sample B, and note any instances in which results from sample C or sample D lead to differing conclusions.

Our results so far rely on the assumption that the differences in the correlation of profits and investment across plants are driven by differences in access to capital rather than differences in technologies and product-specific demands. This assumption might fail if our results are largely comparing plants in different industries. That is, one might be concerned there are some industries

that use technologies that happen to produce a high correlation between profits and investment and also happened to boom in the post-1983 period. We first address this alternative by controlling for the investment rate of each plant's industry each year that we study. We then turn to alternative identification strategies.

We first compare the investment behavior of firms that are constrained and unconstrained relative to the average investment in that industry in that year. That is, we drop the firm and time effects in equation (5.1), and instead include a set of 33 three-digit industry level dummies interacted with a complete set of time dummy variables.[32] Denoting this interacted set α_{jt} we estimate

$$\ln\left(\frac{I}{K}\right)_{i,t} = \alpha_{jt} + \gamma_C C_i + \gamma_{LC} LC_i + C_i \mathrm{D}_t \beta_C + LC_i \mathrm{D}_t \beta_{LC} + \varepsilon_{i,t}. \tag{5.2}$$

The coefficients γ_C and γ_{LC} capture the average investment rates of constrained and possibly constrained plants and the coefficient vectors β_C and β_{LC} measure the higher investment to capital rates for constrained and possibly constrained plants in each year relative to the average in that industry in that year. Columns two and four of Table 4 show that our conclusions are robust to this alternative specification. The relative investment rates of constrained and possibly-constrained plants rise significantly during the reform. Again, there is some evidence that the relative boom in investment of constrained plants declines over time following the end of the reform. It is also interesting to note that the coefficients on the indicator variables for constrained and possibly constrained firms are both negative. This indicates that constrained firms invest at lower rates than unconstrained firms, as one might expect.

It is still the case however that we treat a plant as constrained if its correlation is in the top third for all plants rather than relative to the typical correlation in its own industry. Thus we next divide plants by investment-profits correlation relative to the average rate in their industry. A plant is deemed constrained if, among the plants in its four digit industry, it is among the top third in net profits-investment correlation prior to the reform. The results of this exercise are

[32]The food production industry (31) is treated as four separate three digit industries since it has so many of the firms in the sample (groups are 3111 and 3112 (meat and dairy); 3113, 3114, and 3115(canning and oils and fats); 3116, 3118 and 3119 (grains, sugar, and cocoa); 3117 (bakeries); 3121, 3122, and 3140 (other, animal feed, and tobacco); 313 as is). Industry 381 (fabricated metal except machines) is also treated more finely – it is simply left at the four digit level. Finally, due to small numbers, industry 3540 (petroleum and coal) is grouped with 353 (petroleum refineries), 3620 (glass) is grouped with 361 (pottery and china).

substantively identical to the results in Table 4. Plants we deem likely to be constrained experience larger investment booms.

Having established that plants with higher correlations of profits and investment benefit more from the reform, we now investigate alternative assumptions for identifying constrained and unconstrained plants. We consider three other measures that seek to measure the degree to which a plant is short on internal funds: the ratio of short-term reserves to capital, the ratio of rental payments to capital, and the size of the firm. All of the splits are based on numbers in 1980 and 1981, when book values are reported and well prior to the tax experiment we are considering. On balance, the results of these alternative splits do not clearly support or refute our main hypothesis.

Table 5 shows that the investment to capital ratios of plants deemed constrained by their holdings of short term reserves in 1980 and 1981 increase relative to other plants in the same industry and year, but not relative to their own average investment rates and the average investment rate in that year. That is, Columns 1 and 3 show no evidence of increases in investment activity at the time of the reform. Columns 2 and 4 show increases in investment rates, but these are significantly smaller than those found in Table 4. Findings using samples C and D are substantively similar. Identifying plants as constrained by comparing their level of short term reserves to their industry's average level, we find slightly more support for our hypothesis in samples C and sample D only.

One possible explanation for the lack of relative investment boom in this split of the data is that firms that are constrained may hold more liquid assets to avoid bankruptcy than plants that can borrow freely. Thus plants with credit lines maintain low levels of short-term assets without bankruptcy risk and contaminate this variable as an indicator of constrained status. There is also the possibility that the high inflation rates in 1980 and 1981 lead to a pattern of reserves that is more dependent on monetary factors than real factors. Nevertheless, we conclude that there is at best weak evidence to support our hypothesis in this cut of the data.

Our second alternative identification strategy is to assume that plants that are financially constrained and have highly productive investment opportunities may be able to rent physical capital to partially loosen the financial constraint. That is, a financially constrained firm is more likely to rent than own the building in which it operates. In Table 6 we investigate whether plants that report paying rental payments benefit more during the years of the reforms. Since most plants report paying no rent, we simply study those that do relative to those that do not. We find no evidence

that plants that pay more rent invest more following the reform.

The final alternative identification strategy is to assume that small plants are more likely to be constrained. This is standard practice in the literature on credit constrained plants in the United States – small plants are seen as having significantly lower access to credit markets – but in Chile several issues arise. First, the size of a plant is generally determined by its capital stock in the period prior to that being studied. Thus, capital stocks in 1980 and 1981 could be used to create a split. However, since only book capital is available and there is significant mismeasurement of initial capital stock, this would create a bias towards small plants having high investment to capital ratios early in the sample. This bias would create the incorrect illusion that small plants are growing faster than large plants prior to the tax reform and potentially that their growth slows relative to large plants as the tax reform is instituted. We provide a partial solution to this problem by splitting plants by the average number of employees in 1980 and 1981 rather than by initial capital stock.

The second problem with size is that most small manufacturing plants in Chile are family-run businesses that are perhaps limited in size by economies of scope. The most notable example of this is that 14 percent of our sample is plants in ISIC 3117, bakeries. In the United States, "small" firms in investment studies are usually small public firms, and in 1980 and 1981 in Chile less than one percent of plants are even public. Thus we are really comparing small plants to small plants. Finally, currently, but even more so in the early 1980's, Chile's financial markets are significantly less developed than those in the United States. Many relatively large plants in Chile do not have access to capital in the same way that relatively large companies in the United States do. In short, size is much less of an indicator of access to capital in Chile and more an indicator of industry, for example. We provide a partial solution to these problems by splitting firms by size in their industry, as discussed for previous splits.

Table 7 presents the results from dividing plants by size. To re-emphasize how different this exercise is from previous studies of US data, in the typical industry in Chile, small plants are defined as averaging 19 employees or less while large plants are defined as averaging 44 employees or more. As Table 7 shows, there is no evidence that small plants benefit disproportionately from the reform. If anything, it is the plants that start out the largest that benefit the most from the tax reforms.

In sum, plants that have a high correlation between cash flow (net profits) and investment prior to the reform have the largest increases in investment rates post-reform. This finding is quite robust.

However, alternative measures of which firms are likely to be constrained are not supportive of the main hypothesis. We believe that the first measure is the best, but report the results of our other analyses.

6 Other Policy Reforms in Chile

We argue that in a country such as Chile with underdeveloped financial markets, investment is constrained by the lack of access to the credit. By increasing the internal funds available to firms, the 1984 corporate tax reform played a large role in unleashing the savings and investment boom that took place in Chile. However, an alternative hypothesis is that most firms were not credit constrained and that the increase in aggregate national savings was due to other reforms implemented by Chile's military regime over this time period. Under this alternative hypothesis, the effect of the 1984 tax reform was simply to shift the desired composition of savings to corporate savings without affecting the aggregate investment rate.

This section describes the major reforms that occurred in Chile over the last 25 years: the semi-privatization of the public pension system, the liberalization and development of financial markets, and the opening to trade and capital flows.[33] Each subsection describes the major policy changes in one area and argues that the reforms in question are, based on theory and current evidence, unlikely to alter the inferences drawn so far in this paper. To be clear, we do not mean to argue that these reforms did not benefit Chilean economic growth. Rather each of these reforms surely played a role. But in each case we are skeptical that the direct role is large. Put differently, the corporate tax reform caused an investment boom, leading to faster convergence. These other reforms affected the steady-state levels of output and capital per worker, and convergence to these levels, for most countries and states, is a slow process.

6.1 Privatization of the public pension system

Prior to 1981, Chile had an unfunded, pay-as-you-go, public pension system much like the U.S. Social Security system.[34] The average payroll tax rate varied significantly across firms, but was around

[33] See the chapters in Bosworth, Dornbusch, and Laban (1994) and Perry and Leipziger (1999) for a detailed description of the reforms implemented by the Chilean government.

[34] For more complete descriptions, see Edwards (1996) and Diamond (1993).

30 percent of wages.[35] In 1981, the Chilean government cut and standardized the payroll tax, and created a new system which mandated contributions to heavily regulated but privately-managed accounts. All new entrants to the labor force had their payments (20% of wages), less administrative fees and a share for disability and health insurance (10% of wages), placed into private accounts which they could invest into one of several regulated mutual funds.[36] Those employed at the time of the reform had the option to switch into the new system or remain in the old. The new system was immediately popular: 70 percent of private employment switched in the first year.[37] Elderly workers tended to remain with the old system and 20 percent of the self-employed opted to participate.

The new system was fully funded, with the exception that all plans were guaranteed by the government. To pay the unfunded liabilities of the old system, the government issued a large amount of new debt, "recognition bonds," which were bought by households and slowly paid down by the government. The fiscal costs of these unfunded liabilities averaged 4.7 percent of GDP in 1981-1988.[38]

How might this reform be responsible for the savings and investment boom? First, note that as long as households do not change their consumption behavior and government spending does not change, such a reform has no effect on aggregate national savings. In such a Ricardian world, measured household savings increases by definition because contributions into private accounts are counted as private savings, and this increase is mirrored by the increased public spending necessary to pay the unfunded liabilities of the old system. There is therefore no net effect on aggregate savings.

But Ricardian equivalence seems like a poor assumption to apply to Chile in the early 1980's. Chile had poorly developed financial markets and, we argue, many households and small businesses were financially constrained. However, the impact of this reform is exactly the same as in a Ricardian world if the households cannot access or borrow against their private pension accounts. The consumption and investment of constrained households does not change since the privatization merely

[35]Exact estimates differ. See Coronado (1997), Gruber (1995), Edwards and Edwards (2000). The rates were significantly higher early in the 1970's.

[36]The health insurance share of the tax could be used by the payee to purchased health insurace from private providers, subject to strict regulation. Among new entrants, the participation of the self-employed was optional, and this has lead to a significant problem of households gaming some of the redistributive nature of the system by moving in and out of self-employment.

[37]Coronado (1997).

[38]Ortuzar (1988), quoted in Edwards (1996), Table 5.

replaces a government IOU with a particular account that the government funds by issuing a government IOU. One caveat to this argument is that this reform might alter factor prices, but this does not occur if rates of return are set by the world capital market. That is, the privatization of the pension system does not alter saving and investment if the domestic and/or international capital markets absorb the additional government bonds without altering the domestic real interest rate.

Indeed, in practice, the privatization seems to have just re-categorized public pension contributions as private instead of public saving. Figure 4*c* decomposes household savings into contributions to the privatized social security system and into non-social security savings. A significant part of the trend increase in household savings (from −3.8 percent of GDP in $1975-83$ to 1.7 percent of GDP in $1984-94$) is due to contributions into the privatized social security accounts. The increase in measured household savings due to these contributions is mirrored by lower public savings due to the costs of the unfunded liabilities of the old pension system (as shown in Figure 2*b*).

Our discussion so far assumes that taxes are nondistortionary. But if private savings incentives were affected by the reform, then the privatization of social security could be partially responsible for the savings boom. For example, if payroll taxes were high and not related to benefits before the reform, then the privatization of social security would increase the incentives to earn by giving households greater benefits for greater taxes paid. An increase in labor supply could lead to an investment boom. Evidence on this point is provided by Gruber (1995), which finds that the incidence of payroll taxes in Chile fell fully on wages, with no effect on employment. According to this evidence, payroll taxes under the old system did not create significant labor market distortions.

Another alternative channel is that the privatized pension funds may have lead to a deepening of financial markets and so increased the incentives of households to save. There is some evidence that non-social security savings increased over the relevant time period (see Figure 4*a*), but the magnitude of the increase – slightly over 3 percent of GDP from $1975-83$ to $1984-94$ – is small relative to the increase in the aggregate savings rate. Financial market development is discussed in the next section. For now, we note that even if the reform increased savings, in theory this does not lead to an investment boom in a small open economy like Chile. As Chile saved more, capital might simply flow out of the country. Many economists are sceptical of this small open economy theoretical argument on empirical grounds: saving rates and investment rates are highly correlated across countries. But if high saving lead to high investment in Chile, we would expect to see Chile

exporting at least a small amount of capital. In fact, following the reform and through much of the 1980's, Chile ran significant current account deficits, importing capital. This fact is strongly suggestive that high saving did not directly cause high investment, and more importantly that the role of the reform of the public pension system in the investment boom is minimal.

One important final piece of evidence comes from the experiences of the set of countries that reformed their public pension systems. Samwick (2000) studies seven pension reforms in Latin America, seven reforms in Africa, two reforms in Asia, and four reforms in developed economies. Samwick (2000) finds no evidence that countries that privatized their social security systems experience an increase in savings rates, with one exception, Chile.[39] It seems unlikely that Chile was the one exception in which the reform of a public pension lead to investment and saving booms.

6.2 Liberalization and development of financial markets

Over the last 25 years, there has been a significant increase in the role of bank credit and publicly-traded equity in Chile's financial markets.[40] However, most of this deepening of financial markets occurred in the 1970's and 1990's. The increase in financial intermediation of the 1990's seems a direct result of growth rather than the other way around.

During the first few years of the military regime, Chile focused its efforts on liberalizing the banking sector. From $1974-81$, the government lifted interest rate controls, eliminated entry barriers to the banking industry, lowered liquidity requirements for banks, eliminated quantitative controls on credit, and privatized state-owned banks. The result was a large expansion in bank credit, which increased from 10 percent of GDP in the early 1970's to almost 60 percent of GDP by the early 1980's. This development halted with the advent of the debt crisis and the recession of 1982. After the banking crisis of 1982, the government took over most of the country's banks, and, undertook the process of liquidating or recapitalizing and privatizing them, a process which took many years. Bank credit declined significantly in 1982 and continued falling during the beginning of the investment boom. Bank credit reached its low of 40 percent of GDP in $1985-86$. A new banking law in 1986 established limits on the leverage positions of the banks, increased reserve requirements,

[39] He concludes, ". . . no country other than Chile that moved to a system of based more on defined contributions during the sample period experienced an increase in the trend saving rates after reform." Samwick (2000), page 272.

[40] For additional details, see Gallego and Loayza (2000) and Barandarán and Hernández (1999).

and generally increased the supervisory capacity of the Central Bank over the banking sector. These restrictions kept bank credit roughly constant at 40 percent of GDP until the start of the 1990's. Thus, bank credit was falling as the investment boom began and did not rise as a share of output until investment and saving rates stopped growing.

Turning to the equity market, the stock market played an even more minor role in Chile's financial system in the 1980's; the market value of publicly traded equity in Chile was 30 percent of GDP in the 1980's. As shown in Figure 4b, it was not until the 1990's that the stock market in Chile increased rapidly. The market value of publicly-traded stocks in Chile (relative to GDP) roughly tripled from 35 percent of GDP in 1989 to 94 percent in 1996.[41] Since the growth of bank credit was limited in the 1990's, the deepening of Chile's capital markets during this decade was disproportionately due to the growth in the stock market.

Might these changes in Chile's financial structure have driven the savings and investment boom? They could explain the investment boom if firms that were previously credit constrained were able to obtain financing for their investments as a result of the deepening of Chile's financial markets. However, the aggregate evidence indicates that the investment boom was not financed by external credit but rather by retained earnings. In addition, the timing of the lending boom and the stock market boom in Chile does not support the hypothesis that the investment boom is due to developments in Chile's financial market. The investment boom in Chile took place from 1984 to 1989, but aggregate bank credit did not increase over this time period. Similarly, Chile's equity market did not increase significantly until the 1990's, after the investment boom. This suggests that the investment boom caused the development of Chile's equity market rather than the reverse.[42]

Finally, we check that our main result is not due to the fact that credit-constrained firms had more access to credit after 1984. Recall that we find that the investment of liquidity constrained firms (measured as firms with a high correlation of investment to cash-flow) increased after 1984

[41]This increase is only partially due to an increase in the price of Chilean equity. In fact, the quantity of Chilean equity, computed by dividing the market value of Chilean stock by its price, increased by 70 percent from 1990 to 1998 (Eyzaguirre and Lefort (1999), Table 3-1 and Figure 3-2).

[42]If the investment boom was driven by the development of Chile's financial markets, then a firm's investment should become less sensitive to cash flow, not more sensitive to cash flow. Gallego and Loayza (2000) find some evidence that the investment of publicly traded companies was less sensitive to cash-flow, but *only after the investment boom*, that is in the 1990's relative to the 1980's.

relative to the investment of firms that are unconstrained. If this boom were due to an increased access to credit, then we would expect that the ratio of interest payments to capital would rise for our constrained firms relative to our unconstrained firms. To test this hypothesis, we estimate equations (5.1) and (5.2) with interest payments to capital as the dependent variable. We find little evidence of this effect. Table 8 shows that the regressions differ by sample, with sample A showing a weak statistical rise in interest payments to debt and sample B showing the reverse.

6.3 Trade liberalization

Another major reform pursued by Chile in the late 1970's and early 1980's was the liberalization of its trade regime.[43] During the 1960's and early 1970's, Chile, like many developing economies, pursued policies of import substitution. By 1973, in addition to multiple official exchange rates and quantitative restrictions on imports, the average tariff rate exceeded 100 percent. Among the economic reforms pursued by the Pinochet government was international economic openness, so that by 1979, the average tariff rate had fallen to 12 percent and many of the regulatory restrictions on importing and exporting had been removed. From 1976 to 1981, Chilean manufacturing production grew by 25 percent, but at the same time, the balance of trade worsened and the real exchange rate appreciated significantly.

While the liberalization would seem like a boon to growth and possibly a direct cause of high rates of investment, policy reversed direction during the debt crisis and the deep 1982 recession. By 1984, when the investment boom began, tariffs had been raised to an average of 36 percent. It seems unlikely that decreased openness would lead to an investment boom. As the economy improved, the tariffs were again lowered, to an average of 15 percent by 1988.

To summarize, low tariffs lag economic growth and do not lead it. The investment boom began in 1984, when tariffs rates peaked. Openness may have been an important foundation for growth, but seems unlikely to have been the precipitating factor for the investment boom and growth of the 1980's and 1990's.

[43] See Tybout (1996) and Pavcnik (1999).

7 Conclusion

In 1984, Chile had a poorly developed financial system, with many banks under public control or poorly capitalized. Average tariff rates were double the rates of five years earlier. The semi-privatization of the public pension system had moved a large amount of implicit government debt into an explicit form. Yet, unlike the other Latin American economies, Chile experienced an investment and growth boom over the next decade.

This paper makes the novel argument that a corporate tax reform is the most direct cause of this boom. We use aggregate and plant-level data to make the case that the reduction in the taxation of retained earnings allowed financially constrained firms to take advantage of highly profitable investment activities. Plants that exhibit a high correlation of investment with cash flow prior to the tax reform increase their investment rates the most during and to some extent following the reform. Our case is not airtight, as the plant-level data does not confirm our main hypothesis for other identification strategies, strategies which we view as inferior but not without some merit.

The more general point of our paper is that, in countries with poorly developed financial markets, taxation of retained profits can have a significant effect on corporate savings and can therefore be particularly harmful for growth. Taxation of retained earnings slows convergence and growth to steady-state in an economy already burdened by poor financial markets. By taxing retained profits, the government removes internal funds from some firms where the value of these resources exceed the real interest rate. In an economy with well developed financial markets, this form of taxation is not particularly harmful.

This argument is conditioned on a country having otherwise favorable macroeconomic policies and conditions. In an economy with high levels of corruption or taxation, poor property rights, poor infrastructure, and so forth, the reduction of a tax on retained profits is likely to accomplish little since investment is low not because of poor financial markets but due to few opportunities for profit.

Finally, in terms of the contribution to understanding the large cross-country differences in savings and investment rates, our paper adds to evidence that underdeveloped financial markets are a significant factor retarding economic growth. Corporate saving is an important source of productive investment, and policies that increase the internal funds available to firms may have disproportionately large growth effects.

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Tax Bracket (1983-1985)	Marginal Tax Rates 1983	1984	1985	Tax Bracket (1986)	Marginal Tax Rate 1986
0-32,140	0.00	0.00	0.00	0-32,140	0.00
32,140-80,350	0.08	0.07	0.06	32,140-96,420	0.05
80,350-128,560	0.13	0.12	0.11	96,420-160,700	0.10
128,560-176,770	0.18	0.17	0.16	160,700-224,980	0.15
176,770-224,980	0.28	0.27	0.26	224,980-289,260	0.25
224,980-273,190	0.38	0.37	0.36	289,260-385,680	0.35
273,190-321,400	0.48	0.47	0.46	385,680-482,100	0.45
above 321,400	0.58	0.57	0.56	above 482,100	0.50

Table 1: Personal Income Tax Rates in Chile pre and post Reform

Notes. The tax brackets are indexed for inflation. The 1986 tax bracket is quoted in January 1984 pesos p/month

	Sociedad Anonimas		Sociedades Limitadas	
	Retained Profits	Distributed Profits	Retained Profits	Distributed Profits
pre-1984	0.460	$0.244 + 0.54\tau$	$0.1 + 0.9\tau$	$0.10 + 0.9\tau$
1984	0.370	$0.118 + 0.65\tau$	0.1	$0.01 + 0.9\tau$
1985	0.235	$0.04375 + 0.765\tau$	0.1	$0.01 + 0.9\tau$
post 1985	0.100	$0.01 + 0.9\tau$	0.1	$0.01 + 0.9\tau$

Table 2: Corporate Tax Rates in Chile pre and post Reform

Notes. τ is the marginal personal income tax rate.

Table 3

Number of Plants and Investment Capital Ratios by Year and Sample

Sample A
Capital stock initialized as the reported book value
Investment missing if zero in two consecutive years

Year	Number of Observations	Mean	Standard Deviation	Median
1981	1,869	0.215	0.361	0.091
1982	1,750	0.107	0.260	0.031
1983	1,450	0.096	0.230	0.029
1984	1,306	0.128	0.256	0.051
1985	1,197	0.095	0.171	0.039
1986	999	0.149	0.269	0.067
1987	855	0.136	0.212	0.069
1988	806	0.139	0.219	0.079
1989	772	0.153	0.217	0.093
1990	738	0.164	0.251	0.088
1991	704	0.168	0.269	0.107
1992	666	0.204	0.287	0.125

Sample B
Capital stock initialized from World Bank extract
Investment missing if zero in two consecutive years

Year	Number of Observations	Mean	Standard Deviation	Median
1981	1,873	0.198	0.366	0.080
1982	1,725	0.104	0.277	0.030
1983	1,437	0.099	0.246	0.029
1984	1,296	0.135	0.279	0.053
1985	1,195	0.112	0.231	0.041
1986	995	0.163	0.289	0.073
1987	852	0.148	0.237	0.076
1988	803	0.146	0.236	0.088
1989	771	0.167	0.237	0.098
1990	737	0.175	0.271	0.097
1991	701	0.178	0.286	0.113
1992	664	0.217	0.313	0.130

Sample C
Capital stock initialized as the reported book value
Investment missing following the World Bank extract

Year	Number of Observations	Mean	Standard Deviation	Median
1981	3,213	0.121	0.287	0.000
1982	3,240	0.058	0.202	0.000
1983	3,139	0.059	0.202	0.000
1984	3,151	0.072	0.211	0.000
1985	3,056	0.062	0.194	0.000
1986	2,807	0.087	0.251	0.000
1987	2,702	0.105	0.253	0.009
1988	2,563	0.118	0.282	0.020
1989	2,475	0.126	0.280	0.025
1990	2,398	0.122	0.274	0.019
1991	2,315	0.135	0.304	0.022
1992	2,270	0.144	0.291	0.022

Sample D
Capital stock initialized from World Bank extract
Investment missing following the World Bank extract

Year	Number of Observations	Mean	Standard Deviation	Median
1981	3,212	0.116	0.300	0.000
1982	3,211	0.058	0.214	0.000
1983	3,119	0.057	0.206	0.000
1984	3,130	0.074	0.225	0.000
1985	3,042	0.063	0.200	0.000
1986	2,788	0.087	0.243	0.000
1987	2,687	0.103	0.253	0.009
1988	2,550	0.111	0.262	0.019
1989	2,474	0.126	0.262	0.025
1990	2,395	0.119	0.266	0.018
1991	2,309	0.130	0.288	0.022
1992	2,281	0.144	0.295	0.022

Note: Samples A and B sets investment and the capital stock to missing if investment is reported as zero in two consecutive years. Samples C and D follow the World Bank extract set and sets investment and the capital stock to missing only when this data set does.

Table 4

Investment to Capital Regressions on Year and Correlation of Investment and Profits

		Sample A				Sample B			
		(1) Coeff.	S.E.	(2) Coeff.	S.E.	(3) Coeff.	S.E.	(4) Coeff.	S.E.
High correlation dummy:				-0.030	(0.011)			-0.043	(0.012)
High correlation plants in:	1984	0.090	(0.020)	0.097	(0.020)	0.081	(0.022)	0.096	(0.023)
	1985	0.057	(0.020)	0.056	(0.021)	0.063	(0.023)	0.074	(0.023)
	1986	0.080	(0.022)	0.078	(0.022)	0.078	(0.025)	0.089	(0.025)
	1987	0.034	(0.024)	0.037	(0.024)	0.024	(0.027)	0.031	(0.027)
	1988	0.063	(0.024)	0.078	(0.024)	0.046	(0.027)	0.069	(0.027)
	1989	0.031	(0.024)	0.042	(0.025)	0.019	(0.027)	0.034	(0.026)
	1990	0.054	(0.025)	0.072	(0.025)	0.022	(0.028)	0.048	(0.028)
	1991	0.032	(0.025)	0.040	(0.026)	0.012	(0.029)	0.025	(0.029)
	1992	0.055	(0.026)	0.043	(0.026)	0.040	(0.029)	0.037	(0.030)
Medium correlation dummy:				-0.040	(0.011)			-0.043	(0.012)
Medium correlation plants in:	1984	0.059	(0.019)	0.063	(0.020)	0.057	(0.022)	0.058	(0.022)
	1985	0.045	(0.020)	0.042	(0.020)	0.061	(0.023)	0.060	(0.023)
	1986	0.066	(0.022)	0.064	(0.022)	0.089	(0.025)	0.090	(0.025)
	1987	0.015	(0.023)	0.012	(0.023)	0.022	(0.026)	0.015	(0.026)
	1988	0.052	(0.024)	0.067	(0.024)	0.052	(0.027)	0.060	(0.027)
	1989	0.023	(0.024)	0.027	(0.024)	0.031	(0.027)	0.030	(0.027)
	1990	0.036	(0.024)	0.048	(0.024)	0.034	(0.027)	0.040	(0.027)
	1991	0.053	(0.025)	0.056	(0.025)	0.038	(0.028)	0.054	(0.028)
	1992	-0.012	(0.025)	-0.022	(0.025)	0.019	(0.028)	0.002	(0.029)
Year Effects:		Yes		No		Yes		No	
Industry x Year Effects		No		Yes		No		Yes	
Plant Effects		Yes		No		Yes		No	
Number of Obs		10069		10069		10041		10041	

Note: Samples A and B treat investment and capital stock as missing if investment is reported as zero in all categories in two consecutive years. Sample A constructs capital stock starting from the book value reported in 1980; Sample B constructs capital stock starting from the 1980 constructed measure in the World Bank extract. Regressions are run on data from 1982 to 1992 and include only plants that survive until at least 1985. See text for further details.

Table 5

Investment to Capital Regressions on Year and Short Term Reserves

		Sample A				Sample B			
		(1) Coeff.	S.E.	(2) Coeff.	S.E.	(3) Coeff.	S.E.	(4) Coeff.	S.E.
Low ST reserves dummy:				-0.001	(0.011)			0.002	(0.012)
Low ST reserves:	1984	-0.021	(0.020)	-0.001	(0.021)	-0.020	(0.022)	0.017	(0.023)
	1985	-0.005	(0.021)	0.003	(0.022)	0.003	(0.023)	0.032	(0.024)
	1986	0.014	(0.023)	0.018	(0.024)	0.001	(0.026)	0.028	(0.026)
	1987	0.010	(0.024)	0.014	(0.025)	-0.023	(0.027)	-0.004	(0.028)
	1988	0.007	(0.025)	0.007	(0.026)	-0.020	(0.028)	0.006	(0.029)
	1989	-0.052	(0.025)	-0.048	(0.026)	-0.034	(0.029)	-0.057	(0.029)
	1990	-0.002	(0.026)	-0.002	(0.026)	-0.057	(0.029)	-0.019	(0.029)
	1991	-0.045	(0.026)	-0.042	(0.027)	-0.074	(0.030)	-0.049	(0.030)
	1992	-0.009	(0.027)	0.011	(0.028)	-0.029	(0.031)	0.003	(0.031)
Medium ST reserves dummy:				-0.026	(0.010)			-0.038	(0.012)
Medium ST reserves:	1984	-0.023	(0.018)	-0.016	(0.019)	-0.023	(0.021)	-0.008	(0.022)
	1985	-0.003	(0.019)	0.005	(0.020)	-0.003	(0.021)	0.011	(0.022)
	1986	0.016	(0.020)	0.007	(0.021)	0.005	(0.023)	0.005	(0.024)
	1987	0.001	(0.021)	0.000	(0.022)	0.010	(0.024)	0.009	(0.025)
	1988	-0.001	(0.022)	-0.013	(0.023)	0.008	(0.025)	-0.009	(0.026)
	1989	-0.064	(0.022)	-0.068	(0.023)	-0.051	(0.025)	-0.052	(0.026)
	1990	0.033	(0.023)	0.033	(0.024)	0.028	(0.026)	0.019	(0.027)
	1991	-0.017	(0.023)	-0.024	(0.024)	-0.004	(0.026)	-0.024	(0.027)
	1992	-0.046	(0.023)	-0.037	(0.024)	-0.049	(0.027)	-0.058	(0.028)
Year Effects:		Yes		No		Yes		No	
Industry x Year Effects		No		Yes		No		Yes	
Plant Effects		Yes		No		Yes		No	
Number of Obs		10733		10733		11119		11119	

Note: Samples A and B treat investment and capital stock as missing if investment is reported as zero in all categories in two consecutive years. Sample A constructs capital stock starting from the book value reported in 1980; Sample B constructs capital stock starting from the 1980 constructed measure in the World Bank extract. Regressions are run on data from 1982 to 1992 and include only plants that survive until at least 1985. Size is measured by number of workers in 1980 and 1981. See text for further details.

Table 6

Investment to Capital Regressions on Rental Payments to Capital Ratios and Year

		Sample A				Sample B			
		(1) Coeff.	S.E.	(2) Coeff.	S.E.	(3) Coeff.	S.E.	(4) Coeff.	S.E.
High rent dummy:				0.028	(0.009)			0.025	(0.010)
High rent plants in:	1984	-0.013	(0.017)	-0.010	(0.017)	-0.011	(0.019)	-0.006	(0.019)
	1985	0.001	(0.017)	0.001	(0.018)	-0.003	(0.019)	-0.005	(0.020)
	1986	0.021	(0.019)	0.021	(0.019)	0.012	(0.021)	0.016	(0.021)
	1987	-0.015	(0.020)	-0.011	(0.021)	-0.028	(0.023)	-0.021	(0.023)
	1988	0.005	(0.021)	0.016	(0.021)	0.007	(0.023)	0.018	(0.024)
	1989	-0.013	(0.021)	-0.006	(0.022)	-0.022	(0.023)	-0.011	(0.024)
	1990	-0.008	(0.021)	0.010	(0.022)	-0.009	(0.024)	0.013	(0.024)
	1991	-0.014	(0.022)	0.004	(0.023)	-0.020	(0.025)	0.005	(0.025)
	1992	0.001	(0.022)	0.006	(0.023)	0.003	(0.025)	0.013	(0.026)
Year Effects:		Yes		No		Yes		No	
Industry x Year Effects		No		Yes		No		Yes	
Plant Effects		Yes		No		Yes		No	
Number of Obs		10941		10941		10876		10876	

Note: Samples A and B treat investment and capital stock as missing if investment is reported as zero in all categories in two consecutive years. Sample A constructs capital stock starting from the book value reported in 1980; Sample B constructs capital stock starting from the 1980 constructed measure in the World Bank extract. Regressions are run on data from 1982 to 1992 and include only plants that survive until at least 1985. See text for further details.

Table 7

Investment to Capital Regressions on Year and Size of Plant Relative to Industry Average

		Sample A				Sample B			
		(1) Coeff.	S.E.	(2) Coeff.	S.E.	(3) Coeff.	S.E.	(4) Coeff.	S.E.
Small plant dummy:				0.057	(0.011)			0.021	(0.012)
Small plants in:	1984	0.034	(0.019)	0.021	(0.020)	0.040	(0.021)	0.036	(0.022)
	1985	-0.012	(0.019)	-0.020	(0.021)	-0.005	(0.022)	0.011	(0.023)
	1986	-0.013	(0.021)	-0.006	(0.022)	-0.026	(0.024)	-0.003	(0.025)
	1987	-0.034	(0.023)	-0.026	(0.024)	-0.040	(0.026)	-0.012	(0.026)
	1988	0.001	(0.023)	0.014	(0.024)	-0.003	(0.026)	0.029	(0.027)
	1989	-0.070	(0.024)	-0.062	(0.025)	-0.086	(0.026)	-0.036	(0.027)
	1990	-0.026	(0.024)	-0.012	(0.025)	-0.035	(0.027)	0.010	(0.028)
	1991	-0.080	(0.025)	-0.076	(0.026)	-0.104	(0.028)	-0.066	(0.029)
	1992	-0.004	(0.026)	0.024	(0.027)	-0.037	(0.029)	0.060	(0.030)
Medium plant dummy				0.027	(0.010)			0.016	(0.012)
Medium plants in:	1984	-0.009	(0.018)	-0.001	(0.019)	-0.010	(0.020)	-0.002	(0.021)
	1985	-0.007	(0.019)	-0.004	(0.020)	0.005	(0.021)	0.017	(0.022)
	1986	-0.013	(0.020)	-0.007	(0.021)	-0.021	(0.023)	-0.011	(0.023)
	1987	-0.009	(0.021)	-0.012	(0.022)	-0.004	(0.024)	-0.007	(0.025)
	1988	0.009	(0.022)	0.020	(0.023)	0.005	(0.025)	0.016	(0.025)
	1989	-0.022	(0.022)	-0.013	(0.023)	-0.025	(0.025)	-0.020	(0.026)
	1990	-0.041	(0.023)	-0.029	(0.024)	-0.039	(0.025)	-0.033	(0.026)
	1991	-0.036	(0.023)	-0.018	(0.024)	-0.049	(0.026)	-0.035	(0.027)
	1992	-0.018	(0.023)	0.003	(0.025)	-0.002	(0.028)	0.013	(0.027)
Year Effects:		Yes		No		Yes		No	
Industry x Year Effects		No		Yes		No		Yes	
Plant Effects		Yes		No		Yes		No	
Number of Obs		11185		11185		11119		11119	

Note: Samples A and B treat investment and capital stock as missing if investment is reported as zero in all categories in two consecutive years. Sample A constructs capital stock starting from the book value reported in 1980; Sample B constructs capital stock starting from the 1980 constructed measure in the World Bank extract. Regressions are run on data from 1982 to 1992 and include only plants that survive until at least 1985. Size is measured by number of workers in 1980 and 1981. See text for further details.

Table 8

Interest Payments to Capital Regressions on Year and Correlation of Investment and Profits

		Sample A				Sample B			
		(1) Coeff.	S.E.	(2) Coeff.	S.E.	(3) Coeff.	S.E.	(4) Coeff.	S.E.
High correlation dummy:				0.006	(0.024)			0.182	(0.084)
High correlation plant:	1984	0.062	(0.038)	0.014	(0.045)	-0.064	(0.059)	-0.059	(0.083)
	1985	0.085	(0.039)	0.030	(0.046)	-0.083	(0.061)	-0.059	(0.085)
	1986	0.033	(0.042)	0.002	(0.049)	-0.109	(0.066)	-0.073	(0.070)
	1987	0.037	(0.045)	0.014	(0.053)	-0.124	(0.070)	-0.092	(0.074)
	1988	0.047	(0.046)	0.027	(0.054)	-0.144	(0.071)	-0.091	(0.076)
	1989	0.017	(0.047)	-0.007	(0.055)	-0.149	(0.072)	-0.127	(0.077)
	1990	0.009	(0.048)	-0.011	(0.056)	-0.160	(0.074)	-0.138	(0.079)
	1991	0.003	(0.049)	-0.025	(0.057)	-0.183	(0.075)	-0.151	(0.080)
	1992	-0.006	(0.050)	-0.030	(0.058)	-0.203	(0.077)	-0.159	(0.082)
Medium correlation dummy:				-0.008	(0.023)			-0.012	(0.083)
Medium correlation pl	1984	0.063	(0.037)	0.043	(0.044)	0.070	(0.058)	0.096	(0.082)
	1985	0.107	(0.039)	0.064	(0.045)	0.120	(0.060)	0.037	(0.084)
	1986	0.045	(0.042)	0.036	(0.049)	0.097	(0.065)	0.055	(0.069)
	1987	0.032	(0.045)	0.022	(0.051)	0.086	(0.069)	0.007	(0.073)
	1988	0.038	(0.045)	0.033	(0.053)	0.077	(0.071)	0.043	(0.075)
	1989	-0.012	(0.046)	-0.014	(0.053)	0.067	(0.071)	-0.011	(0.075)
	1990	0.002	(0.048)	-0.014	(0.054)	0.076	(0.072)	0.010	(0.076)
	1991	0.015	(0.047)	-0.009	(0.055)	0.075	(0.074)	-0.001	(0.078)
	1992	0.015	(0.048)	-0.001	(0.056)	0.077	(0.075)	0.009	(0.080)
Year Effects:		Yes		No		Yes		No	
Industry x Year Effects		No		Yes		No		Yes	
Plant Effects		Yes		No		Yes		No	
Number of Obs		10069		10069		10041		10041	

Note: Samples A and B treat investment and capital stock as missing if investment is reported as zero in all categories in two consecutive years. Sample A constructs capital stock starting from the book value reported in 1980; Sample B constructs capital stock starting from the 1980 constructed measure in the World Bank extract. Regressions are run on data from 1982 to 1992 and include only plants that survive until at least 1985. See text for further details.

Figure 1a

Figure 1b

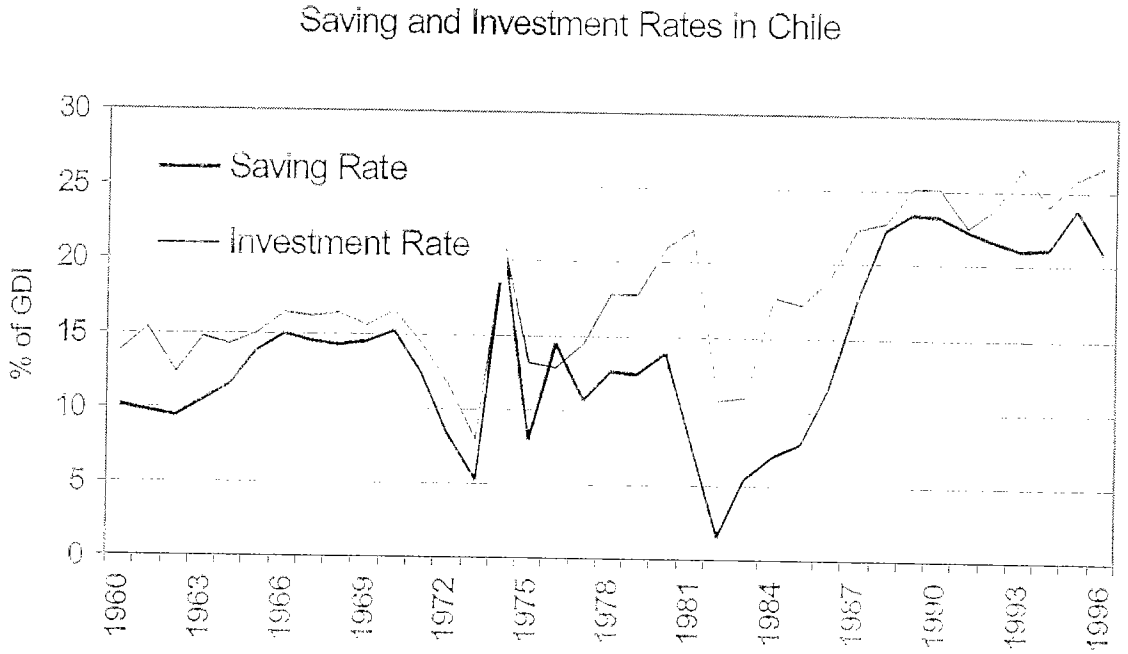

Figure 2a

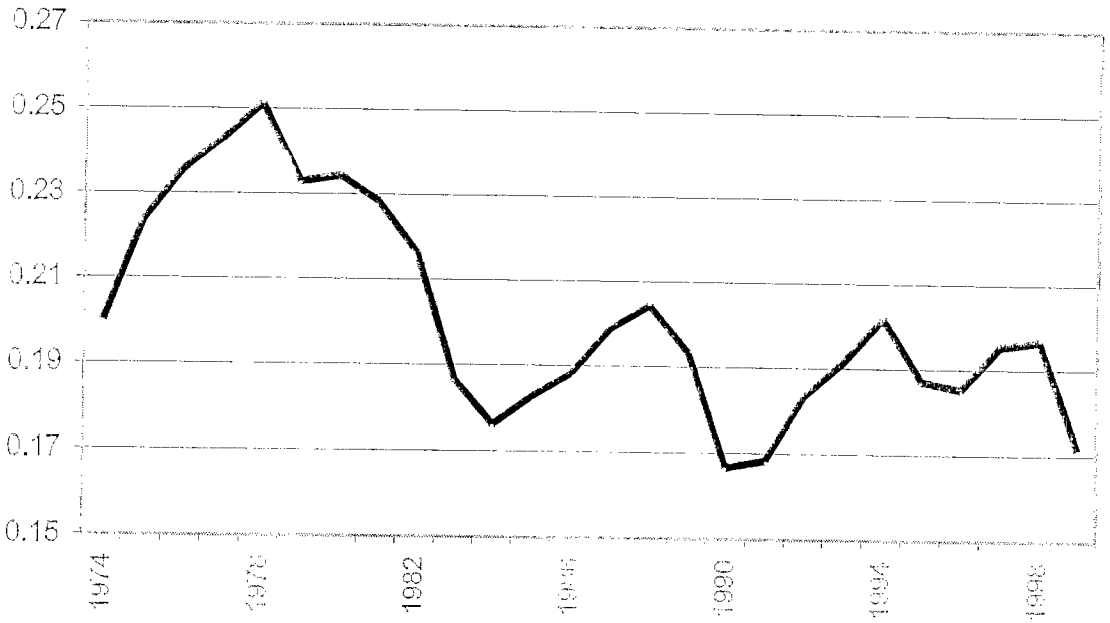

Figure 2b

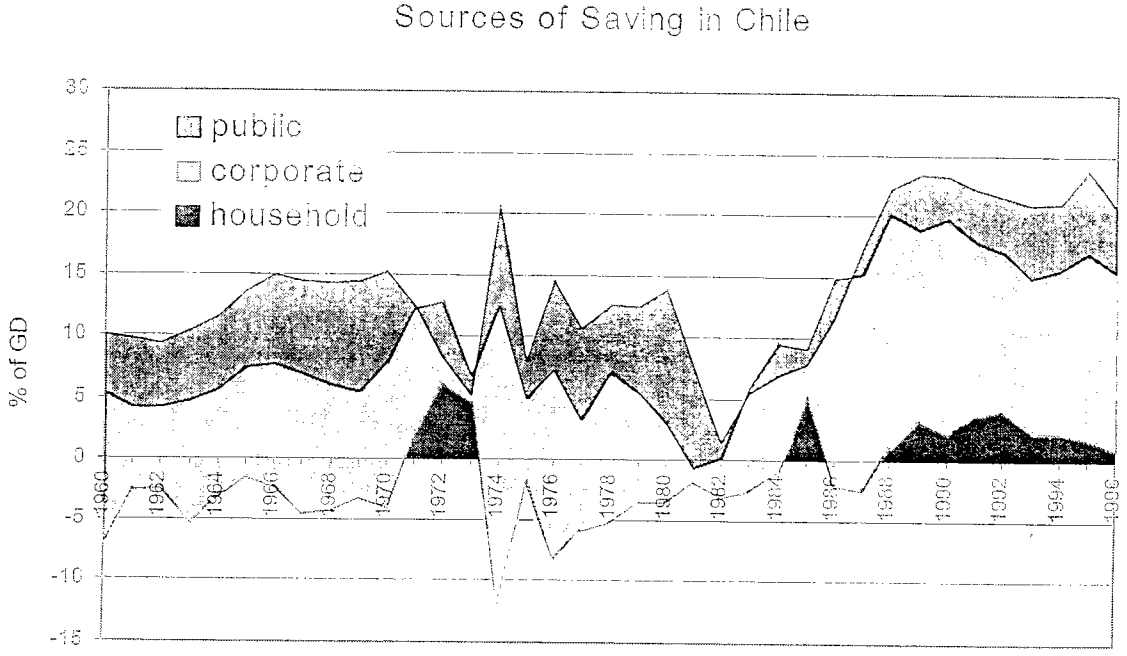

Figure 3a

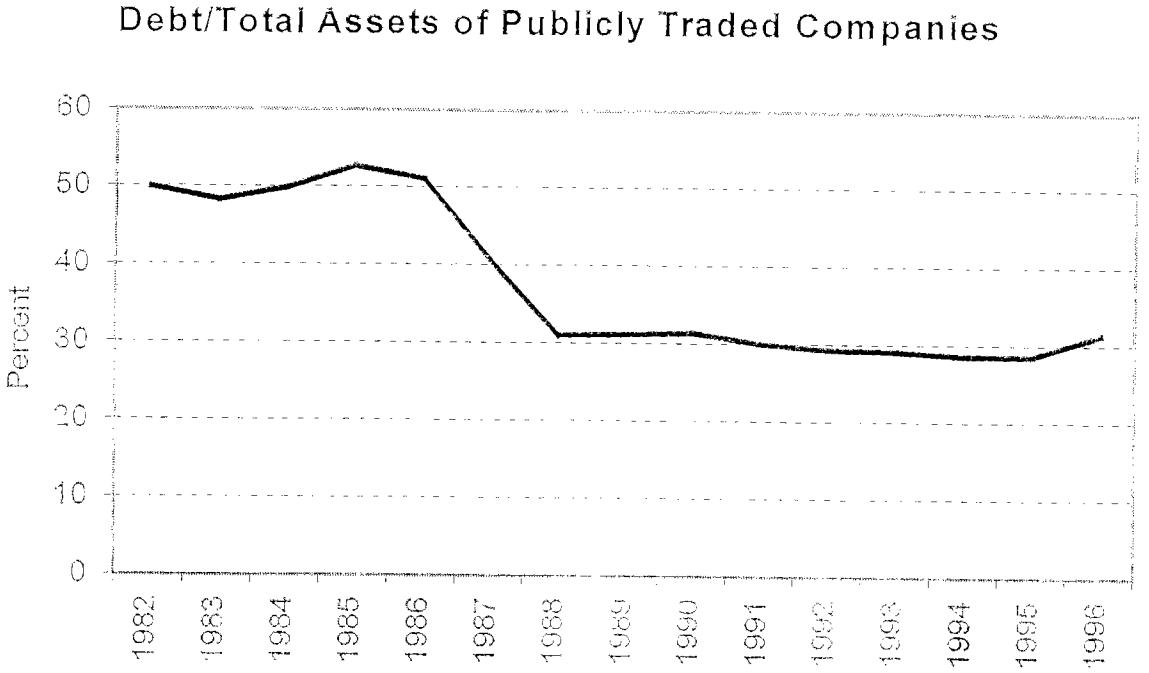

Figure 3b

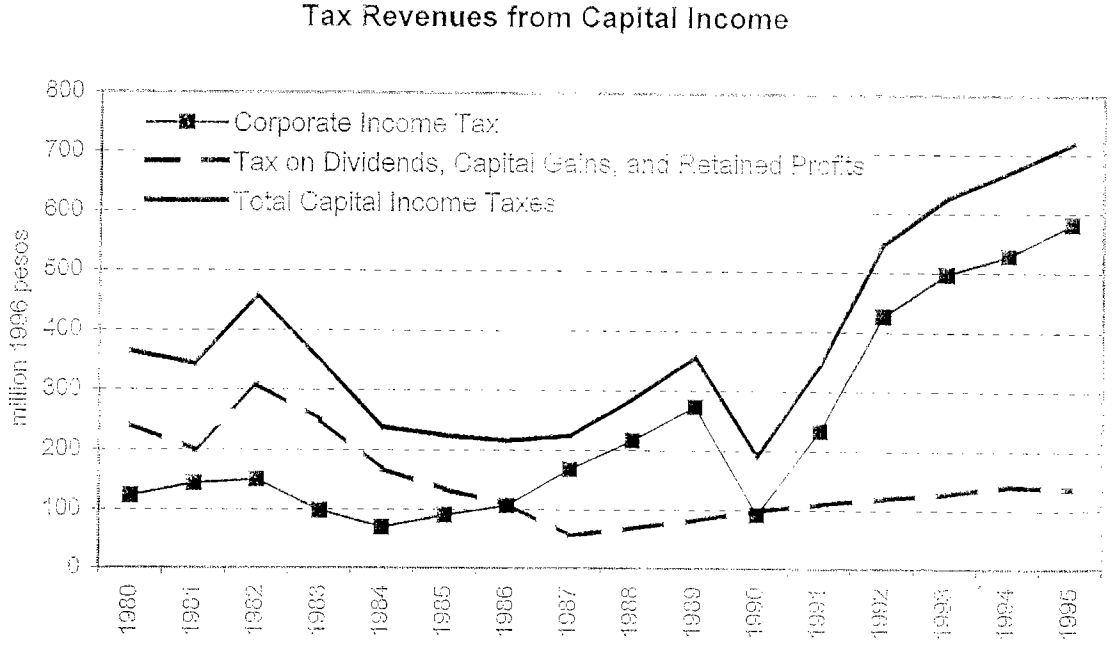

Figure 4a

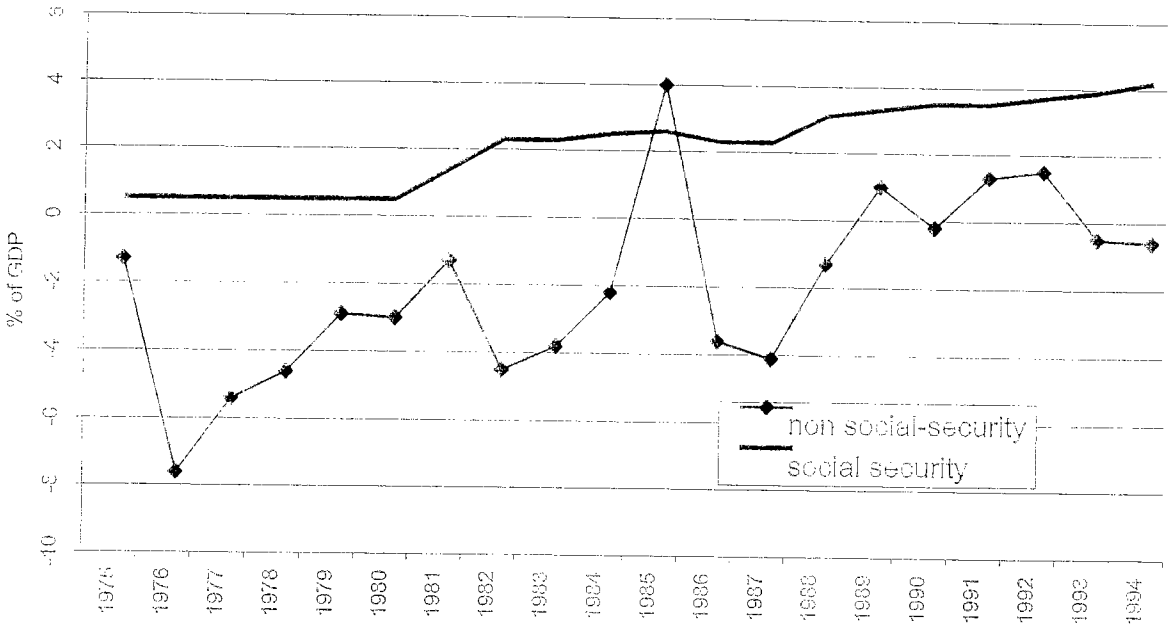

Figure 4b