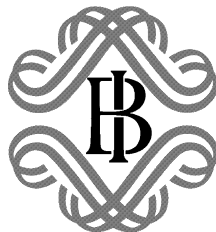# BANCA D'ITALIA

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**Tax reforms to influence corporate financial policy:
the case of the Italian business tax reform of 1997-98**

by Alessandra Staderini

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TAX REFORMS TO INFLUENCE CORPORATE FINANCIAL POLICY: THE CASE OF THE ITALIAN BUSINESS TAX REFORM OF 1997-98

by Alessandra Staderini[*]

Abstract

In this paper company-level panel data are used to explore the role of tax changes on corporate financial policy. A panel model for the years 1993-98 is estimated confirming the explanatory power of the tax variable. The estimation also shows that firms reduced leverage in the last three years (1996-98) as a reaction to important tax changes: the reduction in 1996 was the effect of the temporary investment tax credit of the previous year, while the one in 1997-98 was the result of the business tax reform started in 1997. The reform, by modifying the system for taxing profits, termed Dual income Tax (DIT), and introducing a new regional tax on business activity (IRAP), reduced the bias against equity finance that was present in the previous tax system. Focusing on the reform, a Logit model is estimated to highlight the characteristics of firms that used the DIT tax system in the first two years. The probability of using the DIT increases with profitability, productivity and investment. The significance of the latter variable suggests that the DIT system was used by firms to reduce the cost of financing new investments after the temporary investment tax credit of 1995.

Contents

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1. Introduction[1]

The Italian tax system has experienced a complex business tax reform in recent years. The reform has been oriented towards more neutrality in the corporation tax. The previous system provided complete deductibility of interest payments and no relief for the opportunity cost of equity capital. The business income tax was not neutral with respect to the financing method. The 1997-98 tax reform has introduced relief for equity finance, termed Dual Income Tax (DIT) and taxed interest payments through the new regional tax on value added (IRAP); moreover it has reduced the tax rate on profits with the abolition of the ILOR tax. By reducing the bias against equity capital, this reform can be seen as an initial step towards the complete elimination of the bias in the capital structure decision, in order to have a business income tax that is neutral with respect to financial policy. The way chosen to reach this kind of neutrality contributes to the neutrality of the business income tax also with respect to investment decisions, since the reform reduces the user cost of capital.

The new system, by introducing relief for equity finance, explicitly aims at influencing corporate financial policy. It may appear paradoxical that moving towards a more neutral tax, which in itself should eliminate distortions in firms decisions, firms are expected to change their behaviour. But we are analysing the transition from a non-neutral tax to a more neutral one. In the transition toward the new system, behaviour is expected to change. As of 1997 firms are expected to use more equity finance than debt finance, since equity finance is now less costly than before.

In this paper the reaction of Italian firms to the reform is analysed using firm-level data on firms' capital structure from the Company Accounts Database (Centrale dei Bilanci - CB) for the years 1993-98. Our data show that in the time span considered, the highest increase in net equity occurred as a reaction to important tax changes: the investment tax credit of 1994-95 and the tax reform of 1997-98. We first verify the assumption that tax changes affect corporate financial behaviour using a panel of firms for the years 1993-98.

We then focus on the 1997-98 tax reform. We are aware that the new regime has only been in force for a short time and so may under-evaluate the effects of the reform; the analysis is however important to highlight the characteristics of firms that used the DIT tax system in the first two years of the reform.

2. Why do policymakers care about corporate financial policy?

The Italian tax reform explicitly aims at influencing corporate financial policy. In the literature there is no consensus among economists as to the mechanisms involved in the transmission of tax changes and the effectiveness of the policy measures. Indeed, there is a large body of theoretical work trying to model the interaction of taxation, corporate financial policy and investment, and the empirical evidence is far from conclusive.

Earlier analyses, developed by introducing simple proportional corporate income tax in the Modigliani-Miller world, predicted that firms would use only debt finance and would not pay dividends. The contrast between these predictions and empirical evidence yielded many attempts to explain the coexistence of sources of finance with different tax treatments and different costs.[2] In trying to solve this puzzle, only part of the literature has assigned a major role to taxation in explaining financial behaviour.[3] Nonetheless policy-makers continue to propose tax reforms which are based on the idea that taxes can significantly affect corporate financial policy.

Policy-makers pursue the design of a more neutral corporate tax with respect to financial decisions because a tax system that favours debt may have considerable negative impact on the allocation of resources. A fairly high level of leverage increases the perceived uncertainty of a firm's interest and equity payments reflecting an increase in the probability

[2] For earlier predictions see Stiglitz (1973) and Auerbach (1979). For an introductory survey of the literature originating as a reaction to the capital structure puzzle and the dividend puzzle, see Edwards (1987).

[3] Taxes continue to have some explanatory power only in models that have been developed within the neoclassical framework, maintaining the assumptions of perfect capital markets and no asymmetries of information between investors and managers. In this framework, the coexistence of different sources of finance has been explained as being the balancing of bankruptcy costs against the tax gains of debt finance. However, most of the recent developments in the theory of corporate finance have ended up ignoring the role of taxation in explaining the financial policy. Financial behaviour explained within agency cost theories or signalling

of financial distress, which is costly. Moreover, firms, which may have difficulties in raising debt, are forced to face a higher cost of capital and are penalised compared with firms that can finance a large proportion of their investments with debt. For these reasons, corporate financial policy itself may be the final target of policy-makers. More often, however, corporate financial policy is just an intermediate target to reach the final target of having an adequate level of investments.[4] In the presence of different tax treatments for the various sources of finance (that is when the tax is not neutral with respect to financial decisions), financial policy affects the user cost of capital and therefore investments.[5] Taxes affect investment since the major tax law provisions both at corporate level (tax rates, the present value of depreciation allowances, the tax treatment of different sources of finance and investment tax credits) and at the personal level enter the calculation of this cost.[6]

3. The Italian tax reform: the new business tax

In the previous system, the business income tax was not neutral neither with respect to the financing method nor to the level of investment.[7] With regard to the source of finance, the tax strongly favoured debt rather then equity capital, mainly because it provided complete deductibility of interest expenses and no relief for the opportunity cost of equity capital. With regard to the investment decision, the tax raised the user cost of capital causing

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theories (both originated by relaxing the assumptions of no asymmetric information), for example, does not take explicit account of the tax treatment of different forms of finance.

[4] This is only one of the various theories explaining the determinants of investment. It belongs to the neoclassical approach first originated by Jorgenson (1963). The Jorgenson model became the standard model of analysing investment in empirical work for a few decades. By the 1980s, however, another model of investment behaviour spread through the literature, still derived from a firm maximisation problem: the Q formulation. For complete surveys of the literature, see Jorgenson (1971), Auerbach (1983), Chirinko (1993). See also the special issue on investment in the Oxford Review of Economic Policy (n. 12-2) in which the following papers are presented: Bond and Jenkinson (1996), Schiantarelli (1996) and Bond et al. (1996).

[5] The user cost of capital differs from the cost of capital (which only includes the cost of finance) because it also includes taxation and depreciation. It represents a summary statistic for the implicit rental price that firms must pay for the use of capital in production.

[6] The importance of personal tax in determining the user cost of capital stems from the fact that existing tax systems provide differential personal tax treatments for interest, dividends and capital gains. Starting from the usual market arbitrage condition (according to which the after-tax rewards must all be equal to the rate of time preference) these differential tax treatments imply differential costs to the firms for the sources of finance.

[7] It may have escaped the reader's notice that in business taxation there are three types of neutrality: neutrality with respect to the level of investment, the source of finance and the type of investment. These types can work independently. For example, a tax providing no deduction for the cost of debt or for the cost of equity

a tax bias against company investment.[8] The reform, by introducing a relief for equity finance, is going to make the system more neutral.

In the transition from a non-neutral tax to a more neutral one, corporate behaviour is expected to change. A neutral tax with regard to financial decisions does not alter the choice between debt and equity; the reform, in order to reach such neutrality, makes issuing equities or retaining earnings less costly then before. Firms are thereby expected to adapt their behaviour until their capital structure reaches the composition consistent with the change in the relative cost of the two sources of finance introduced by the more neutral tax.

The main tax changes that occurred in 1997-98 were: a) the introduction of a new system for taxing corporate income, termed Dual Income Tax (DIT); b) the introduction of a new regional tax on business activity (IRAP); c) the reduction in the profits tax rate through the abolition of the ILOR tax.

In the previous system, interest expenditures were tax exempt at company level, while profits (representing the return to own capital) were taxed with two taxes: IRPEG and ILOR with proportional rates of respectively 37 and 16.2 per cent. In 1997 the structure of IRPEG was modified by introducing the DIT system of taxation. According to the new system, a reduced tax rate of 19 per cent, $t_{reduced}$, is applied to the component of the taxable income representing the opportunity cost of shareholders' funds, that is net equity formed by capital and reserves. The ordinary rate of 37 per cent, $t_{ordinary}$, is applied to the income exceeding such a cost. The average tax rate, t_a, is the weighted average of the tax rates on the two components of taxable income. By law, the average tax rate can not be lower than 27 per cent.[9]

(1) $$t_a = s \cdot t_{reduced} + (1-s) \cdot t_{ordinary} \geq 0.27$$

where s is the share of profits representing the opportunity cost of shareholders' funds:

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capital is neutral with respect to the method of financing but not the level of investment, because it increases the user cost of capital compared with a situation of no taxation.

[8] Bond et al. (1993), for example, estimated that the absence in the UK tax system of any relief for investment financed with retained earnings adds 1-2 percentage points to the user cost of capital which may have been responsible for depressing investment by 5 per cent.

[9] This limit has been abolished from 2001.

$$(2) \qquad s = \left(\frac{r_l \cdot \Delta\, Net\, Equity}{\Pr ofits} \right)$$

Firms are required to calculate their opportunity cost of finance by multiplying the funds accumulated since 1997 (via new equity issues and via retained earnings) by an interest rate fixed by law, r_l. The latter is based on the average return on public bonds plus a risk premium. It represents the rate of return that could have been obtained had the funds been invested in the financial market. The new business income tax provides relief for equity finance. The relief however is restricted to the opportunity cost of the funds that have been put into the company since 1997 and not to the opportunity cost of total equity and reserves. This means that the reduction in the average profits tax rate is conditional to raising net equity either via retained earnings or via new equity issue.

In 1998, ILOR was abolished and a new tax on business activity was introduced. The new tax is based on value added and has a rate of 4.25 per cent. The substitution of ILOR with IRAP further reduced the bias in favour of debt with respect to equity finance: the taxation of profits was reduced from 53.2 per cent to 41.25 per cent (37+4.25 per cent), while interest payments were taxed also at company level with IRAP. Moreover in 1998 corporate net wealth tax was abolished.

The reform is therefore designed to achieve more neutrality. The new system reduces, although does not eliminate, the bias against equity finance that was provided by the previous tax structure.

The DIT is consistent with the basic idea underlying what is known in the literature as the ACE system (Allowance for Corporate Equity), that is a tax that provides deductibility for both interest payments and the opportunity cost of equity finance.[10] However the Italian version differs from ACE in two important aspects which strongly reduce the effectiveness of the relief. First, the opportunity cost of equity finance is not deductible from taxable income (as it is in the ACE system) but is taxed at a reduced rate. Second, following an 'incremental' approach, the benefit is restricted to funds in excess of the 1996 level.

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[10] For the theoretical framework underling the ACE system, see Boadway and Bruce (1984), Deveureux and Freeman (1991), Bond and Devereux (1995). See also Bond et al. (1993), Bond et al. (1996).

The two restrictions stem from the necessity of limiting the revenue cost of the reform. However the incremental approach also aims at strengthening the effectiveness of the incentive to increase equity finance; it stems from a generally felt concern that the leverage of Italian firms is too high.

4. Measuring the tax advantage of leverage: the "Miller index"

In order to quantify the reduction in the bias in favour of debt caused by the reform, an index measuring the tax advantage of debt has been constructed. The index was originally derived by Miller (1977).[11] It compares the net-of-tax return from equity with that from bonds. Taxes are calculated using legal tax rates of both corporate and personal taxation. The gain from the leverage index is given by:

$$(3) \qquad GL_{personal} = \left[1 - \frac{(1 - t_c)(1 - t_{pd})}{(1 - t_{pb})} \right]$$

$$(4) \qquad GL_{corporate} = \left[1 - \frac{(1 - t_c)}{1} \right]$$

The tax rates τ_c, τ_{pd}, and τ_{pb} are respectively the corporate tax rate, the personal income tax rate applicable to dividends and the tax rate for returns from bonds.[12] According to the Italian tax code, returns to equity are taxed at corporate level (τ_c,) and at personal level with the personal tax rate (τ_{pd}).[13] Interest is taxed with a proportional withholding tax (τ_{pb}) at personal level; until 1997 it was tax exempt at company level.[14] The ratio inside the brackets is a ratio between the two net-of-tax returns. The index is equal to zero if the taxation on dividends is equal to the taxation on bond interest. The index is greater than zero if taxes on

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[11] See also Rajan and Zingales (1995) for an analysis which uses this measure.

[12] The rate τ_{pd} also includes the imputation system between corporate and personal tax rates. The expression $(1-\tau_c)(1-\tau_{pd})$ which represents the total burden on dividends (both at the corporate and at the personal level) can be written as $[1 - (\tau_c + (1-\tau_c) \tau_{pd}]$, where τ_{pd} is the rate on dividends which takes into account the tax credit provided by the imputation system. $\tau_{pd} = [\tau_{pi} (1 + \text{tax credit}) - \text{tax credit}]$ where τ_{pi} is the personal income tax which has progressive rates.

[13] The personal tax rate τ_{pd} is calculated for a representative taxpayer. It is a weighted average of average tax rates, with weights based on the population distribution of dividend income.

[14] Since 1998, the IRAP tax is applied to interest payments.

returns to equity are higher than taxes on interest, it is lower than zero in the opposite case. If we do not take into account personal taxation, as in (4), the index simply measures the tax advantage of interest deductibility at the corporate level, given by τ_c.

The two indexes $GL_{personal}$ and $GL_{corporate}$ are plotted in Figure 1. The indexes are both positive confirming the existence of a significant tax bias in favour of debt meaning that, for a given level of gross income, the net return to a shareholder (the numerator of the ratio inside the square brackets) has always been lower than the net return to a bondholder. The positive value of $GL_{corporate}$ is due to the deductibility of interest at corporate level. Moreover, $GL_{personal}$ is always greater than $GL_{corporate}$. This means that for the average saver, the tax system favours debt also at the personal level. The index shows that the introduction of the DIT tax system represents the first step in the reduction of this advantage. The second step was taken in 1998 when the IRAP tax substituted the ILOR tax.

Figure 1

THE GAIN FROM LEVERAGE EVALUATED USING LEGAL TAX RATES
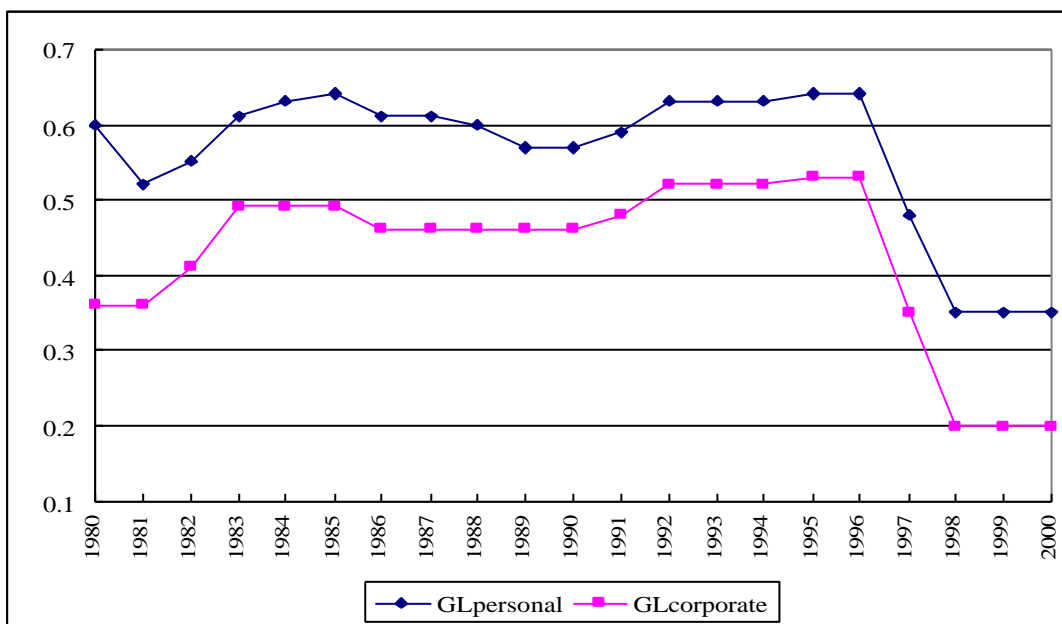
In order to have a more comprehensive measure of the tax advantage of debt, the "Miller" index is calculated using effective tax rates, instead of legal tax rates.[15] Effective tax rates enable the representation of the economically relevant features of highly complex tax systems in a very succinct way. These rates take into account the main aspects of the tax treatment of capital income both at company level (depreciation allowances, deductibility of interest expenses, investment tax credits, and full imputation system) and at personal level (personal income tax, imputation system). The gain from leverage becomes:

$$(5) \qquad GL_{ETR} = \left[1 - \frac{\left(1 - t_{EQU}\right)}{\left(1 - t_{DEB}\right)} \right]$$

Where t_{EQU} is the "effective tax rate" applicable to income from equities and t_{DEB} is applicable to income from bonds. The higher the t_{EQU} (taxation on equities) compared with t_{DEB} (taxation on debt), the greater the gain from leverage. The tax rates t_{EQU}, t_{DEB} and GL_{ETR} are plotted in Figure 2.

Figure 2 confirms the trend already shown in Figure 1. Taking into account other aspects of taxation at corporate level does not change significantly the tax advantage of debt, which was very high in the eighties. The opportunity cost of equity was taxed at corporate level with very high rates and the imputation system worked only for part of the corporate tax burden (it did not work for ILOR). The difference in the two tax burdens was quite stable from the end of the eighties up to 1996.

In 1995 a temporary tax credit for investments was introduced that strongly reduced the effective tax rate for both equity financed and debt financed investments. The tax credit did not however alter the bias in favour of debt since the percentage decrease of the effective tax rate is the same for the two sources of finance. In 1997 the reduction in the tax advantages of leverage started with the DIT. Using effective tax rates, the reduction of 1998 also reflects the abolition of the tax on corporate net-wealth (which is included in t_{EQU} but not in t_{DEB}).

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[15] The formula for the effective tax rate used in the calculation is taken from Monacelli et al. (2001). This tax rate comes from the same conceptual framework of the effective tax rate introduced by King and Fullerton (1984); it makes the assumption of inflation and economic depreciation as being equal to zero. For a discussion of the advantages of using this tax rate compared to the King and Fullerton one, see Monacelli et al. (2001).

Figure 2

THE GAIN FROM LEVERAGE EVALUATED USING EFFECTIVE TAX RATES
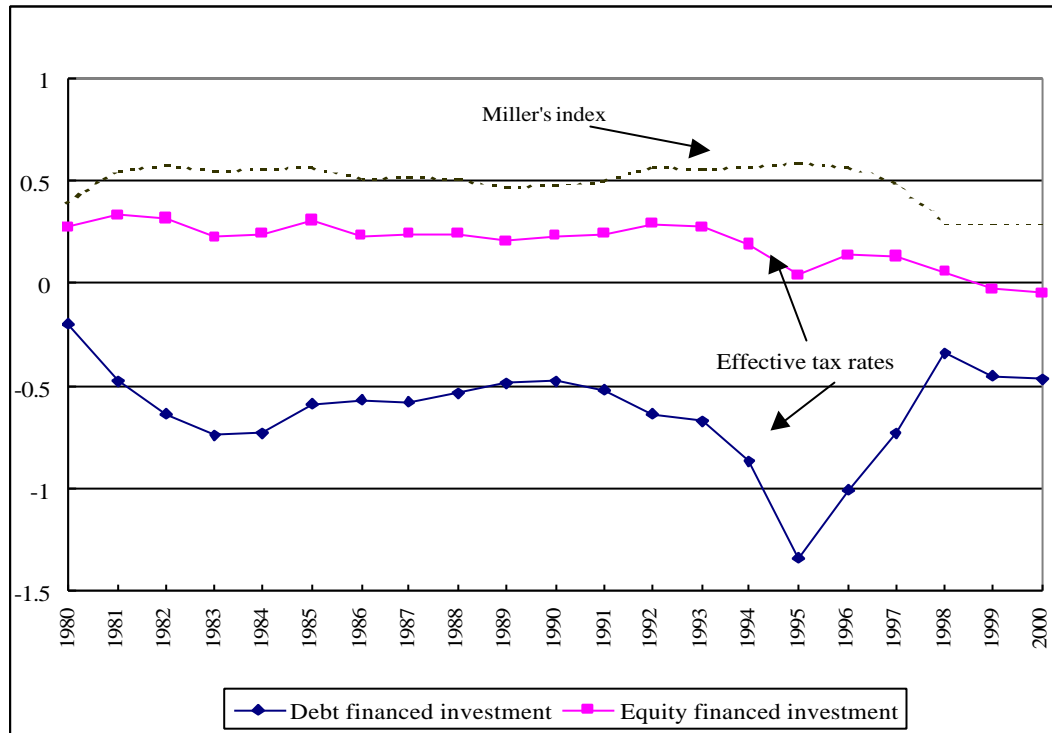
5. The first reaction to the reform: some descriptive statistics

To analyse the first reaction of Italian firms to the reduction in the bias in favour of debt we use company-level data on the capital structure of a panel of firms for the years 1993-98.[16]

From the considerations made earlier we expect to find a change in financial behaviour starting from 1997. We do not however expect the change in the behaviour to be dramatic, given the limited time span considered; the decision to increase net equity via new equity issues might require more time. Moreover the relief offered by the DIT system, which

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[16] For a description of the data see the Appendix.

was in force in 1997-98, was very limited; the awareness of these limits led to the revision of the original structure.[17]

In order to provide some descriptive evidence of the reaction of companies, two proxies of financial behaviour are calculated: the *DIT requirement indicator* and the percentage increase in net-equity (Table 1). The *DIT requirement indicator* is a time-variant indicator: every year it takes the value of 1 for firms presenting a change in net equity which is: *a)* greater than zero and *b*) greater than the increase in a component of financial fixed assets represented by securities and by holdings in controlled and related enterprises.

Table 1

CORPORATE FINANCIAL DECISIONS OVER TIME

	Selected CB sample			Sub- sample with 1997-98 reform indicator = 1		
	DIT requirement Indicator (mean)	Net Equity increase		DIT requirement indicator (mean)	Net Equity increase	
		Mean	Median		Mean	Median
1993	0.51	0.10	0.02	0.53	0.11	0.02
1994	0.52	0.07	0.01	0.52	0.07	0.01
1995	0.63	0.09	0.02	0.67	0.09	0.03
1996	0.69	0.11	0.04	0.73	0.12	0.05
1997	0.61	0.09	0.02	0.78	0.11	0.04
1998	0.63	0.08	0.02	0.77	0.10	0.04

Notes: The *DIT requirements indicator* takes the value of 1 for firms that present the requirements required by law to use the DIT tax system and 0 otherwise; it is calculated for each year. The *1997-98 reform indicator* takes the value of 1 for firms that present the requirements required by law to use the DIT tax system either in 1997 and/or in 1998; it is a time-invariant variable. For firms with the *1997-98 reform indicator* equal to 1, the *DIT requirements indicator* does not take the value of 1 in 1997 and in 1998, because of the presence of firms that present the right requirements only in 1997 or only in 1998. *Net Equity increase* is the percentage increase in net equity (equity and reserves). The *1997-98 reform indicator* a time-invariant indicator taking the value of 1 for firms presenting the relevant DIT requirement in the years 1997-98.

In our sample, 61 per cent of the firms in 1997 (63 per cent in 1998) have the requirements for DIT tax relief. Since these firms have the right requirements in the relevant years, we assume that these firms actually used the DIT tax system. This group of firms is

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[17] From 2000 a coefficient has been introduced that multiplies $\boldsymbol{D}$*Net Equity* in (2) in order to increase the share of income to be taxed under the reduced rate. Moreover, from 2001 the average tax rate can be lower than 27 per cent.

identified on the basis of another indicator, called the *1997-98 reform indicator*, which is a time-invariant indicator taking the value of 1 for firms using the DIT either in 1997 or in 1998. In the second part of the table, the statistics for the capital structure variables are evaluated only for this subset of firms: in this case, 78 per cent of the firms in 1997 (77 in 1998) used the DIT tax system.

The majority of firms in our sample used the DIT tax relief. However, the percentage of firms presenting the DIT requirements in 1997-98 is not much higher than in previous years. The financial structure indicators show an exceptional peak in 1996 when the percentage of firms presenting the DIT requirements is 69 per cent.

The increase in 1996 is the one-off effect of a temporary investment tax credit that was introduced in June 1994. Data show that the use of this tax credit was widely spread among firms, causing a strong reduction in the firms' tax burden that produced an increase in retained earnings, with a consequent increase of the reserves in the following year. The effects of this temporary investment tax credit on retained earnings are shown in Table 2. The year 1995 shows the highest level of retained earnings, although profits before taxes are more or less stable in the years 1995-97. The unusual value of retained earnings in 1995 determines an unusually high increase in reserves the following year.

Table 2

RETAINED EARNINGS OVER TIME

	Selected CB sample			Sub-sample with 1997-98 reform =1		
	Profits before taxes	Profits after taxes	Retained earnings	Profits before taxes	Profits after taxes	Retained earnings
1993	0.03	0.013	0.007	0.05	0.015	0.009
1994	0.06	0.029	0.002	0.07	0.034	0.021
1995	0.08	0.040	0.026	0.10	0.049	0.033
1996	0.08	0.031	0.018	0.10	0.042	0.029
1997	0.08	0.030	0.019	0.10	0.038	0.027
1998	0.11	0.029	0.017	0.12	0.035	0.023

Notes: Variables are expressed as a ratio to value added and correspond to the median of the distribution.

Our data show that in the time span considered, the highest increase in net equity occurred as a reaction to important tax changes: the investment tax credit of 1994-95 and the

tax reform of 1997-98. The assumption that tax changes affect corporate financial behaviour is here verified using a panel of firms for the years 1993-98.

6. Do tax changes affect corporate financial decisions?

For the specification of the model, we draw on previous empirical studies on financial behaviour [18] that highlight the existence of a correlation between a variable representing financial behaviour (leverage) and some factors defining the characteristics of firms. The model is the following:

$$(6) \text{Leverage}_{it} = \beta_0 + \beta_1 \text{ roa}_{it-1} + \beta_3 \text{ EG}_{it} + \beta_4 \text{ Size}_{it} + \beta_2 \text{ tang}_{it-1} + \beta_5 \text{ rate}_{it-1} + \beta_6 \text{ GDP}_{it} + u_i + e_{it}$$

Where the dependent variable is *leverage*; *roa* is a profitability index and *EG* is the proxy for expected growth. *Tang* is tangibility of real fixed assets; the variable is introduced since the theory of capital structure predicts a positive correlation since real fixed effects represent collateral which should make lenders more willing to supply loans.[19] The variables *rate* (interest rate) and *GDP* are introduced in order to control for monetary conditions and the business cycle. The term u_i is a firm-specific effect, which is unobservable. In panel models using firm-level data, the term u_i is time-invariant and is generally assumed to represent managers' abilities that vary across firms. The presence of such heterogeneity among firms is verified with the test developed by Breush and Pagan. All the models are first estimated using a random-effect estimator, but the Hausmann test rejects the hypothesis of an absence of correlation between u_i and the regressors. Fixed-effect estimation is then performed, yielding very similar coefficients. The models are estimated for both groups of firms split by the *1997-98 reform indicator*. We focus on the estimation for the group of firms with the *1997-98 reform indicator* =1 and present the other group estimation as a robustness check.

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[18] See Sapienza (1997) and Rajan and Zingales (1995).

[19] In the estimation, the previous period value of firm-specific variables are used in order to avoid possible endogeneity.

The existing empirical literature usually includes a variable measuring the tax advantage of debt, that takes into account the tax advantage of interest deductibility at the corporate level. This study differs from previous ones since it focuses on the tax variable, by using the Miller index presented in section 4. Since it is constructed on the basis of effective tax rates, it is a comprehensive measure, taking into account all the economically relevant features of the tax system: personal and corporate tax rates and the main aspects of the tax treatment of capital income at company level (depreciation allowances, deductibility of interest expenses, investment tax credits, and full imputation system). In the time span considered in this study, this variable, after being fairly stable from 1993 to 1996, is lower in 1997 and in 1998 because of the reform (see Figure 2).[20]

Three different specifications of the leverage equation are estimated. In the first specification we let time dummy variables capture the effects of tax changes, having already controlled for the effects of macro-economic conditions. In the second specification only one time dummy is included and the Miller indicator is utilised. In the third specification a firm-specific proxy to measure the tax advantage of leverage is constructed, by multiplying the Miller index by the previous year's interest expenditure. In doing so it is assumed that the tax advantage of debt is higher for firms with higher interest expenditure, given the important role of the deductibility of interest payments in defining the tax advantage, as emerged by comparing (3) and (4) in section 4. The results are shown in table 3.

In all models the variables representing company characteristics are highly significant as well as those representing macroeconomic conditions. As far as *Roa* and *Tangibility* are concerned, we obtain standard results: leverage is negatively linked to profitability and positively to tangibility. The sign of the variable S*ize* is consistent with the evidence that in Italy small firms are more leveraged than large firms.

The sign of the growth opportunities variable is positive. There are conflicting theoretical predictions on the effects on leverage of this variable: on the basis of the theory we cannot expect a particular sign. The sign of the coefficient seems however not to be consistent with the result of the Logit model estimated in section 7, which detects the existence of a positive correlation between expected growth and the probability of using the

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[20] This particular behaviour makes this variable almost collinear with the full set of time dummy variables.

DIT system. However in this estimation, covering 6 years (1993-98), the sign of the coefficient may have been caused mainly by the years before the reforms (4 years out of 6).

Before going into the details of the three specifications, we emphasise that all the estimations of the leverage equation confirm the explanatory power of the tax variable.

Equation 1 provides some evidence that tax changes affected financial behaviour: the dummies are significant only for the years 1996-98, when important tax changes occurred. Since a tax variable is not explicitly taken into account in this specification of the model, the coefficients of the dummies can be interpreted as the effects of tax changes, having already controlled for the effects of macroeconomic conditions. These coefficients suggest that there was a reduction in the level of leverage in the last three years. Our interpretation is that in 1996 this was the effect of the temporary tax relief of 1995 (as shown in section 5), and in the following years there was the effect of the tax reform of 1997-98.

To find confirmation of this interpretation, equations 2 and 3 are estimated. In equation 2, Miller's index (presented in section 4) is used together with a dummy variable for 1996 for the temporary investment tax credit. Without controlling for the 1996 effect, the estimation would be affected by a temporary tax change that could mask the effects of the 1997 reform. The tax variable (*tax bias*) coefficient is highly significant. A reduction by one percentage point of the tax index reduces leverage by 0.15 percentage points. The reform caused this index to fall strongly: from 0.57 in 1996 to 0.49 in 1997 and 0.29 in 1998.

Because of collinearity problems, it is not possible to estimate the Miller's index and the full set of time dummies in the same equation. The third equation overcomes this problem by constructing a firm-specific tax variable by multiplying Miller's index by the lagged value of interest expenditure. The results are consistent with the previous specifications. The coefficient of the firm-specific tax variable is still significant, although the magnitude is reduced: in this specification a reduction by one percentage point of the firm-specific tax variable reduces the leverage by 0.07 percentage points. The dummy for 1996 still captures a reduction in the average level of leverage in that year, while the dummies for 1997 and 1998 have changed the sign capturing some other factors that increase leverage.

Table 3

LEVERAGE EQUATIONS

Dependent variable: Leverage			
	Model 1	Model 2	Model 3	Model 3'
Constant	0.4816***	0.4068***	0.3350***	0.3418***
	(0.0274)	(0.0279)	(0.0275)	(0.0487)
Roa(t-1)	-0.0024***	-0.0025***	-0.0022***	-0.019***
	(0.0002)	(0.0002)	(0.0002)	(0.0003)
Tangibility(t-1)	0.0187***	0.0169***	0.0102***	0.0069
	(0.0028)	(0.0028)	(0.0028)	(0.0049)
Expected growth(t)	0.0261***	0.0260***	0.0254***	0.0143*
	(0.0053)	(0.0053)	(0.0052)	(0.0084)
Size(t)	-0.0087**	-0.0088*	-0.0106**	-0.0143*
	(0.0046)	(0.0046	(0.0045)	(0.0077)
Interest rate(t-1)	-0.3613***	-0.3501***	-0.5440***	-0.5350***
	(0.0218)	(0.0216)	(0.0225)	(0.0421)
GDP(t)	-0.0041***	-0.0055***	-0.0059***	-0.0038***
	(0.0006)	(0.0006)	(0.0006)	(0.0012)
Tax bias(t)	_	0.1539***	0.0729***	0.0708***
		(0.0071)	(0.0028)	(0.0050)
Dummy1994	0.0036*	_	0.0051**	0.0006
	(0.0022)		(0.0021)	(0.0041)
Dummy1995	Dropped	_	Dropped	Dropped
Dummy1996	-0.1696***	-0.1491***	-0.0155***	-0.0029
	(0.0021)	(0.0019)	(0.0020)	(0.0038)
Dummy1997	-0.0278***	_	0.01211***	0.0632***
	(0.0021)			(0.0049)
			(0.0026)	
Dummy1998	-0.0427***	_	0.0823***	0.1691***
	(0.0022)		(0.0052)	(0.0097)
Breush and Pagan	30.68***	38.51***	21.47***	22.90***
Hausmann	880.75***	891***	3660***	731***
N. Obs. (firms, periods)	18065 (3010, 6)			5088(848,6)

Notes: All equations are estimated using fixed effects. Standard errors in parenthesis (*, **, *** indicate significance at the 10,5, and 1 per cent level, respectively). Model 1 includes a full set of time dummies; to avoid perfect collinearity, the first period dummy is dropped. Model 2 includes the Miller index and one dummy for 1996. Model 3 includes a firm-specific tax variable and the full set of time dummies. Models 1, 2 and 3 are estimated for firms with the *1997-98 reform indicator*=1. Model 3' is the same as model 3 but is estimated for firms with the *1997-98 reform indicator*=0. *Leverage* is the ratio of financial debt (both short term and long term) to net assets (assets minus accounts payable and other current liabilities). *Roa* is the ratio of earnings before interest and taxes to total assets. *Tangibility* is the logarithmic of real fixed assets. *Expected growth* is the ratio of investments to fixed assets of the previous year. *Size* is the logarithmic of the number of employees. *Interest rate* is the ratio of interest expenditures (for financial debt) to financial debt. *Tax bias* is the Miller index for the tax advantage of debt in model 2, while in model 3 it is made firm-specific by multiplying it by the lagged value of the interest expenses. *GDP* is the percentage increase of real GDP. Breush and Pagan is the test used for heterogeneity in the errors. Hausman is the test used for fixed or random effects.

The comparison of the dummy coefficients in Equations 1 and 3 suggests that the tax variable is able to capture the effects of the 1997-98 tax reform. When the tax variable is not explicitly taken into account, the time dummies detect a reduction in the average level of leverage in 1997 and 1998. On the contrary when the tax variable is made explicit, the reduction in the level of leverage is captured by this variable and the time dummies detect some other factors affecting leverage in 1997 and 1998 which operate in the opposite direction.

The robustness of this result is checked also by estimating Equation 3 for the firms which did not use the DIT tax system (see Model 3' in Table 7). All the coefficients are consistent with that obtained for firms with *1997-98 reform indicator*=1, except for time dummy variables: the 1996 dummy is not significant, meaning that these firms were not affected by the temporary tax relief of 1995.

Firms that did not use the DIT, seem indeed to be as sensitive to fiscal variables as those using the DIT, given the sign and the significance of the coefficient for the tax variable. However in 1997 and 1998 there may be some other factors at work inducing these firms not to increase net equity: the time dummy coefficients are positive and greater for these firms in comparison with the ones for firms with *1997-98 reform indicator*=1.

7. The characteristics of firms using the DIT in 1997-98

The *1997-98 reform indicator* splits the original sample into two groups of firms, those using the DIT and those not using it. To assess whether these two groups are different with regard to some characteristics, a t-test for equality in the mean is performed for the year 1996, the year before the reform.[21] The test is applied to many variables, but only a few of them have a significantly different behaviour between the two groups (Table 4).

Firms using the DIT tax system show higher profitability, productivity and expected growth.

Firms that did not use the DIT had on average lower earnings and lower productivity. In this group the percentage of firms with negative taxable profits is higher, meaning there was a smaller incentive to reduce the tax burden through the DIT system.

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[21] We use the t-test which is designed for unequal variances.

Given also their lower level of investments, it seems that for these firms the reform came at the wrong time, in a year with apparently low expected growth. The lower ratio of net equity to fixed assets suggest that these firms present a lower propensity to use equity in financing their investments, which is confirmed also for the years before 1996. This behaviour might explain the higher leverage.

Table 4

T-TEST FOR THE EQUALITY OF MEAN

	Roa	Produc-tivity	Net Equity/ Fixed assets	Leverage	Investments	Expected growth	Size
Mean by groups:							
DIT=0	5.0	31.0	118	0.51	1,046	0.10	209.2
DIT=1	8.5	34.9	168	0.50	1,555	0.11	182.0
t-test	-14.15	-5.47	-6.08	1.8	-1.6	-2.15	2.13
P-value	0.000	0.000	0.000	0.076	0.10	0.032	0.033

Notes: Groups are defined over the dichotomous variable *1997-98 reform indicator* (here DIT). Means refer to the years 1993-1998. The t-test is applied for the year 1996, the year before the reform. It tests the null hypothesis that the mean of a variable is the same for both groups of firms. *Roa* is the ratio of earnings before interest and taxes to total assets. *Productivity* is the ratio of value added to total assets. *Net Equity* is expressed as a ratio to fixed assets. *Leverage* is the ratio of financial debt (both short term and long term) to net assets (assets minus accounts payable and other current liabilities). *Investments* are expressed in millions of lire. *Expected growth* is the ratio of investments to the real fixed assets of the previous year. *Size* is the number of employees.

The logit model. - A Logit model is estimated for the probability of using the DIT system:

$$\Pr ob(DIT=1) = \frac{e^{x'b}}{1 - e^{x'b}}$$

Where *x'β* is:

(7) $\qquad \boldsymbol{b}_0 + \beta_1\, roa_i + \beta_2\, productivity_i + \beta_3\, EG_i + \beta_4\, size_i + e_i$

The first two variables are indexes for profitability (r*oa*) and *productivity*. EG is a proxy for expected growth.[22] The model is estimated for t=1996, the year before the

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[22] In comparison with the variables presented in Table 4, no capital structure variable is included here: it would be redundant given that the variables in (7) are the main explanatory variables for leverage (see section 6).

introduction of the reform. To check for robustness, the model is estimated also for t=1995, obtaining very similar results. Estimated coefficients are reported in Table 5.

The Logit model confirms what already emerged from the descriptive statistics of Table 4: the first two coefficients are positive and are highly significant: the probability of using the DIT increases with profitability and productivity. The coefficients suggest that firms with higher earnings have more incentives to find methods to reduce tax payments. Moreover these firms probably had a greater availability of internal funds to use to increase reserves. The probability of using the DIT increases with expected growth.

The descriptive statistics and the Logit model show that in our sample firms with higher investments in 1997 and 1998 increased their net equity. In the first two years the incentive to raise net equity was not strong enough to affect all firms: the change in the relative cost of the two sources of finance (caused by the tax reform) was not strong enough to induce firms to change the composition of their liabilities, given their total. However, the incentive was more effective for firms requiring new funds because of their higher level of investment.

Table 5

THE LOGIT MODEL: ESTIMATION RESULTS

Dependent variable: probability of using the DIT tax system	
Roa	0.0896***
	(0.0078)
Productivity	0.0081***
	(0.0029)
Expected growth	0.4287*
	(0.3001)
Size	-0.1721***
	(0.0397)
N. obs.	3858

Notes: *Roa* is the ratio of earnings before interest and taxes to total assets. *Productivity* is the ratio of value added to total assets. *Expected growth* is the ratio of investments to the real fixed assets of the previous year. S*ize* is the logarithmic of the number of employees. A test on the accuracy of the prediction of the models is performed. For almost 3,000 firms, classification is accurate in the sense that the model estimates a probability of at least 0.5 for a 1997-98 reform indicator equal to 1, and the event does in fact occur. The overall "correctly classified" rate is more than 78% for both specifications.

Additional information on the role of the investment variable in explaining the utilisation of the new tax system, also emerges in Table 6. Here variables concerning investment activity and capital structure appear separately for firms with *1997-98 reform indicator* = 1 and for those with *1997-98 reform indicator* = 0.

Let's focus on the investment variable in 1995, the year of the investment tax credit. Data show that the level of investment in both groups was higher than in the previous years. As a consequence of the exploitation of this tax credit, net equity increased in 1996, as already explained in section 5. After the temporary tax credit of 1995, firms not using the DIT system reduced their investments going back to the level of 1993 and 1994. As has already been shown, at the time of the introduction of the DIT reform, for these firms, expected growth, profitability and productivity were lower. On the contrary, firms using the DIT did not reduce investments after the tax credit of 1995. These firms met their requirement for new funds by increasing net equity in order to be able to apply the reduced tax rate provided by the DIT system (for these firms the ratio of net equity to fixed assets continued increasing after 1996 as well, while this ratio decreased in 1997-98 for the other group of firms). This seems to suggests that the DIT system was used by firms in order to reduce the cost of financing new investments, after the temporary investment tax credit of 1995.

Table 6

INVESTMENT AND EXPECTED GROWTH BY YEAR AND BY GROUP

	Investment		Net Equity/ Fixed assets		Expected growth	
	Mean	Median	Mean	Median	Mean	Median
1997-98 reform indicator = 1						
1993	1,293	224	149	89	0.10	0.07
1994	1,256	246	155	94	0.11	0.07
1995	1,533	338	157	96	0.13	0.09
1996	1,555	323	169	100	0.11	0.08
1997	1,513	327	171	104	0.10	0.07
1998	1,663	357	179	103	0.11	0.08
1997-98 reform indicator = 0						
1993	1,216	281	142	80	0.12	0.07
1994	1,224	259	136	84	0.12	0.06
1995	1,447	333	137	84	0.12	0.07
1996	1,046	313	118	79	0.10	0.07
1997	1,211	279	108	73	0.09	0.06
1998	1,351	272	102	68	0.09	0.06

Notes: Groups are defined over the dichotomous variable *the 1997-98 reform indicator. Investment* is expressed in millions of lire. *Net Equity* is expressed as a ratio to fixed assets. *Expected growth* is the ratio of investments to the fixed assets of the previous year.

8. Conclusions

In this paper the role of tax changes on corporate financial policy has been analysed, focusing on the tax reform of 1997-98. Before the reform, the tax system provided a clear advantage in favour of debt compared with equity; there was complete deductibility of interest expenses and no relief for the opportunity cost of equity capital. The reform was designed to reach more neutrality and so the new system has reduced, although not eliminated, the bias against equity finance provided by the previous tax structure. The reform has caused the relative tax advantage of debt, measured by the Miller index, to fall by almost 50 per cent.

We have used company-level data on capital structure from the Company Accounts Database (Centrale dei Bilanci - CB) for the years 1993-98 to analyse the reaction of Italian firms to the reform.

By reducing the bias against equity finance that was provided by the previous tax structure, the reform has offered a natural experiment for evaluating the responsiveness of financial policy to tax changes. A panel model for the years 1993-98 has been estimated to test the hypothesis that corporate financial policy is influenced by tax policy. Our study differs from previous financial structure equations since it has focused on the tax variable, by using the Miller index, constructed on the basis of effective tax rates.

Three different specifications of the leverage equation have been estimated. They have all confirmed the explanatory power of the tax variable and show that firms reduced leverage in the last three years (1996-98) as a reaction to tax changes. The reduction in 1996 was the result of the temporary investment tax credit of the previous year, while the one in 1997-98 was the result of the business tax reform. In the first equation (with the full set of time dummies and no explicit tax variable) the reduction in the level of leverage in the last three years is shown by the coefficients of the time dummies (negative and significant). In the second and in the third equation (with an explicit tax variable), the tax variable coefficient is positive and highly significant, giving empirical evidence that the reduction in the tax advantage of debt, caused by the reform, is going to reduce the leverage.

In the last part of the paper, we have focused on the 1997-98 tax reform. We are aware that the reduced time span concerning the new tax regime may induce an under-evaluation of

the effects of the reform. However the analysis is important to highlight the characteristics of firms that used the DIT tax system in the first two years of the reform. A Logit model for the probability of using the DIT in 1997 or 1998 has been tested: the probability increases with profitability and productivity. The coefficients suggest that firms with higher earnings had a greater incentive to reduce tax payments; these firms also had readily available funds to increase their reserves. The probability of using the DIT increased with expected growth (as measured by the ratio of investment to fixed assets of the previous year). In our sample firms with higher investments in 1997 and 1998 increased their net equity.

Our data seem to suggest that in the first two years the incentive to raise net equity was not strong enough to affect all firms: the change in the relative cost of the two sources of finance (caused by the tax reform) was not strong enough to induce firms to change the composition of their liabilities, given their total. However, the incentive was effective for firms requiring additional funds because of their higher level of investment. After the temporary investment tax credit of 1995, firms not using the DIT system reduced their investments going back to the level of 1993 and 1994. For these firms at the time of the introduction of the DIT reform, expected growth, profitability and productivity were lower. On the contrary, firms using the DIT did not reduce investment after the tax credit of 1995, suggesting that the DIT system was used by firms to reduce the cost of finance of new investments.

The reform influenced, although to a limited extent, corporate financial behaviour in a way consistent with its aims. However, the magnitude of the effects were limited probably because: a) the period of two years represents too short a time span to study decisions that require more time (especially for increases via the issue of new equities); b) the relief offered by the DIT system, as originally designed, was too small to affect corporate behaviour significantly. The awareness of these limits caused the revision of the original structure: since 2000 a coefficient has been introduced in order to increase the share of income to be taxed under the reduced rate and from 2001 the average tax rate can be lower than 27 per cent.

Appendix: Data sources

The data used in this paper are taken from the Company Accounts Database (Centrale dei Bilanci - CB). CB is a database containing balance sheets and profit and loss accounts for approximately 40,000 Italian companies. The sample is not randomly drawn since CB's data sources are banks that collect accounting data as part of their risk monitoring activities.

Only firms with a number of employees greater than 15 are selected for the period starting from 1992 up to 1998.[23] Selected firms belongs to several sectors: manufacturing, construction, services. Financial firms (banks and insurance companies) are excluded since they are not involved in the tax reform in the years we analyse. To avoid outliers, firms with values of the main capital structure variables lower than the first percentile or higher than the 99th percentile are excluded. The sample also excludes firms that shows a change in total assets greater than 20 per cent, in order to eliminate firms which might have experienced extraordinary firm shocks (for example mergers) or CB coding error. This sample selection produces a balanced panel of 3,858 firms. In Table 1, the characteristics of the firms selected in our sample are compared with the one regarding the whole CB sample. Firms selected are larger, have lower leverage and higher net wealth than the full CB sample.

Table 1

COMPARISON OF SAMPLES

	Full CB Sample		Selected CB Sample	
	Mean	Median	Mean	Median
Roa	7.5	7.07	7.73	6.73
Productivity	32.8	29.15	34.11	30.94
Leverage	0.55	0.61	0.51	0.53
Size	106	31	191	72
Net Equity/fixed assets	295.8	86.22	154.9	92.4

Notes: In the CB sample 35,000 firms are included, while in the selected sample 3,858. *Roa* is the ratio of earnings before interest and taxes to total assets. Mean and variance refer to the years 1993-98. *Productivity* is the ratio of value added to total assets. *Leverage* is the ratio of financial debt (both short term and long term) to net assets (assets minus accounts payables and other current liabilities). *Size* is number of employees. *Net equity* is expressed as a ratio to fixed assets.

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[23] The year 1998 is the latest available data set at the time of writing this paper.

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