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CORPORATE TAXATION AND ITS REFORMS: EFFECTS ON CORPORATE FINANCING DECISIONS IN ITALY

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1. Introduction[1]

Corporate capital structure is one of the most studied areas of business decisions. Nevertheless, it continues to be one of the least understood and more difficult to quantify. In this line of research, there is a large body of work modelling the interaction between taxation and corporate financing decisions, but little support has been found in empirical analysis. In the Anglo-Saxon literature few research papers have found clear evidence of the effects of tax benefits on debt financing (Graham, 2003, for a review).

Several problems arise in analysing the role of taxation on debt financing. First of all, it is difficult to translate the technical details of the tax code into a proper measure able to capture the relative tax benefits of debt versus equity finance. Various empirical approaches have been used to account for the interaction between tax rates, interest deductions, non-debt tax shields and the loss carry-back and –forward provisions. None of them, however, is completely satisfactory, also due to the lack of confidential firm-level tax return data.

Second, fiscal variables are endogenous: for example, the greater the firm's borrowing, the lower could be the effective tax benefit of interest deductions, since the tax advantage of debt declines as companies become tax-exhausted, and this could in fact be the case with growing interest payments.

Third, fiscal and non fiscal variables are intra- and inter-correlated. Correlation among fiscal factors worsens the endogeneity problem: current operating losses, non debt tax deductions (loss carry forwards and depreciation allowances) and interest deductions from already existing debt may contribute, along with interest deductions on new debt, to increase the tax-exhaustion status of firms. Moreover, borrowing also depends on other factors correlated with tax status. If these factors are omitted from the model, this would impart biases to the fiscal parameter estimates.

This paper has two objectives. The first is to provide a systematic quantitative analysis of the relationship between fiscal variables and borrowing in Italy, trying to tackle the problems outlined above. The empirical evidence on this issue is still relatively scarce in Italy

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and, as for other countries, cannot be considered conclusive (see *e.g.* Bonato-Faini-Ratti, 1993, Staderini, 2001, and Alworth-Arachi, 2001).

The second aim is to use our framework to shed some light on the effects of tax policy changes on corporate financial policy. This is of particular relevance in the Italian case. Here, a tax reform was implement at the end of the 1990s with the main purpose of reducing the tax advantage to debt and stimulate firms' capitalisation. Unfortunately, the reform was shortly reversed (in 2001), thus preventing the possibility to undertake a "natural experiment" test. Nevertheless, the analysis put forward in this paper can provide some useful indication of the effects on debt of these alternative reforms.

The paper is organised as follows.

Section 2 describes the model used to represent debt financing choices. This is a dynamic representation of the modified pecking order theory (MPO) where both trade-off and pecking order theories are nested. This specification of all the potential determinants of debt financing avoids biases of the relationships between borrowing and the tax variables due to omitted variables eventually correlated with fiscal factors.

Section 3 explains how we proceeded in measuring the tax variables entering into the model. To this aim a chief role was played by a microsimulation model (MATIS) able to take into account the complex interaction of the various aspects of the fiscal law.

Section 4 presents the econometric estimate of the debt-ratio determinants. They are based on an unbalanced panel of about 24,000 manufacturing companies for the 1982-1999 period. The endogeneity problem of fiscal and other explanatory variables is tackled by the instrumental variable estimation technique. Moreover, we implement an analysis of robustness of alternative MPO model specifications.

Section 5 presents several simulations devoted to disentangle the effects on borrowing decisions of the two recent tax reforms mentioned above: the one introduced in 1997-98, and the reform proposed in 2001, by the newly elected government.

Section 6 concludes by summarising the main findings and suggests possible developments for future research.

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remarks during a presentation of this research. The usual caveats apply. Financial support from MIUR (40%) is gratefully acknowledged.

2. The MPO model

The literature on the determinants of corporate financial structure focuses on two frequently opposed explanations: the trade-off (TO) and the pecking order (PO) theories. Here, following a suggestion of Myers (1984), and its empirical representation provided in a previous paper by one of the authors (Bontempi, 2002), we use the modified pecking order (MPO) model, where both TO and PO leverage determinants are nested.

The TO focuses on the benefits and costs of issuing debt (for a survey see Harris-Raviv, 1991). Benefits include: the tax deductibility of interest paid (fiscal factors); the use of debt to indicate high-quality company performance (signalling factors); the use of debt to reduce the amount of a company's resources that managers are free to waste on unprofitable projects (agency factors). Costs include: the likelihood and cost of inefficient liquidation, and the agency costs due to the debtors' incentives towards taking actions that may be detrimental to lenders (failure factors); the possibility of losing the tax benefit deriving from other (non-debt) tax shields (fiscal factors).

The TO debt-ratio determinants are summarised in four groups of regressors (fiscal, failure, agency and signalling effects), included in the $trade_{it}$ vector, so that for company i at time t, we have:

$$d_{it}^{*} = (b'/-a)\, trade_{it} \qquad (1)$$

where vector b and scalar a are parameters. In the long run, these variables characterise the target leverage d_{it}^{*} that firms have to reach in order to maximise shareholders' wealth. In the short run, the actual debt-ratio (d_{it}) dynamics is supposed to follow an equilibrium-correction mechanism towards the target debt-ratio, so that:

$$\Delta d_{it} = a\,(d_{it-1} - d_{it-1}^{*}) \qquad (2)$$

where Δ is the first-difference operator.

The PO theory, originally developed by Myers-Majluf (1984), considers the role of information asymmetries (with regard to assets presently held and investment opportunities) between firms and capital markets. PO predicts that companies adopt a hierarchical order of financing: internal funds are given preference over external ones. If external financing is needed, to finance investment, firms first seek low-risk debt funding that cannot be sold for more than it is worth. New shares are issued only as the last resort, when debt financing would be extremely costly. The PO determinants can be grouped into three variables: cash-

flow, investment needs, and financial slack (cash, liquid assets and marketable securities, unused borrowing power), that are included in the fcf_{it} vector:

$$\Delta d_{it} = c' fcf_{it} \qquad (3)$$

where c is a vector of parameters.

The components of *fcf* vector in equation (3) are proxies for the so called "*free cash flow*", that is to say, internal funds in excess to investment opportunities.

As already mentioned, the MPO empirical specification is a general model that nests "pure" PO and TO theories:

$$\Delta d_{it} = c' fcf_{it} + a\, d_{it-1} + b' trade_{it-1} + u_{it} \qquad (4)$$

where $u_{it} = \mu_i + \lambda_t + \varepsilon_{it}$ represents individual, time and random unobservable components. According to this specification, firms may modify their leverage position not only in order to rebalance to their long run target, but also because they need external finance in the short run.

In equation (4) the vectors fcf_{it} and $trade_{it-1}$ contain both fiscal and non fiscal variables. To focus attention on the effects of the former, the next Section is particularly devoted to a detailed explanation of how they can be measured.

3. The measurement of the tax variables

Our explanatory fiscal variables are: in the *trade* vector, the relative cost of debt and equity capital and non-debt tax shields; and in the *fcf* vector, the after-tax cash flow.

The measurement of the cash flow variable is fairly straightforward and uncontroversial in the literature. Cash flow is usually defined as operative earnings before depreciation, non-operative and extraordinary items, and other non-cash expenses, net of total interest expenses, taxes, and dividends paid. Thus, cash flow is influenced by taxes through the fiscal liabilities in each accounting period.

The measurement of the TO fiscal factors (the relative cost of capital and non-debt tax shields) entails more difficulties. Theoretically, their effect on leverage is relatively clear: the deductibility of interest charges from taxable income lowers the cost of debt financing compared to the cost of equity financing, that is not usually granted a similar deduction. The tax advantage to debt, however, declines as companies become tax-exhausted. This might occur as a consequence of current operating losses, non debt tax deductions (like carry-back

and -forward of losses or depreciation allowances), and interest deductions from already-existing debt.

The most adequate measure of the tax advantage to debt should be a forward looking indicator that takes into account the present status and the future profitability of the firm, the presence of other tax deductions or credits that might reduce the advantage of interest deduction, and the details of the tax legislation concerning carry-back and forward of losses. Ideally, one should take into account all those interactions at the firm level by using a unique measure, rather than separate variables (Graham, 2003). However, an effective tax rate of this type is not available, since it is based on unknown managers' expectations of the future tax status of the company (Shevlin, 1990). As a result, alternative approaches are used, in the empirical literature, all of which have pros and cons.

In their debt regressions, a number of authors (*e.g.* Titman-Wessels, 1988) try to capture fiscal effects by including non-debt tax shields only. One problem with this fiscal indicator is the often-estimated wrong sign. Instead of a tax substitution effect (tax shields against interest deductions), non-debt tax shields, in the form, for example, of depreciation allowances, capture the presence of highly profitable investments and more guarantees (securability effect). The estimation of the substitution effect between interest deductions and non-debt tax shields requires either particular measures (for example, loss carry-forwards only) or that non-debt tax shields interact with a variable identifying firms near tax exhaustion (see *e.g.* MacKie-Mason, 1990), especially when they consist of investment tax credits or depreciation allowances.

In addition to non-debt tax shields, Graham (1996a) introduces in his debt regressions the estimated marginal tax rate (MTR). This effective tax rate measures the present value of current and expected future taxes paid on an additional unit of income earned today. Expected future taxes are computed by assuming that managers forecast future taxable income using a random walk model with drift, and by accounting for the present features of the tax legislation. Despite the noticeable appeal of this indicator, a number of limitations may occur. On the behavioural side, it is reasonable that "some managers make decisions based on their firm's current statutory tax status", and "not all firms simulate marginal tax rates" (Graham, 1996a, pp. 55, and 62). For this reason, Graham includes in his debt-model specification also the difference between the statutory tax rates and the MTR. On the statistical side, the forecast of the expected taxable income requires a considerable time span *before* the period of MTR

computation. For example, the MTR estimation for 1990 requires a stream of future incomes expected in 1990, which can be forecasted on the basis of the past record of company earnings (prior to 1990) only. The forecast horizon depends on the carry-back and -forward provisions.

In the specification of our empirical MPO model, we follow the Graham (1996a) approach, since we include in the *trade* vector of equation (4) both non-debt tax shields and simulated effective tax rates. However, we differ in two ways. Firstly, we do not adopt a specific measure of non-debt tax shields, but implement different measures to check the robustness of the MPO model estimates to alternative specifications (see Section 4). Secondly, our effective tax rates derive from a micro-simulation model (MATIS) based on the detailed accounting items reported by the companies in our sample. MATIS calculates the tax liabilities on present income realisations; thus it is not based on the expected stream of taxable income. This choice is due to the short time span of our sample which does not allow a reliable representation of the stochastic process of future profitability, and hence the MTR's computation. However, for a sub-sample of companies, we can estimate the perfect foresight marginal tax rate (Graham, 1996b), *e.g.* the expected effective tax rate based on realised taxable income rather than simulations of the future. A comparison between the performance of our simulated tax rates and the perfect foresight MTR is presented in Section 4.

Our simulated tax rates have a number of positive features. MATIS takes into account the tax code treatment of net operating losses and tax credits, *e.g.* the complex interaction of the various aspects of the fiscal law. Even though there are differences between accounting and taxable profit (the latter could be properly measured only by using individual data on tax returns, see Plesko, 1999), the richness of the accounting information in our sample, along with the details of the legislation included in the MATIS model, allow us to mimic the tax-code formulas with a good level of precision.

The relative cost of capital variable (*ccnsitd*) is constructed as the ratio of the user cost of capital under debt and equity financing, where both include the corresponding MATIS simulated tax rates[2]. The following formulas illustrate the changes in the tax legislation over our sample period (1982-1999):

[2] The user cost of capital is derived from a model of market equilibrium with no arbitrage opportunities and ignoring risk, so that investors earn the same net return on debt and equity investment. We do not include

$$ccnsitd_{82-91} = 1 - t_{sc} \tag{5}$$

$$ccnsitd_{92-95} = \frac{1 - t_{sc}}{1 + \frac{t_{spat}}{ieq}} \tag{6}$$

$$ccnsitd_{96} = \frac{1 - t_{sc}}{nsitd + (1 - nsitd)(1 + \frac{t_{spat}}{ieq})} \tag{7}$$

$$ccnsitd_{97} = \frac{1 - t_{sc}}{nsitd\,(1 - agev) + (1 - nsitd)(1 + \frac{t_{spat}}{ieq} - agev)} \tag{8}$$

$$ccnsitd_{98-99} = \frac{1 - t_{sirpeg}}{1 - agev} \tag{9}$$

In equations (5)-(8), $t_{sc} = t_{silor} + (1-\beta\, t_{silor})t_{sirpeg}$, where t_{silor} and t_{sirpeg} are the MATIS simulated tax rates for the local income tax on profits (Ilor) and the national corporation tax (Irpeg) respectively, and β is the share of Ilor deductible from the Irpeg tax base[3]. These MATIS simulated tax rates take into account the carrying forward of losses, that is granted for five years under Italian legislation (no carry back is allowed). Compensation of losses is allowed against Irpeg, but not Ilor. Since no information is available about losses prior to the first year of our sample, we assumed that they are equal to zero in the initial period; this means that, during the first five years, the simulated effective tax rate may overestimate the true effective tax rate.

In equation (6), valid for the 1992-1995 period, the denominator is greater than one because of the presence of a tax on net wealth of companies (levied at the MATIS simulated rate t_{spat}). This tax increased the cost of equity (both retained earnings and new share issue)[4].

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personal tax rates for two major reasons. First, they are not relevant for companies raising finance on the international market or through tax-exempt financial institutions. Second, information on each firm's tax clienteles are not available.

[3] In 1982-1997 the statutory Ilor tax rate was 16.2%; the tax was abolished in 1998. In 1982 the statutory Irpeg tax rate was 27%; 36% during 1983-1994, and 37% since 1995. The share of Ilor deductible from Irpeg base was 1 in 1982-1990; 0.75 in 1991, and 0 since 1992.

[4] The statutory tax rate on net wealth was 0.75%.

To transform the tax rate on net wealth into a corresponding rate on income suitable to be included in a cost of capital formula, the former is discounted by the Treasury bills interest rate, *ieq*.

From 1996 the tax on net wealth is not paid if the marginal source of finance is new subscription of capital. In order to account for this change in tax code, equations (7) and (8) weight the two different sources of equity financing with *nsitd*, the percentage of financing with new share issues over the total financing with new equity.

Both the net wealth tax and the local tax were abolished in 1998 by a tax reform that also introduced since 1997 a new allowance on equity capital. According to this allowance, corporate income is divided into two components. The first, called "ordinary income", is computed so as to approximate the opportunity cost of new financing with equity capital. To do so, a notional interest rate set yearly by the Government on the basis of the market interest rate is applied to a measure of new equity (new subscriptions and retained earnings from 1996 onwards) invested by the firm. This "ordinary return" (normal profit) is taxed at the reduced rate of 19%. The remainder part of profits is taxed at the Irpeg statutory rate. The tax saving due to this allowance is $agev = (0.37 - 0.19)\frac{IMP_{Dit}}{RO + RIP_{Dit}}$. The difference between statutory and reduced tax rates is multiplied by the ratio $\frac{IMP_{Dit}}{RO + RIP_{Dit}}$, to account for the possibility of tax exhaustion, which might prevent the firm benefiting from this allowance. More precisely, the term $RO+RIP_{Dit}$ represents the amount of income that potentially may be taxed by the reduced tax rate (19%), where *RO* is the opportunity cost of shareholders' funds and RIP_{Dit} is the carry-forward of the fiscal allowance not exploited because of earnings' exhaustion; IMP_{Dit} is the amount of Irpeg taxable income that actually benefits from the reduced tax rate. All these values are simulated by the MATIS model. The variable *agev* ranges form a minimum of zero - when firms are not able to exploit the Dit advantage - to a maximum of 18% - when firms can entirely use the Dit advantage.

4. The econometric estimate of the debt-ratio determinants

The source of data for this study is drawn from the Company Accounts Data Service (CADS), a large database with information on the balance sheets and income statements of above 50,000 Italian companies covering all industries from 1982 to 1999 (for further CADS description see Bontempi, 2002, section 4.1). Our selection rules includes: all manufacturing

industries; firms whose data are available for at least four consecutive years; companies respecting our clearing criteria (no inconsistencies in the accounting items, no strong outliers of all the variables of interest)[5]. The resulting sample is an unbalanced panel of 24,796 companies (225,333 observations).

In the empirical implementation of the MPO equation (4) we choose to explain the changes in the ratio between bank-debt and net assets (see the Appendix). The bank-borrowing choice is suggested by the large use of this type of debt by Italian manufacturing companies. This derives from the institutional and legal system that does not support so much active public participation in the bond capital markets, and from the existence of long-term ties between major banks and their client firms[6]. Bank-debt represents about 90% of total financial debt (bonds are 5%, loans from subsidiaries, affiliates and parent companies are 3%, and shareholder loans are 2%).

The empirical difficulties raised by the estimation of equation (4) can be summarised in: (*a*) the endogeneity of the explanatory variables; (*b*) the correlation of the regression residuals across firms (see *e.g.* Fama-French, 2000, p. 20); (*c*) the specification choice of the variables included in the *fcf* and *trade* vectors. Parameter estimates are obtained by using the instrumental variables approach in dynamic panels with both individual (μ_i) and temporal (λ_t) fixed effects (see Anderson-Hsiao, 1981). In our view, this approach is able to account for both (*a*) and (*b*) econometric issues.

As far as issue (*a*) is concerned, theory assumes that firms, when choosing their financing, are faced with various capital market imperfections and agency costs, which imply the reciprocal influence of internal funds availability, investment decisions, and borrowing. Moreover, as anticipated, also the effective tax rate against which interests can be deducted is a decreasing function of borrowing. In order to avoid the simultaneity bias resulting from the endogenous nature of some of the variables used to predict financial policy, we instrumented all the explanatory variables with the corresponding two-period-lagged levels (see Arellano, 1989). Efficiency problems of the instrumental variables approach are overshadowed by the size of the sample.

[5] Details on the selection rules are available from the authors.

[6] For a discussion about this issue, see Bontempi (2002).

As far as issue (*b*) is concerned, modelling cross section dependence is more complicated than modelling time series dependence, because individual cross-section observations display no natural ordering and structure. In our fixed effects panel specification of equation (4), the time-specific common effect λ_t allows for a degree of dependency across individuals due to individually unimportant but collectively significant effects (*e.g.* widespread optimism or pessimism), though it relies on a strong parametric assumption of cross section dependence.

Another merit of our two-way fixed-effects panel approach is reducing or avoiding the omitted variable bias. This problem, listed at point *(c)*, arises because "variables traditionally used to control for taxes do not appear to sufficiently disentangle taxes from numerous other factors related to firm behaviour". Hence, "inferences based solely on the estimated coefficients of the tax proxies or other variables may be incorrect" (Plesko (1999, p. 29). For example, a profitable firm with a great fiscal advantage of debt may borrow less than it would be predicted under a pure TO model, because of a PO behaviour. Point *(c)* is also tackled by our general and dynamic MPO model which encompasses both TO and PO behaviours.

A related issue is that often economic theories are not explicit enough about what explanatory variables belong to the "true" regression. From this last point of view, the MPO theory is not an exception to the rule: it does not generate a complete specification of the empirical model, but simply suggests a number of potentially influential effects, classified in PO and TO debt-ratio determinants. Thus, a difficulty in implementing the analysis of fiscal factors effects on firms financial behaviour is that some explanatory variables included in the model may be imperfect or mixed measures of the "ideal" determinants: for example, the possible measurement errors involved in the proxy for the non-debt tax shields can alter sign and significance of tax variables estimated coefficients (as discussed in Section 3). To tackle this last issue, we adopt a number of different measures, suggested in the literature, for all the variables that can be defined as control variables. Table 1 illustrates these alternative measures: the first column reports the debt-ratio theoretical determinants included in *fcf* and *trade* vectors (see also Section 2), the second column shows the parameter labels (*e.g.* c_1 is the first parameter in the vector *c*, and it measures the effect of cash flow on debt-ratio), and

the following columns list the alternative measures (explanatory variables) that we used for each effect[7].

As Table 1 makes clear, the only explanatory variables that we do not change are the cash flow (*casha*) on the PO side, and the relative cost of capital (*ccnsitd*) on the TO side. This choice has two reasons. The first is the satisfactory precision of the PO theory in defining internal funds, and the relative advantages of our MATIS-simulated cost of debt versus equity capital, with respect to other available indicators. The second motivation arises from our objective of assessing the relevance of taxes on debt policy through the simulation and evaluation of alternative fiscal regimes (Section 5). According to this objective, *casha* and *ccnsitd* are the direct transmission channels of tax policies on corporate borrowing. Hence, it is particularly important to check for the robustness of *casha* and *ccnsitd* parameter estimates to alterations of the MPO model specification.

Tab. 1 - The structure of equation regressors in *trade* and *fcf* vectors

Theoretical effects	Parameter	Alternative measures (explanatory variables) by effect ([1])					
Dynamics	a	d_{it-1}					
PO (*fcf* vector):							
Cash flow	c_1	$casha_{it}$					
Investment needs	c_2 c_3	$iinva_{it}$ $inva_{it}$	$iinva1_{it}$	$iinvna_{it}$ $invna_{it}$	$iinvna1_{it}$	$iinvna2_{it}$	
Financial slack	c_4	$vnwc_{it}$	$vnwc1_{it}$				
TO (*trade* vector):							
Fiscal	b_1 b_2	$ccnsitd_{it-1}$ $ndts_{it-1}$	$ndtsr_{it-1}$	$ndtsrof_{it-1}$	$ndtsrrof_{it-1}$	$ndtstw_{it-1}$	$ndtstw1_{it-1}$
Failure	b_3	$matna_{it-1}$	$terna_{it-1}$	$termacna_{it-1}$	$garna_{it-1}$		
Agency	b_4	$imatna_{it-1}$	$redna_{it-1}$	$redplana_{it-1}$			
Signalling	b_5	nwc_{t-1}	$nwc1_{t-1}$				

([1]) Both motivations about the choices we made and the description of each label are in the Appendix.

[7] Detailed definitions and descriptive statistics of these variables are in the Appendix; a survey of motivations for their inclusion is in Harris-Raviv (1991).

In order to ease the presentation of our sensitivity analysis, equation (4) can be rewritten as:

$$\Delta d_{it} = \beta_I I_{it} + \beta_M M_{it} + \beta_X X_{it} + \varepsilon_{it} \qquad (10)$$

where: Δd_{it} is the debt-ratio in first differences; the vector I includes the deterministic individual and time effects μ_i and λ_t, *i.e.* the variables common to all the alternative models; $M = (casha_t, ccnsitd_{t-1}, dfbta_{t-1})'$ includes the three focus variables and β_M is the corresponding vector of parameters $(c_1, b_1, a)'$; finally, X is the conditional information set which includes the seven control variables (belonging either to *fcf* or *trade* vectors in Table 1) with parameter vector $\beta_X = (c_2, c_3, c_4, b_2, b_3, b_4, b_5)'$. Although the estimation of β_X is not of direct interest for our policy evaluation, alternative measurements of X imply different β_M estimates. Since the focus here is to assess the significance of such changes in β_M estimates, we carried out a sort of Leamer (1985) extreme bound analysis (EBA). EBA consists of varying the measures of X in order to find the widest range of $(c_1, b_1, a)'$ estimates: the last are labelled as "robust" if they are significantly of the same sign, despite alterations of the specification of the conditional information set X.

Our EBA application to the MPO model implies the estimation of all the possible combinations of the alternative explanatory variables in X (see the list in Table 1), and delivers 2,880 estimates of the three parameters of interest. Estimation results are summarised in Table 2.

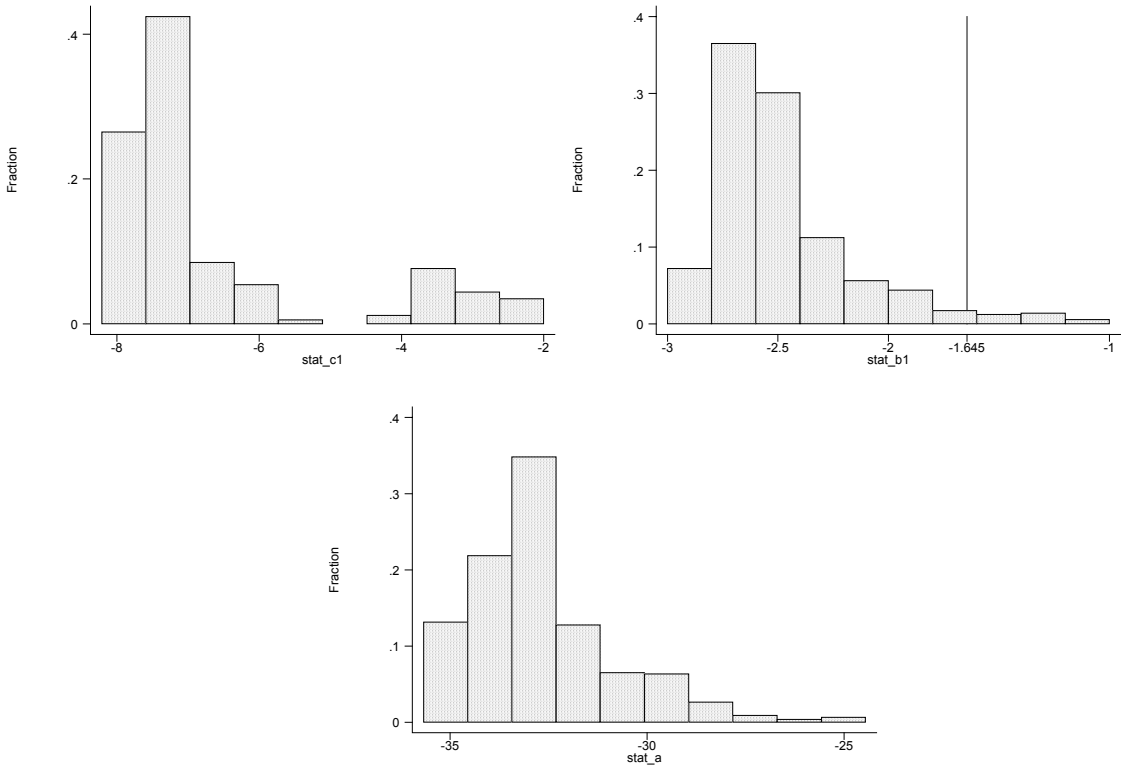
Tab. 2 - A synthesis of the 2,880 estimates

	$\hat{c}_1$	$\hat{b}_1$	$\hat{a}$
Summary statistics:			
Mean	-0.259	-0.00305	-0.427
Standard deviation ([1])	0.026	0.00040	0.008
Minimum	-0.367	-0.00429	-0.447
1st quartile	-0.267	-0.00326	-0.431
Median	-0.255	-0.00309	-0.426
3rd quartile	-0.244	-0.00290	-0.422
Maximum	-0.201	-0.00160	-0.408
Weighted averages: ([2])			
Estimate	-0.260	-0.00305	-0.427
Standard error ([3])	0.048	0.00124	0.013

([1]) Standard deviation of the 2,880 parameter estimates
([2]) Weights are based on generalised R^2 of each regression.
([3]) Weighted average of the 2,880 standard error estimates

The cash flow parameter c_1 estimates are always negative, as predicted by the PO theory; their distribution suggests a quite relevant effect on firms leverage, since one point more of the cash flow-assets ratio induces, on average, a decrease of ¼ in the debt-ratio. The dispersion of the results is rather small, with a standard deviation equal to 0.026. The dynamics parameter *a* estimates, in the last column of Table 2, are even less dispersed, and suggests a speed of adjustment around 1.2 years to close half of the deviation between the actual and the target debt-ratios. The relative cost of capital parameter b_1 estimates are always negative, as predicted by the TO theory; if *ccnsitd* doubles, firms reduce on average their debt-ratios of about 0.15%[8]. Though statistically significant, the economic relevance of the relative cost of capital in explaining borrowing seems more limited than cash flow. But at this stage the comparison is difficult, while will be clear when discussing the effects on debt of tax reforms (Section 5).

Fig. 1 - The distribution of the test-statistics of the parameters of interest (*)



(*) The vertical line at 1.645 is the critical value at one-tail 5% significance level: the statistics that fall on the right side of the critical values suggest the corresponding estimates are not robust (the line is not plotted if the critical value falls outside the right hand of the histogram).

[8] In fact, -0.0305*0.4855 = 0.00148, where 0.4855 is the mean value of *ccnsitd* (see the Appendix).

In order to term our estimates as "robust", MPO-theory predictions and the stability condition of the dynamics require that all the c_1, b_1, and a estimates are all significantly negative. The three histograms in Figure 1 allow for a visual inspection of the robustness of the estimates of our focus variables: they report the distribution of the test-statistics for the null hypothesis that the parameters are equal to or bigger than zero.

The statistics always reject the null hypothesis that c_1 and a parameters are zero or positive, while, as far as b_1 parameter is concerned, the null is not rejected only in a very limited number of cases (96 out of 2,880). Strictly speaking (*i.e.* in EBA terms), only c_1 and a are robust, while b_1 is not robust. However, as noted by Sala-I-Martin (1997), the EBA approach is often too strong for any variable to pass it. For this reason, he proposes a less "extreme" approach in order to assign some level of confidence to the variables under scrutiny, based on the whole distribution of the parameter estimates, instead of the EBA zero-one labelling of "robust" vs. "non robust".

The procedure used here is a slight variant of Sala-I-Martin proposal. We constructed the mean estimate and the average standard error of each parameter of interest by using the 2,880 regressions; each mean estimate is a weighted average of all individual estimates, where the weights are proportional to the generalised R^2 (see Pesaran-Smith, 1994) of each individual regression. In line with seminal Theil's (1971) criterion of model selection, the reason for using this weighting scheme is to give more weight to the regressions that have a better fit (the implicit hypothesis is that the better the fit, the higher the probability of the model being true). Moreover, with respect to the Sala-I-Martin (1997), we avoid possible problems of a spurious good fit due to endogenous regressors because we instrumented all the explanatory variables instead of using OLS.

Averaging over the whole distribution of the 2,880 outcomes leads to the results reported in the last two rows of Table 2. Given that each average parameter estimate is (in absolute value) well above two times its average standard error, we confirm the EBA results for the cash flow and the dynamics parameters. In addition, we can be confident about the significance of the relative cost of capital too: the average estimate over the average standard error is equal to -2.46, and falls in the region where the null hypothesis is 5% rejected.

The validity of our relative cost of capital measure can be further assessed by adding an explanatory variable measuring the difference between two relative costs of capital: one including the perfect foresight MTR and the other including our simulated average effective

tax rate. The associated coefficient, if significantly negative, indicates that expected tax status has a role in explaining borrowing, in addition to the current tax status (for a similar approach, see Graham, 1996a, p. 55). The perfect foresight relative cost of capital variable replaces t_{sc} with the perfect foresight MTR in equations (5) and (6). This variable is computed, and the corresponding MPO model is estimated, only for the period 1992-1994; this is due to the 5-year loss carry-forwards provision of the Italian tax legislation that requires the knowledge of realised taxable income for at least five years in the future. Over this period, the 2,880 estimation results show that: 1) the difference between the two relative costs of capital has a significantly negative effect on debt ratio only in a very limited number of the 2,880 cases (less than 10%); 2) differently from cash flow, lagged debt-ratio, and MATIS simulated cost of capital parameters, the relative cost of capital implementing perfect foresight MTR misses robustness to the use of alternative MPO specifications and instruments[9]; 3) our MATIS simulated cost of capital estimates show to be remarkably stable in the 1982-94 sub-sample (the average estimate and t-statistic are -0.0043 and -1.71 respectively); 4) the average R^2 of our model specifications in table 2 is 0.200; in the sub-sample up to 1994 it is 0.174; it drops to 0.135 if we use MTR cost of capital instead of MATIS cost of capital[10]. Though confined to the sub-sample up to 1994, these outcomes, unfavourable to the use of perfect foresight MTR cost of capital, probably reflects the difficulties to model the managers' expectations of taxable income. Over the period of our analysis, the Italian economy was characterised by high degrees of uncertainty, exacerbating the problems raised by any attempt to model expected-income. In addition, there are other specific facts that might weaken the difference between MTR and MATIS average effective tax rates in our context: the absence of carry-back of losses and the short period for carrying forward (five years only); the large share of firms in our sample (about 78%) with positive taxable income; and the high tax status-persistence probabilities (firms experiencing positive taxable income will experience again positive income with a probability of 89.6%).

[9] Since lagged values of MTR cost of capital may be used as instruments for lags bigger than 6 only, we use more parsimonious lags of earnings before taxes and of interest expenses. Other possible instruments (such as lags of sales or estimated taxable income, and further lags of cash flow) would have worsened the MTR cost of capital estimation results.

[10] Detailed results are available upon request from the authors.

Overall, the results in this section show that the tax effects on debt-ratio are robust and have significant right signs.

5. The assessment of the financial effects of alternative fiscal reforms

As mentioned in Section 3, the corporate tax code in Italy has experienced several changes over time. The most important one has been the introduction of the Dual income tax (Dit) system in 1997 and the abolition of Ilor and the net wealth tax in 1998. These taxes, along with a contribution levied on wages and earnings and earmarked for health expenditure, were replaced by a new regional tax (Irap), levied on a measure of value added of the net income type. In the manufacturing sector, the tax base is computed as the difference between sales revenue on the one hand, and costs for intermediate goods and services and depreciation on the other. Neither labour costs, nor interest payments are deductible from the Irap tax base.

This reform significantly altered the tax liabilities of companies and the relative cost of capital. In fact, one of the major goals of the reform was the reduction of the wide gap between the tax costs of debt and equity finance, in order to stimulate Italian firms' capitalisation (Bordignon *et al*, 2001). The original reform was incremental: only new equity financing from 1996 onwards was eligible to the allowance. However, "a regime" it stated the full application of the Dit system to the stock of net equity (and not only to the new equity capital addition). Moreover, the decrease of the Irpeg statutory tax rate up to 35% in 2003 was envisaged.

Prior to its final implementation, this reform was substantially reversed by the political majority winning the 2001 election. The newly elected Government soon abolished the Dual income tax system on new equity financing, and is progressively eliminating the allowance also on previously made investments. The new system that the Government is proposing goes back to a flat corporate tax rate, that should decrease up to 33%. In addition, the Irap tax should be progressively abolished. The first objective could be easily achieved, without having detrimental effects on tax revenue. This is not the case, though, for the abolition of the Irap tax, that provides a revenue as high as about 30 billion euros, an amount similar to the corporation tax. The Government has not made clear yet how this loss of revenue will be financed. The progressive abolition of this tax will be decided year by year, depending on the general condition of the budget deficit, and the need to respect the European Stability and Growth Pact.

Within a partial approach framework, fiscal reforms give the opportunity of further exploring the effect of taxes on company financial decisions in two alternative ways: (*a*) comparing what was forecasted and what happened; (*b*) measuring the financial debt responses to tax impulses that embody "how much" the tax variables are altered by the reforms. The first route, followed for example by Gordon-Mackie Mason (1990), is not suitable in our context, because we do not have enough post reform history: the reform introduced in 1997-98 was in fact abolished before its final implementation, and the new reform initiated in 2001 is still under course .

In what follows we implement the (*b*) approach. In Section 5.1 we first assess, by using alternative MATIS microsimulations, the impact of these tax reforms on the tax variables of the model; then, in Section 5.2, we measure the debt-ratios dynamic responses by using the model estimated in Section 4.

5.1 The microsimulation of the fiscal impulses

In order to assess the effect on the MPO fiscal variables (cash flow trough tax liabilities, and the relative cost of capital through effective tax rates) of the 1997-98 and 2001 reforms, we perform *microsimulation* exercises by using the MATIS model for three different tax regimes: the legislation in force before 1997, that we use as the benchmark (microsimulation B), the 1997-1998 reform (microsimulation V), and the newly proposed system (microsimulation T). In each microsimulation, indexed *ms*, the MATIS model applies each tax code of interest (*ms* = B, V, and T respectively) to *all* the firm-year balance sheets in our sample (above 200,000 cases).

In other terms, in each microsimulation the fiscal variables are endogenised (and then simulated) by the MATIS structure that mimics the working of the tax code under scrutiny in each firm-year case by using all the information available for that firm-year: for example, the microsimulation B applies the same tax code in force in 1996 to all available firm-year observations, and not only to firms in 1996. The reason for this procedure is to increase the number of specific cases studied for each firm: the bigger they are, the more informed the model answers will be.

The fiscal burdens entering into the cash flow definition are simulated by MATIS according to the following equations for the B, V, and T tax regimes:

$$T^{B} = T_{Irpeg37} + T_{Ilor} + CS + T_{Pat} \qquad (11)$$

$$T^V = T_{Irpeg19\text{-}35} + T_{Irap} \quad (12)$$

$$T^T = T_{Irpeg33} + T_{Irapcl} \quad (13)$$

T^B is the tax burden according to the tax legislation in force in 1996; it consists of the simulated tax burden for the corporation tax, levied at the rate of 37% ($T_{Irpeg37}$), the Ilor tax (T_{Ilor}), non deductible from the Irpeg tax base, the health contributions on wages (CS), and the net wealth tax (T_{Pat}).

T^V is the simulated tax payment under the 1997-98 tax reform, including the new tax on productive activity (T_{Irap}) and the dual corporate tax system ($T_{Irpeg19\text{-}35}$). The lower rate (19%) is applied to the whole stock of net equity capital, as it would have been with this reform "a regime".

T^T is the tax burden under the new reform; it is computed under the assumptions that the Dit system is completely disallowed, the corporate tax rate is reduced to the uniform value of 33%, and that the Irap tax burden is reduced by subtracting 20% of the labour costs from the tax base. It is important to note that this simulation does not reproduce the exact content of the new reform. As previously mentioned, the latter is still much uncertain in its timing and final design, in particular concerning the full abolition of the Irap tax. The assumption made here refers to a possible intermediate step in the abolition of Irap, that was announced by the government, when the reform was originally presented. In our context, it has the main purpose of comparing the effects on debt of two alternative tax regimes, having opposite effects on cash flow, and on the relative cost of capital of debt versus equity finance.

As far as the relative cost of capital is concerned, we have the following formulas for V and T reforms (the formula for $ccnsitd^B$ is the same as in equation (7)):

$$ccnsitd^V = \frac{1 - t_{sirpeg35}}{1 - agev} \quad (14)$$

$$ccnsitd^T = 1 - t_{sirpeg33} \quad (15)$$

where $t_{sirpeg35}$ and $t_{sirpeg33}$ are the MATIS simulated Irpeg tax rates in the case of V and T reforms, respectively; $agev = (0.35 - 0.19)\frac{IMP_{Dit}}{RO + RIP_{Dit}}$.

The changes in cash flow and in the relative cost of capital are the basic fiscal impulses to the debt-ratio relationship. They are defined as:[11]

$$\Delta casha^{ms}{}_{it} = -\frac{T_{it}^{ms} - T_{it}^{B}}{A_{it}}, ms = \mathrm{V},\ \mathrm{T} \qquad (16)$$

$$\Delta ccnsitd^{ms}{}_{it} = ccnsitd_{it}^{ms} - ccnsitd_{it}^{B},\ ms = \mathrm{V},\ \mathrm{T} \qquad (17)$$

i.e. the differences between the MATIS simulated total fiscal burden T_{it}^{ms} and relative cost of capital $ccnsitd_{it}^{ms}$ (where ms = V, T) with respect to the baseline solutions T_{it}^{B} and $ccnsitd_{it}^{B}$. By definition, the difference between T and V changes, with respect to B, delivers the changes in taxation induced by the 2001 reform with respect to the 1997-98 reform, *i.e.* the change of the T reform with respect to the V reform.

Fiscal impulses by firm are then averaged over two sub-periods, both of six years: 1988-1993[12] and 1994-1999, in order to check for possible time effects on simulation results. Table 3 summarises the mean and standard deviation of the changes in cash flow (*Δcasha*) and cost of capital (*Δccnsitd*) due to the two reforms (V, T), with respect to the benchmark 1996 legislation (B).

Tab. 3 – Summary of the microsimulated fiscal impulses

	$\Delta casha^{ms} = \frac{1}{N(T_2 - T_1 + 1)} \sum_{i=1}^{N} \sum_{t=T_1}^{T_2} \Delta casha_{it}^{ms}$		$\Delta ccnsitd^{ms} = \frac{1}{N(T_2 - T_1 + 1)} \sum_{i=1}^{N} \sum_{t=T_1}^{T_2} \Delta ccnsitd_{it}^{ms}$	
$T_1 - T_2$	ms = V	ms = T	ms = V	ms = T
1988 – 93:				
Mean	0.0044	0.0052	0.2901	0.1419
s.d.[a]	(0.0084)	(0.0085)	(1.5908)	(0.1023)
1994 – 99:				
Mean	0.0046	0.0052	0.2870	0.1519
s.d.[a]	(0.0088)	(0.0089)	(0.4182)	(0.1011)

[a] Standard deviations measuring the variability of individuals averaged over the period from T_1 to T_2.

[11] We assume that total net assets, A, do not change subsequently to the reforms with respect to the benchmark. Similarly, in examining the effects of the 1986 US tax reform, Gordon-MacKie Mason (1990) take as given firms decisions about ITC and tax loss carryforwards.

[12] The first five years, 1982-1985, were discarded to initialise the loss carry-forward procedure.

The reduction in the tax burden (*i.e.* the increase in the ratio of cash flow to total assets) is slightly greater with the T reform, while the rise in the relative cost of capital induced by the V reform is always well above that induced by the T reform (see the fourth and the fifth columns of Table 3). As far as the firm-variability of the changes is concerned, the effects of the V reform on the relative cost of capital show greater variability than the T reform ones.

Looking at the difference between the T and V fiscal impulses, it emerges that the former further increases the cash flow, but reduces the relative cost of debt capital. The first effect will imply a reduction in the debt-ratio additional to that involved by the V reform, while the second will work in the opposite direction of increasing the debt-ratio.

5.2 From fiscal impulses to financial responses

Since aggregate fiscal impulses by sub-period are quite similar (see Table 3), we focus on period 1988-1993 averages by firm only, in order to avoid possible biases on Dit simulation outcomes due to a 1994-1995 temporary incentive (which reduced the tax burden and increased retained earnings and reserves), and to exclude the years in which the V reform was already in act.[13]

In the light of the MPO model structure, the time-averages by firm measure the permanent impulses to debt-ratios due to V and T tax reforms. Hence, the assessment of the debt responses to the impulses of the reforms is obtained by combining the time-average of the firm-specific changes, $\Delta casha_{i.}^{ms} = \frac{1}{6}\sum_{t=1988}^{1993} \Delta casha_{it}^{ms}$ and $\Delta ccnsitd_{i.}^{ms} = \frac{1}{6}\sum_{t=1988}^{1993} \Delta ccnsitd_{it}^{ms}$ (*ms* = V, T), obtained from the MATIS microsimulations in Section 5.1, with the estimates of the c_1, b_1 and a parameters of the MPO model in Section 4.

Given the MPO dynamic specification, we can assess the timing of the fiscal effects: the impact effect (at horizon zero) in the year of introduction of the reform, the effect after one year, and the long run effect (when the fiscal impulses have exerted all their effects on debt choices).

As discussed in Section 4, the MPO model was specified in alternative ways, and a different set of estimates corresponds to each specification. Consequently, the fiscal impulses

[13] Results are robust to the use of the averages over the 1994-1999 period.

by company cause alternative responses of debt ratios in the 2,880 different MPO specifications. In other words, we obtained 2,880 debt-ratio responses for each of the about 24,000 firms in our sample. Overall, the bulk of these responses is the thick representation (see Granger-Jeon, 2001) of the fiscal impulses from V and T reforms. The advantage of a thick representation over a thin one (where the effects of the reforms on financial choices are measured by only one model, considered the "best") is that thick responses supply a range of outcomes to the policymaker, quantifying the uncertainty surrounding the empirical specification of the financial behaviour.

In what follows, we concentrate on two measures of the financial effect of V and T alternative policies: the percentage of firms reducing their leverage (Table 4), and the quantitative changes in debt-ratios (Table 5).

Tab. 4 – Percentage of firms reducing their debt-ratios

Horizon	V against B	T against V		
			of which: firms not reducing under the V reform	of which: firms reducing under the V reform
0[a]	70.1%	68.9%	24.8%	44.1%
1[a]	84.2%	44.9%	11.3%	33.6%
range[b]	*79.5 / 86.7%*	*40.1 / 52.8%*	*9.3 / 14.9%*	*30.8 / 37.9%*
long run[a]	88.4%	36.3%	8.0%	28.3%
range[b]	*83.5 / 90.7%*	*31.0 / 46.2%*	*6.3 / 11.8%*	*24.7 / 34.4%*

[a] Average percentage over the 2,880 outcomes. [b] The lowest and the highest percentages from the 2,880 outcomes. As far as the impact effect is concerned, in both reforms no interval is provided since all the short-term parameter estimates of the cash flow effect are negative (see c_1 estimates in Table 2), hence the 2,880 percentages coincide.

With respect to the benchmark, the V reform induces more than 70% of firms in our sample to reduce the debt-ratio in the short run; this effect is monotonically reinforced in the long run (more than 88%), when the relative cost of capital transmission channel fully exploits its effects. The effect of shifting from the V to the T reform induces firms to further reduce their debt-ratios, and the number is similar, at the beginning. However, the reaction is different as time passes. The reason is traceable to the different effect of the two reforms on the two transmission channels in this study: cash flow and the cost of capital. At the horizon 0, when only the former operates, the V against B and the T against V effects show similar results: as discussed in Section 5.1, the two reforms consecutively reduce the fiscal burden,

even though by different amounts. However, in the long run, the T reform gradually loses its initial debt-shrinking stimulus, because the relative price effect comes into the picture and works in the opposite direction of stimulating a debt increase, with respect to the V reform. The last two columns of Table 4 disaggregate the percentages of firms reducing debt under the T reform depending on the companies' behaviour under the V reform. Results show that the T reform maintains the firms' tendency of reducing their leverage already engendered by the V reform, instead of inducing a genuine modification of financial behaviour of companies.

Table 5 illustrates the quantitative relevance of the V and T reforms in terms of debt-ratio variations. In order to answer the question about the most relevant tax transmission channel, the total effect of the reforms is also disentangled to separately consider the cash flow and relative cost of capital effect.

Tab. 5 – Deviations of the debt-ratios with respect to the benchmark

	Total effect		Cash flow effect		Relative cost of capital effect	
Horizon	V reform	T reform	V reform	T reform	V reform	T reform
0[a]	-0.11%	-0.13%	-0.11%	-0.13%	-	-
range[b]	*-0.16/ -0.09%*	*-0.19/ -0.10%*	*-0.16/ -0.09%*	*-0.19/ -0.10%*		
s.d.[c]	(0.22)	(0.22)	(0.22)	(0.22)		
1[a]	-0.27%	-0.25%	-0.18%	-0.21%	-0.09%	-0.04%
range[b]	*-0.37/ -0.19%*	*-0.36/ -0.19%*	*-0.26/ -0.14%*	*-0.30/ -0.16%*	*-0.12/ -0.05%*	*-0.06/ -0.02%*
s.d.[c]	(0.60)	(0.36)	(0.34)	(0.35)	(0.48)	(0.03)
....						
long run[a]	-0.48%	-0.42%	-0.27%	-0.32%	-0.21%	-0.10%
range[b]	*-0.68/ -0.32%*	*-0.60/ -0.30%*	*-0.39/ -0.21%*	*-0.46/ -0.24%*	*-0.30/ -0.11%*	*-0.15/ -0.05%*
s.d.[c]	(1.26)	(0.55)	(0.51)	(0.52)	(1.14)	(0.07)

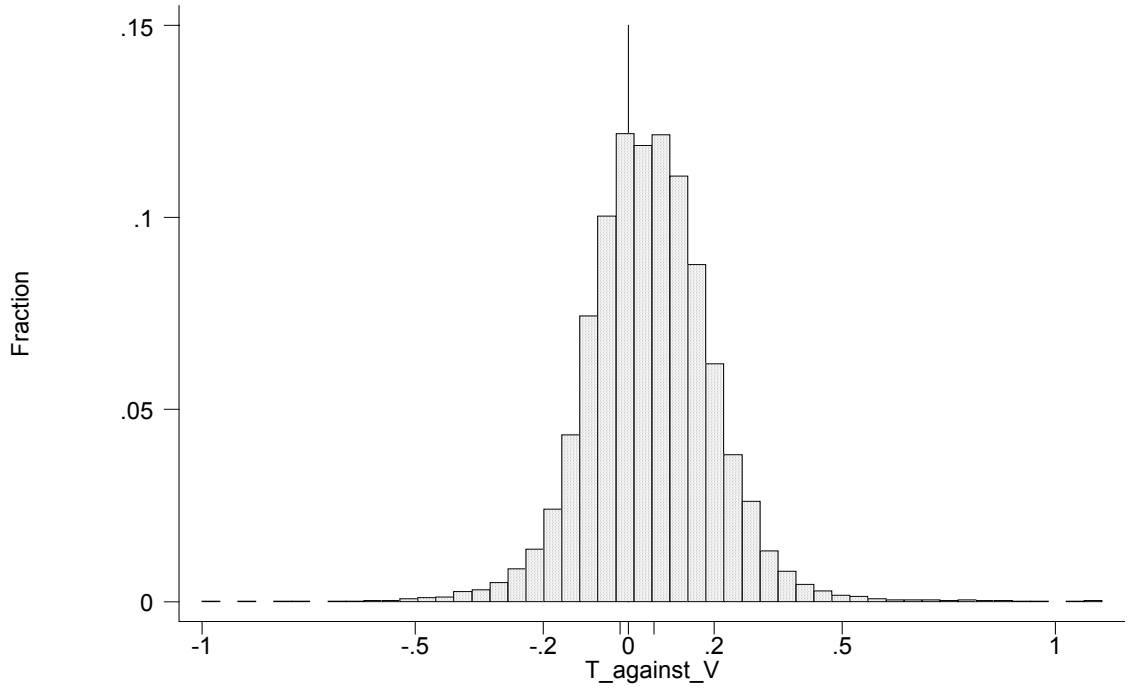
[a] Average debt-ratios changes over the above 20,000 firms of our sample, averaged over the 2,880 outcomes.[b] The lowest and the highest average deviations in the 2,880 outcomes. [c] Average of the 2,880 standard deviations, measuring the firm variability within the 2,880 simulation results.

With respect to the benchmark, both the V and T reforms entail reductions in the company debt-ratios: the reduction is modest at the beginning, but increases over time. The difference between T and V effects allows for a quantification of how much the last reform (T) further decreases debt-ratios with respect to previous one (V). At the beginning, despite the T reform further induces 68.9% of firms to reduce their leverage (see Table 4), the average change of debt ratio is a mere –0.02%. In the long run, the sign is even reversed: the average change of the debt-ratio is positive (0.06%). As it is clear by looking separately at the effects of cash flow and the cost of capital, the T reform further reduces the debt ratio, with respect to the V reform, in as far as it increases cash flow, but increases it, because it widens

the gap in favour of debt, by reducing its relative cost. This latter effects overcome the former, as time goes by.

Figure 2 offers a representation of the long-run debt-ratio changes of all the above 20,000 firms of our sample - with parameters estimates averaged over the 2,880 outcomes - induced by the shifting from the T to the V reform. The figure synthesises two interesting findings of Table 4 and 5: the debt-ratio changes are included in the -0.5 / 0.5% interval, but the increases in debt ratios brought about by the T reform overcomes the reductions and concern the majority of companies (about 64%).

Fig. 2 - The distribution of the T against V reforms effects (*)



(*) The vertical line at 0 indicates no debt-ratio change. The figure is obtained by using all the above 20,000 firms in our sample and the parameter estimates averaged over the 2,880 outcomes.

6 Concluding remarks

The analysis undertaken in this paper shows that both PO and TO tax variables, i.e. cash flow and the relative cost of capital, are significant explanations of firms borrowing in the Italian context. This finding does not change even though we allow for model specification indeterminacy by the means of a "reasonable EBA" analysis.

The tax reform undertaken in 1997-98 had both cash flow and relative price effects, each going in the direction of reducing the debt ratio. On average, in our sample, the effect

can be quantified in 0.48 percentage point of reduction in the debt/asset ratio, almost equally shared by the increase in cash flow (0.27 percentage point) and in the relative cost of capital (0.21 points). The former effect was brought about by the abolition of some taxes and contribution, not fully compensated, in terms of revenue, by the introduction of a new regional tax (Irap). This substitution had also the effect of increasing the cost of debt relatively to equity finance: two of the abolished taxes (the local profit tax and the net wealth tax) highly discriminated against equity finance, whereas the new regional tax is neutral with respect to financing choices, in as far as interest payments are not deductible from the tax base. In addition, a new allowance on new equity finance was introduced (Dit). Our results also show that the debt reducing behaviour was widespread, counting on average almost 90% of the companies in our sample.

The new and only partially enacted tax reform announced by the government in 2001 goes in the opposite direction of widening the relative tax benefit of debt finance. The discrimination remains much lower than it was in the mid 1990s, because the statutory rate is much lower (33% with respect to 53.2%). If compared to the 1996 tax legislation, the relative cost of debt capital increases by about 15 percentage point. However, as a consequence of the abolition of the Dit, it is significantly enhanced relatively to the 1997-98 tax reform (about 13 percentage points). In terms of cash flow, the effect of the new reform is still very uncertain. The abolition of the Dit would be substantially matched by the announced reduction in the legal corporate tax rate. Hence any decrease in the total tax burden would only depend on the possibility of reducing the Irap tax base. The assumption made in this study, of a reduction equal to a 20% deduction of labour costs, is what explains the increase of about 0.06 percentage points in cash flow when comparing the two reforms. However, this assumption is highly questionable. Because of the tight budget constraint, it would be very difficult for the government to progressively abolish the Irap tax without compensatory measures enabling to maintain the overall tax burden on companies. Despite our generous assumption of a 20% reduction in the Irap tax base, the overall result of the relative prices and cash flow effects is, on average, a slight increase in the debt-asset ratio, of about 0.06 percentage points, with respect to the 1997-98 reform. In the absence of this assumption (i.e. with equal cash flow), the increase in the debt-asset ratio would be much higher: around 0.38 percentage points.

In general, we may conclude that tax reforms diminishing the overall tax burden might be as effective in lowering corporate leverage as reforms reducing the relative tax advantage

of debt versus equity. Both are important channels to explain debt choices in the Italian context, where both PO and TO behaviour are diffused. However, the former effect is relatively much more costly in terms of loss of revenue for the State.

The results of this paper can be further developed by future research. A possible extension of the present study is to evaluate the debt responses of tax changes in sub-samples of firms whose parameters can be pooled according to PO and TO homogeneous behaviours. This could assess the robustness of our results with respect to alternative ways to pool possibly heterogeneous firm behaviours. In addition, the update of the whole database, and the precise definition of the design and timing of the new reform could allow in the future to provide for a better understanding of its effect, and shed more light on the pros and cons of the two tax designs, with respect to financing decisions.

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Appendix: Alternative explanatory variables of the MPO model

Legenda of the variables in Table 1[14].

Label	Measures	first decile	median	mean	last decile	standard deviation	pseudo stan. deviation
Δd	First difference in the book value of long- and short-term debt versus banks and quasi-bank intermediaries (such as factoring and leasing).	-.0966	.0007	.0061	.1150	.0944	.0717
casha	Operative earnings before depreciation, non-operative and extraordinary items, and other non-cash expenses, net of total interest expenses, taxes, and dividends paid.	.0087	.0651	.0719	.1551	.0735	.0527
iinva	Investment in advertising, R&D and other intangibles, not fiscally deductible in the accounting year.	0	.0007	.0067	.0177	.0193	.0038
iinva1	iinva plus auxiliary expenses necessary to the investment working.	0	.0007	.0070	.0188	.0199	.004
iinvna	Net investment in intangibles (investment minus disinvestment).	-.0006	.0004	.0048	.0157	.0211	.0032
iinvna1	iinvna plus auxiliary expenses necessary to the investment working.	-.0006	.0005	.0051	.0168	.0216	.0034
iinvna2	First difference in the net stock of R&D, advertising, and other intangible assets.	-.0008	0	.0004	.0010	.0142	0
inva	Investment in plant, equipment, buildings and land.	.0043	.0344	.0567	.1330	.0711	.0442
invna	Net investment in tangibles (investment minus disinvestment).	.0017	.0309	.0497	.1265	.0766	.0429
vnwc	First difference in net working capital, computed as total current assets (inventories, short-term trade and financial credit, cash and other marketable securities) minus short-term trade and non-financial debt.	-.1130	.0338	.0299	.1782	.1570	.0999
vnwc1	First difference in net working capital, computed as total current assets minus total current liabilities (excluded short-term bank debt but included short-term bonds, shareholder loans and loans from subsidiaries, affiliated and parent companies).	-.1156	.0332	.0289	.1778	.1573	.1005
ccnsitd	Ratio between cost of debt and equity funds. Corporate tax rates are the MATIS simulated tax rates; the weights for the two types of equity financing are the percentages of new share issues and retained earnings on total equity financing.	0	.4410	.4855	.796	.2740	.0769
ndts	Depreciation allowances on tangible and intangible assets, included accelerated depreciation.	.0126	.0372	.0452	.0876	.0332	.0279
ndtsr	ndts plus advertising and R&D expenses fiscally deductible in the accounting year.	.0139	.0407	.0502	.0969	.0394	.0306
ndtsrof	ndtsr plus interest expenses on already-existing non-bank debt.	.0153	.0438	.0532	.1015	.0404	.0319
ndtsrrof	ndtsrof plus net operating loss carryforwards simulated by MATÌS and lagged one period.	.0174	.0516	.0734	.1385	.0938	.0415
ndtstw	Difference between theoretical fiscal charge (computed on the basis of before-financing taxable income, i.e. earnings before taxes, depreciation and interest on bank debt) and Irpeg charge simulated by MATÌS.	.0069	.0411	.0516	.1059	.0463	.0353
ndtstw1	Difference between theoretical fiscal charge	.0083	.0440	.0543	.1101	.0472	.0366

[14] With the exception of the relative cost of capital, all the variables are scaled by net assets.

	(computed on the basis of after-financing taxable income, i.e. earnings before taxes and depreciation) and Irpeg charge simulated by MATÌS[15].						
matna	Net stock of all tangible assets, included those obtained in leasing.	.0542	.2098	.2388	.4631	.1612	.1572
terna	Net stock of buildings and land.	0	.0628	.0862	.2072	.0927	.0876
termacna	terna plus net stock of plant and equipment	.0195	.1862	.2136	.4371	.1625	.1597
garna	Suretyships, warranties, and real guarantees received by controlled and associated companies, by others, and by banks and quasi-bank intermediaries, minus those laid down by the firm.	-.0382	0	-.0097	.0017	.2703	0
imatna	Net stock of all intangible assets.	0	.0052	.0176	.0465	.0353	.013
redna	Net stock of R&D, patents of invention, licences, concessions, and registered trade-marks.	0	0	.0042	.0072	.0194	.0004
redplana	redna plus net stock of plant expenses (technology expenses and soft capital inputs).	0	.0051	.0174	.0458	.0351	.0127
nwc	Net working capital, computed as total current assets minus short-term trade and non-financial debt.	.1293	.3759	.3661	.6028	.2093	.1825
nwc1	Net working capital, computed as total current assets minus total current liabilities (excluded short-term bank debt but included short-term bonds, shareholder loans and loans from subsidiaries, affiliated and parent companies).	.1204	.3708	.3600	.5988	.2121	.1841

The PO vector of explanatory variables (*fcf*) includes all the components of free cash flow: profitability (casha) with expected negative sign on borrowing, together with alternative measures of growth opportunities (iinva, iinva1, iinvna, iinvna1, iinvna2, inva, invna, vnwc, vnwc1) with expected positive sign. The variations in net working capital (vnwc and vnwc1) point to the firm's attempt to build up financial slack (cash, liquid assets and marketable securities, unused borrowing power).

The TO vector of explanatory variables (*trade*) includes fiscal factors other than the relative cost of capital (ndts, ndtsr, ndtsrof, ndtsrrof, ndtstw, ndtstw1), failure factors (matna, terna, termacna, garna), agency factors (imatna, redna, redplana), and signalling factors (nwc, nwc1).

Tangible assets (matna, terna, termacna) increase a company's debt capacity, because they are readily marketable and more valuable in a situation of short-notice liquidation. A similar argument is valid for the guarantees (garna).

The value of intangible assets such as technology, human capital, trade marks and patents (imatna, redna, redplana) is an information that managers prefer not to reveal because

[15] In other terms, ndtstw and ndtstw1 include tax credits scaled by the MATIS simulated Irpeg tax rate in order to transform them in a deduction from taxable income. Tax credits on dividends are excluded because they may

secrecy on corporate strategies is of crucial importance to competitive advantage. Thus, intangibles offer considerable opportunities for discretionary behaviour of managers, which might be mitigated by increased borrowing.

Finally, the widespread use of multiple borrowing by Italian companies may induce serious informational problems of the banks and free-riding problems. Liquid assets (nwc, nwc1) mitigates moral hazard and adverse selection problems in loan contracting. In fact, they proxies for the various financial services (such as letters of credit, deposits, check clearing and cash management services) which can increase the customer-specific information available to the intermediaries beyond that information readily available to the public, and can limit the problem of asymmetric information resulting from multiple borrowing.

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create positive taxable income when the firm has net operation losses, thus allowing for interest deductions.