Ex-post evaluation of tax reforms: the case of the Italian Partial Ace*

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Abstract

This paper is the first attempt to provide an ex-post evaluation of the impact of the much debated Italian Partial ACE scheme (better known as 'Dit') in the period between 1997 and 2000. In its essence, this scheme allowed for partial deductibility of the cost of equity thus partially offsetting full deductibility of interests paid on debt and approaching financial neutrality. We start from a description of the Italian Partial ACE scheme to show main determinants of the choice between debt and equity. Then, we construct an econometric model to explain the choice to use the Italian Partial ACE by Italian corporations in year 2000. Applying this model to a sample containing more than 16.000 observations and controlling also for the tax position of the firm and for heterogeneity of legal types we find that while, as expected, profitability is positively related to the probability to use the Italian Partial ACE in year 2000 this probability is related in an unexpected way to the interest rate. We propose two alternative explanations of these results and thereby indicate directions for future research.

JEL: H200, H320

1 Introduction

Tax schemes are usually designed according to some pre-specified desirable property. In the case of corporate tax systems, a large body of literature has been devoted to the theoretical analysis of neutral tax schemes (Bond and Devereux, 1995 and 2003). On the contrary, much less attention has been devoted to the ex post evaluation of the impact of these schemes. This paper tries to start filling in this gap considering the Italian experience in the application of a partial ACE scheme.

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The ACE (IFS, 1991) is designed to increase neutrality of corporate tax systems by allowing full deductibility of both the cost of debt (i.e. interests) and the opportunity cost of equity. Recently, the ACE scheme has been implemented in Croatia (see Keen and King 2002) and, though only partially, in Italy (Bordignon, Giannini and Panteghini, 1999 and 2001; hereinafter BGP 1999 and 2001) but in both cases it was repealed after few years of enforcement. In the Croatian case the latter decision is apparently based on the need to keep the statutory rate at a competitive level, which is not compatible with a full ACE unless large losses of revenues from corporate taxes are accepted (Keen and King, 2002). In the Italian case, the partial ACE scheme was repealed mainly because of its controversial distributional short-run effects. The Italian partial ACE was introduced in 1998 to reduce the tax advantage of debt financing, generated by the almost complete deductibility of interests paid on outstanding debt, and thus to create incentives for the reduction of the high leverage of many Italian companies. Under the Italian scheme, a fixed (protective) rate was applied every year on the increase of the value of net equity since 1996, thus obtaining the (so-called) normal return on net equity. Subject to certain conditions, this return was taxed at a reduced rate (19% in most cases), while only the portion of the tax base exceeding this normal return was taxed at the ordinary rate (37% until 2000). Therefore, this scheme (better known as 'Dit') could be seen as a *partial* ACE since i) the normal return was taxed at a reduced rate rather than being entirely deducted from the tax base and ii) only the increase of net equity since 1996, rather than the entire value of net equity, entered into the calculation of the tax base (*incremental regime*). Both limitations were mainly due to revenue reasons, but the *pro-tempore* government declared its intention to introduce a full-ACE in the future.

The government appointed in 2001 soon endorsed a completely different viewpoint and, after amending the scheme, it definitely repealed the Italian partial ACE as by 2004 in the context of a new comprehensive reform of corporate taxation. The main motivation for the decision to repeal the partial ACE was the alleged fact that reduced taxation was 'used' only by few firms, especially larger ones located in northern (i.e. richest) regions. As for the number of firms which 'used' the ACE, i.e. which actually benefitted from the reduced taxation by increasing their net equity, it is known that in year 2002 approximately 108. 000 corporations were in a position to benefit from the reduced tax rate (Ministero dell'Economia, 2003, pp. 17-18) i.e. they were *actual* ACE-users in 2002. This corresponds to a percentage of approximately 15% of the total number of corporations and of slightly more than 30% of corporations actually paying taxes. However no information about the features of the ACE-users has been disclosed by official sources.

In this paper we present, for the first time in the literature, an ex-post evaluation of the impact of the Italian partial ACE in the short run. We start from a description of the Italian partial ACE scheme in the context of a very simple investment project (along the lines of Bond and Devereux, 2003), to show main determinants of the choice between debt and equity. As a second step, by making reference to the literature on the determinants of firms' financial

structure (Bontempi, 2002; Titman and Wessels, 1988) and taking also into consideration the tax position of the firm as well as the heterogeneity of legal types, we identify variables which should determine cross-section variability in the use of equity and, therefore, in the use of ACE. We then adopt a binary choice variable model under both the logit and the probit specification to test hypotheses about the statistical significance of relevant effects. Results do not completely match expectations based on economic theory, since they display unexpected relationships between proxies of the interest rate and the probability to use the ACE. We propose two alternative explanations of these results having opposite implications on the distributional impact of the partial ACE scheme in the long run.

The paper is organized as follows. In section 2, the Italian partial ACE scheme is described by means of a very simple model of investment; main determinants of financing choices are thus obtained. Sections 3 and 4 are respectively devoted to the description of the econometric model and of available data. Section 5 contains a discussion of goodness of fit and specification issues as well as main results of logit and probit estimations. Section 6 discusses the results by emphasizing the distinction between efficiency and distributional issues. Section 7 summarizes the main findings of the paper and indicates directions for future research.

2 A description of the Italian partial ACE

We now use a slightly modified version of the model of investment proposed by Bond and Devereux (2003) to compare the cost of debt and the cost of equity under the Italian partial ACE scheme. There are 3 main differences with respect to Bond and Devereux (2003). First, we allow for the possibility of the interest rate to be different from the discount rate. Second, we allow for the possibility of a non-zero transaction cost in equity rasing. Third, we assume decisions are taken under certainty and we postpone the discussion about the role of uncertainty.

Assume that at time 0 the investment of 1 unit is made and that this is financed wholly or partially by debt; the portion of debt-financing is λ with $\lambda \epsilon [0, 1]$. Assume also that at time 1 the debt (if any) plus interests at rate i is repaid and the project earns a cash flow of R_1 net of operating costs but gross of depreciations, interests and transaction costs associated to equity raising. Finally, at time 2 the project earns a cash flow R_2 and the remaining assets are sold at the gross market value K_2.

The net present value of the return on the investment at time 0, assuming no taxation, is written as

$$NPV^* = -(1-\lambda)(1+c) + V_1^0 [R_1 - (1+i)\lambda] + V_2^0 [R_2 + K_2] \qquad (1)$$

where c is the transaction cost of raising 1 unit of equity, i is the interest rate on nominal debt between time 0 and time 1 and V_g^t indicates expectation

in time t of an event happening at time g. Let us denote with r_t the discount rate between time t and time $t-1$. Then we have the following identity

$$\lambda = V_1^0 \left[(1+i)\right] \lambda - \sigma_\lambda, \sigma_\lambda \equiv \lambda \left(i - r_1\right) / (1+r_1) \tag{2}$$

where σ_λ reflects the impact on the cost of debt of imperfect competition on the financial market, which will lead towards $i > r_1$ (see Bond and Devereux, 2003, p. 1304) in the case of oligopolistic power and towards $i < r_1$ in the case of a favorable treatment obtained by the debtor.

By substitution of (2) in (1) one obtains

$$NPV^* = -1 + V_1^0 \left[R_1\right] + V_2^0 \left[R_2 + K_2\right] - \sigma_\lambda - c(1-\lambda) \tag{3}$$

To introduce taxation under the Italian partial ACE scheme let us also define:
$z_t \equiv$arbitrary depreciation allowance in period t $(t = 0, 1, 2)$;
$\widehat{r_t} \equiv$protective interest rate (called 'coefficiente di remunerazione ordinario');
$\tau_d \equiv$reduced tax rate in the dual tax system.

Let us ignore for the moment local taxes (namely IRAP). Total corporate tax in each period T_i is equal to

$$\begin{aligned} T_0 &= -\tau z_0 \\ T_1 &= \tau \left[R_1 - z_1 - \widehat{r_1}(1 - z_0 - \lambda) - i\lambda\right] + \tau_d \widehat{r_1}(1 - z_0 - \lambda) \\ &= \tau \left[R_1 - z_1 - \alpha\widehat{r_1}(1 - z_0 - \lambda) - i\lambda\right], \alpha \equiv (\tau - \tau_d)/\tau \\ T_2 &= \tau \left[R_2 + K_2 - (1 - z_0 - z_1)(1 + \alpha\widehat{r_2})\right]. \end{aligned} \tag{4}$$

As in Bond and Devereux (2003) model, continuous taxation of net revenues is assumed, so that economic profit and losses made in time t are taxed at time t. No deductibility of transaction costs for equity raising and, on the contrary, full deductibility of arbitrary depreciation are assumed. Therefore, ignoring the partial ACE, tax base would be equal to $-z_0$ at $t = 0$,to $R_1 - z_1 - i\lambda$ at time $t = 1$, and finally to $R_2 - z_2 + K_2 - (1 - z_0 - z_1 - z_2) = R_2 + K_2 - (1 - z_0 - z_1)$ at time $t = 2$. This is also a (rough) description of the corporate tax base before the introduction of the Italian partial ACE, i.e. with $\alpha = 0$.

The partial ACE is calculated on the basis of the variation of net equity at time t and it enters into the corporate tax base at time $t+1$. Equity raised at time 0 is equal to $(1 - z_0 - \lambda)$ and on this amount the partial ACE is granted at time $t = 1$. At time 1 debt is repaid by issuing new equity so that the value of equity decreases at $(1 - z_0)$, and then the value of the capital good is depreciated by z_1.Therefore the value of net equity at the end of time 1is equal to $(1 - z_0 - z_1)$ and the latter is the basis for the partial ACE granted at time $t = 2$.

For the project defined previously, the net present value of corporate tax payments under the Italian partial ACE scheme is written as

$$NPV_{TAX} = T_0 + V_1^0 \left[T_1\right] + V_2^0 \left[T_2\right] \tag{5}$$

Therefore the post-tax net present value of the return on the investment at time 0 is equal to

$$NPV = NPV^* - NPV_{TAX} \tag{6}$$

The derivative of NPV with respect to debt is thus equal to

$$\frac{\partial NPV}{\partial \lambda} = V_1^0 \left[r_1 (1 - \tau \alpha \widehat{r}_1 / r_1) - i \left(1 - \tau \right) \right] + c \tag{7}$$

Non-neutrality as defined by Bond and Devereux (2003), i.e. the fact that $NPV \neq (1-\tau) NPV^*$, is due to $\alpha < 1$ (which reflects the partiality of the allowance) and also to the fact that, on the basis of a rule followed in the enforcement of the Italian partial ACE scheme, $\widehat{r}_1 \neq r_1$ (see Keen and King, 2002, p. 415 on the importance of the latter point). Using plausible values for the Italian case[1] one can see that non-neutrality has implied a favorable corporate tax treatment for debt-financing, i.e. $\alpha \widehat{r}_1 / r_1 < 1$. Therefore, equity-financing under the Italian partial ACE scheme should be associated to $i > r_1$ and/or to a higher c. Since r_1 is economy-dependent, cross-section variability in the use of equity, and thus in the use of ACE, should be explained by cross-section variability of i and c. These are the variables we will try to capture in the econometric model of next section. Before turning to the model, however, a number of issues have to be considered.

First, local taxes have been ignored so far. Namely, the Regional Tax on the Value added (IRAP) would enter the tax system (4). However, since neither interests nor the cost of equity were deductible from the taxable base of IRAP, (7) would not be modified.

Second, only the corporate level has been considered. However including taxation at personal level (together with IRAP) into the analysis would not change the fundamental result that debt was still favoured by the tax system even after the introduction of the partial ACE (see BGP, 1999).

Third, certainty has been assumed, contrarily to what is done by Bond and Devereux (2003) to prove neutrality of the ACE-scheme. Uncertainty would imply to treat revenues and asset-values(R_1, R_2, K_2) as random variables, and therefore $V_1^0 [T_1]$ would be a function of a random variable. However, if one retains the Value additivity principle (thus following Bond and Devereux, 1995), $V_1^0 [T_1]$ can be rewritten as $\tau V_1^0 [R_1] - \tau V_1^0 [z_1 + \alpha \widehat{r_1} (1 - z_0 - \lambda) + i\lambda]$ where the second term is non-random so that the derivative in [7] would be unchanged. This clearly rests on the assumption (retained, however, also by Bond and Devereux, 2003) that interest rates and transaction costs are non-random.

[1] For example, in year 2000, $\widehat{r_1} = 7\%$ while the value of the discount rate (TUS) was in the range between 3,25% and 4,75% so that $\widehat{r_1}/r_1 \simeq 18/37$. Recalling that $\tau = 37\%$ and that $\tau_d = 19\%$ in most cases, we had $\alpha \widehat{r_1}/r_1 \simeq 18/37^* 7/4 \simeq 85\%$.

3 The model

We want to analyze the features of partial ACE users (AU) as opposed to those of non-users (NAU) by means of a binary choice model. We define a firm to be a AU in year 2000 either if it actually benefitted from the reduced tax rate or if it was eligible to do so but it chosen to carry forward the tax advantage. Recall (from the introductory section) that a firm may be AU in year 2000 since it raised equity in previous years (1997,1998 or 1999) and not necessarily in year 2000. For every firm included in the sample a binary variable y such that

$$\begin{aligned} y &= 1 \text{ if the firm is a AU} \\ y &= 0 \text{ otherwise (NAU).} \end{aligned}$$

We assume that

$$\text{Prob}[y = 1] = F(x, \beta)$$

where x is the vector of relevant effects and β is the vector of associated parameters.

In principle $F(x, \beta)$ may take the two following specifications

$$F(x, \beta) = \frac{e^{\beta' x}}{1 + e^{\beta' x}}$$

for the logit model and

$$F(x, \beta) = \Phi(\beta' x)$$

for the probit model. As it is well known (Greene, 1990, p. 666; Amemyia, 1981) there are no general rules for the choice of the logit or the probit model, and therefore we will be using both specifications.

As anticipated in previous sections, the choice to use the ACE should be associated with the choice to use equity rather than debt to finance (a portion of) investments. This choice, in turn, should be based on a comparison between the cost of equity and the cost of debt, i.e. the interest rate, in the period 1997-2000. In particular, a high enough interest rate and/or a particularly low transaction cost of equity-raising may explain the use of equity even if debt is still favoured by the tax system as it happened in the 2000 Italian tax system (see previous section).

Unfortunately, the dataset does not provide information about the interest rate during the whole period 1997-2000. Therefore we have to use variables referring only to year 2000 which, to a different extent, may serve as proxies of the value of the interest rate, i in (7), in the whole period.

The evidence seems to indicate that interest rates decline with the magnitude of the loan and that rates are lower for firms located in northern regions of Italy as well as for industrial firms. For example, at the end of year 1999 (Banca

d'Italia, 2000, pp. 267-276) the average interest rate on short-time cash loans was equal to 5,30% in Italy, but ranging: i) from 4,83% in northern regions to 6,89% in southern regions; ii) from 5,17% on industrial firms to more than 6% on non-industrial companies iii) from 8,66% on small loans to 3,71% on larger ones. The latter result allows to assume a negative relationship between interest rates and firm-dimension is one accepts that, on average, larger loans are granted to larger firms. Moreover, the negative relationship between interest rates and firm-dimension is also consistent with the theory arguing that smaller firms are riskier borrowers at least in the long term (Hall et al., 2004; Titman and Wessels, 1988).

To capture these differences we use two dummy variables, *dumnorth* and *dumind*, which equal unity respectively when the firm is located in northern regions and when it is an industrial firm, and a variable *size*, which is just the natural log of total value of assets. On the basis of the above reasoning we expect a negative sign on all these variables.

Interest rates may vary also accordingly to the structure of the firm. The literature on determinants of firms' financial structure (Bontempi 2002; Titman and Wessels, 1988; Bontempi and Golinelli, 1996) predicts that the interest rate is higher the lower is the value of tangible assets, since the latter may act as collaterals. On the contrary, general growth abilities of the firm can hardly be collateralized and therefore they should be positively related to the interest rate. We try to capture these aspects by constructing the variables *tang* and *growth* and, on the basis of considerations made above, we expect a negative sign of the coefficient on *tang* and a positive sign of the coefficient on *growth*. To capture the influence of the financial structure we add a variable *liquid* which is the ratio between, at the numerator, liquid assets (cash and short-term activities) minus imputed short-term debt, and, at the denominator, total assets. Since higher liquidity means lower bankruptcy risk, we expect *liquid* to be negatively associated with the interest rate and thus with the probability to be a AU. It must clearly be said that some of these variables may change over time and thus using data referring only to year 2000 may be misleading. This is especially true for *growth* and, possibly to a lesser extent, for *liquid*, while *tang* is apparently more stable.

According to the pecking order hypothesis (Myers, 1984) firms should prefer debt to external equity because of transaction costs associated to issuing new shares in the presence of asymmetric information about the real value of assets. On the contrary, equity-financing should be cheaper when internal funds are used. Clearly, the availability of internal funds is related to profitability. This means that, assuming that $(1 - \lambda)$ is the initial equity which can be raised either by issuing new shares or by retaining profits generated by other investment projects , c in (7) should be negatively related to profitability. To capture profitability in year 2000 we define the variable $profit$, which is the ratio between earnings before interests and taxes (ebit) and total assets. To capture profitability in previous years, we define the variable $profit\_1$ which is the ratio between

estimated post-tax income in year 1999 and total assets in year 2000[2]. We expect a positive sign of the coefficient on these variables[3]. Internal funds can be generated also by the presence of legal constraints, namely requirements of a minimum amount of equity reserves (BGP, 1999). One of the most prominent example of such legal constraints in the Italian tax system is given by accelerated depreciation since accounting rules suggest (though they do not force) firms to retain corresponding amount of profits in this case. Therefore we define a variable *amm*, which measures the incidence of accelerated depreciation on total value of assets owned by the firm, and can be interpreted as an indirect indicator of profitability (while $profit$ and $profit\_1$ are direct indicators).

So far we have abstracted away from actual complexities of the Italian partial ACE scheme. The application of the reduced tax rate was in fact subject to a number of qualifications and legal requirements so that 'using' this reduced rate was costly. According to many observers, both amendments to the original ACE scheme, i.e. reduced taxation rather than complete deduction as well as the adoption of the *incremental regime*, may have reduced the tax advantage so much that the latter was offset by the cost to use the tax reduction especially for smaller firms hiring external tax consultants and pratictioners. However, in year 2000, another incentive to the use of net equity, the so called 'Visco' incentive (named after the Minister in office at that time), was operating. The partial ACE and the 'Visco' incentive were somehow similar since they both granted a tax reduction in the case of an increase of net equity. However, the 'Visco' incentive operated only if specific kinds of investments in real assets were realized and limitations to double counting were enacted. Therefore, the 'Visco' incentive may have created incentives to use equity-financing and thus reinforced the partial ACE. To capture this relationship we construct the variable *dumvisc* which is = 1 when the 'Visco' incentive was used and = 0 otherwise. On the contrary, a reason why neither the partial ACE nor the 'Visco' incentive were used may simply be that the firm found alternative and cheaper methods to decrease its tax liability. These may be reflected by the use of tax variations (Santoro, 2004) i.e. a body of variables, introduced by the tax system, which determine a (positive or negative) difference between the actual tax base and gross accounting profits. To capture them we insert the variable *taxvar* computed as (taxbase-gross accounting profits)/taxbase and we expect a positive sign since the higher is the incidence of tax variations the higher is the motivation to use tax-rate incentives such as the partial ACE or the 'Visco' incentive. Together, *dumvisc* and *taxvar* define the tax position of the firm.

Finally, we need to account for the heterogeneity of types belonging to the fiscal category of corporations. To do so, we divide the sample in three categories, spa's (i.e. large limited liability companies), srl's (i.e. small limited

[2] We cannot calculate the value of *ebit* in year 1999 since the profit and loss account is available only for year 2000. The information about post-tax income in year 1999 is thus obtained comparing outstanding values of total assets and liabilities at the end of year 1999 from the balance sheet.

[3] On the contrary, a negative sign would be possible if one adheres to the Trade-off theory. However, the latter does not seem to fit too much to the Italian reality (see Bontempi, 2002).

liability companies) and others which we define as 'non-standard corporations'. Then we insert 2 dummy variables, *spa* and *alnat*, which, respectively, take the value of 1 when the firm is a spa or when it is a non-standard corporation and 0 otherwise. Since non-standard corporations usually take the form of cooperatives whose corporate tax liability is very low, we expect a negative sign on *alnat*. On the contrary, larger firms having easier (cheaper) access to financial markets take the form of spa so we expect a positive sign on this dummy. Table 1 summarizes the relevant effects (the components of x's) considered here and expected signs (ES) on the coefficients.

Table 1: Selected relevant effects

Variable	Definition	ES
tang	tangible assets 2000/total assets 2000	−
growth	% increase of total assets (2000 over 1999)	+
liquid	liquid assets-short time debt/total assets 2000	−
size	ln of total assets 2000	−
amm	accelerated depreciation/total assets 2000	+
profit	ebit 2000/total assets 2000	+
profit_1	net income1999/total assets2000	+
taxvar	(base 2000-accounting gross profits 2000)/base 2000	+
dumnorth	=1 if located in northern reg.,0=otherwise	−
dumvisc	=1 if Visco incentive was used, 0=otherwise	+
dumind	=1 if industrial, 0=otherwise	−
spa	=1 if spa, 0=otherwise	+
alnat	=1 non-standard corp., 0=otherwise	−

4 The dataset

The dataset used here is a (weighted) sample of 16.069 firms representing a population of 89.553 corporations which paid taxes and made investments (in a strict sense to be defined) during year 2000. More specifically, the features of the population are the following ones:

1. having a positive taxable income in year 2000;
2. having increased the value of tangible assets between 2000 and 1999;
3. not belonging to the financial sector (banks, insurances and other financial companies are excluded);
4. having a turnover not inferior to 500 millions of ITL (250 000 euros) in 2000;
5. filing a reliable balance sheet and profit and loss account.

The reason why we restrict attention to corporations reporting positive taxable income is that companies that do not pay taxes at all had simply no reason to use the Italian partial ACE. The reason why we restrict attention to investments in tangible assets is that this is the notion of investments which is implicitly retained in economic analysis. Banks and insurances and very small corporations are excluded since they are believed to behave in a peculiar manner.

From this population the sample is obtained randomly through disproportionate stratification. More precisely, one out of six companies is selected among those having a turnover not greater than 50 billions of ITL, while all companies belonging to the population and having a turnover at least equal to 50 billions of ITL are selected since this subpopulation is characterized by a high variance. This stratified sample implies the following weighting structure: weight is equal to approximately 6 for companies belonging to the population and having a turnover not greater than 50 billions of ITL while weight is equal to unity for all companies belonging to the population and having a turnover at least equal to 50 billions of ITL. The data come from tax declarations (Unico-società di capitali) filed by corporations (1 declaration for every corporation). Tax declarations contains two types of data: i) general and economic data and ii) fiscal data. General and economic data include:

-a reclassified profit and loss account;

-a reclassified balance sheet, reporting outstanding values at the end of 1999 and at the end of 2000;

-supplementary information about the company (place of location, operating sector, etc.).

In particular, the profit and loss account and the balance sheet available in the dataset are summaries of the accounting documents and contain only aggregated data.

Fiscal data comprise:

-post-tax economic profit;

-tax variations (*variazioni fiscali*), i.e. differences beween actual tax base and gross economic profits;

-the components of the coporate tax base, namely the portion subject to ordinary taxation and the portion subject to reduced taxation.

All fiscal variables are very detailed and reliable.

In Table 2 we report the percentage of partial ACE users (AU) in both the original sample (16.069 observations) and, after applying appropriate weights, in the population (89.553 corporations). Recall that we define a firm to be a AU in year 2000 either if it actually benefitted from the reduced tax rate or if it was eligible to do so but it chosen to carry forward the tax advantage.

Table 2: ACE-users (AU) and non-users (NAU)

	Sample	Population
AU	8.028 (50%)	40.437 (45, 2%)
NAU	8.041	49.116
ALL	16.069	89.553

The incidence of AU is clearly higher than that reported in official statistics referring to all corporations (Ministero dell'Economia, 2003) mainly because of the filters adopted here and also because of the different definition of AU (the Ministry considers only actual ACE-users and not take into account simple eligibility). Some descriptive features of the sample are outlined in Tables 3, where NF are northern firms (firms located in northern regions).

Table 3: Descriptive features of the population

means (.000 ITL)	AU	NAU
assets	15.268.306	7.349.337
% of NF	70%	51, 4%
tax base	1.019.060	331.891
tax liability	331.891	115.068
tax rate	31, 8%	34, 7%

In the population selected here, AU are larger (assets are more than double than those of NAU) and more concentrated in northern regions (70% versus 51,4%) than NAU. According to the government which repealed the partial ACE (Vitaletti, 2002, p. 118) these should be features of AU also among the generality of Italian corporations, and this would confirm the idea that the partial ACE was used only by large firms located in northern (richest) regions. Therefore, though we are using only a sample, results should give useful insights about these general issues. The effect of the Italian partial ACE, and presumably of the 'Visco' incentive which was also enacted in the same year, is to reduce the weighted tax rate by approximately 3 percentage points (31, 8% against 34, 7%). Descriptive values of selected relevant effects as well as VIF statistics are reported in the Appendix.

5 The results

We will summarize our results in two steps. First, we consider goodness of fit and specification issues of the model described in section 3 under both logit and probit specification. Second, we present estimated coefficients and t-stats for the logit model.

5.1 Goodness of fit and specification issues

We first report in Table 4 some diagnostic statistics with p-values, when appropriate, in round brackets. Note in particular that:

-the χ^2 statistic is a test statistic for the null of all coefficients being equal to 0;

-the rate of correct predictions is an indicator of the goodness of fit, calculated as the percentage of correct predictions under the specification that $\widehat{y} = 1$ if $\widehat{F} > 0,5$ and $\widehat{y} = 0$ otherwise, where "ˆ" denotes predicted values;

-the pseudo R^2, also known as the likelihood ratio index, is another measure of goodness of fit;

-the linktest provided by Stata 7.0® is a regression on (a constant and) the predicted value and on the predicted value squared, thus providing indications on both the significance of the selected relevant effects (indicated by the t-stat on predicted value) and on the possible omission of relevant variables (indicated by the t-stat on the predicted value squared).

We report in the Appendix full output of these texts whose main findings are summarized in Table 4.

Table 4: Diagnostic statistics under logit and probit specification
(°=unweighted sample)

	Logit	Probit
$\chi^2(13)$	2557,91(,000)	3098,08 (,000)
correct predictions°	74,3%	74,2%
pseudo R^2	21,5%	21,3%
linktest stat.(predicted)	47,14 (,000)	56,09 (,000)
linktest stat (squared)	-2,51 (,012)	3,79 (,000)

There are 4 indications arising from this analysis.

First, selected relevant effects are surely significant, since the p-values on the χ^2 statistics as well as those on the t-statistic for the predicted value in the linktest are always zero. This is a first indication that the model is not (completely) misspecified.

Second, goodness of fit varies across the method adopted to evaluate it. On the one hand, the rate of correct predictions is very high, ranging from 65% for $y = 1$ to 83% for $y = 0$ and averaging above70% for both model specifications. On the other hand, the pseudo R^2 values are quite low, slightly more than 21% for both specifications. However, it is useful to recall here that, contrary to standard R^2 in OLS regression, values of the likelihood ratio index between 0 and 1 have no natural interpretation (Greene, 1990, pp. 682-683).

Third, the hypothesis of a completely specified logit model is accepted adopting a 99% confidence interval, but not adopting a 95% confidence interval. On the contrary, the hypothesis of a completely specified probit model has to be rejected.

Fourth, and consequently, overall logit model seems to be preferable to probit model, whose results are thus reported in the Appendix.

To sum up, the model adopted here can provide a first explanation of factors determining the probability to be a AU, although a more complete dataset would

probably improve the goodness of fit as well as the specification of the model (we will discuss further these issues in the concluding section).

5.2 Estimates and inference results

In Table 5 we report main results for logit regression.

Table 5: Logit regression-main results

Variable	Coef	Robust std. error	t	P>|t|
tang	,314	,115	2,73	,006
growth	-,247	,063	-3,94	,000
liquid	,193	,085	2,28	,023
size	,352	,018	19,9	,000
amm	,124	,212	0,59	,558
profit	1,09	,240	4,55	,000
profit_1	2,59	,444	5,83	,000
taxvar	,12E-03	,11E-03	1,08	,279
dumvisc	2,25	,056	39,8	,000
dumind	-,107	,041	-2,64	,008
dumnorth	,679	,041	16,52	,000
spa	,306	,079	3,88	,000
alnat	-,786	,114	-6,9	,000
constant	-6,4	,269	-23,8	,000

These results, which have to be interpreted with a certain caution on the basis of diagnostic analysis conducted in section 5.1, give the following indications.

First, there is no apparent connection between higher interest rates and the probability to be a AU. Indeed *tang*, *growth*, *size*, *dumnorth* have all a sign opposite to the one expected on the basis of pure economic reasoning, while *liquid* is insignificant and the only variable which has a sign according with a priori expectations is *dumind*.

Second, data confirm the expected connection between (direct and indirect) profitability and the probability to be a AU since the coefficients on $profit, profit2$ and *amm* are positive as expected, though *amm* is insignificant.

Third, the importance of the tax position of the firm is also confirmed, since the sign of the coefficient on *dumvisc* and on *taxvar* is positive as expected, though *taxvar* is not significant.

Fourth, also the legal type of the firm plays the expected role, since non-standard corporations clearly use the Italian partial ACE much less than standard limited liability companies (spa's and srl's), while the probability to be a AU is positively related to *spa*.

Supplementary useful information is provided by estimated marginal effects reported in Table 6.

Table 6: Logit regressions-marginal effects

Variable	dx/dy	Std.error	t	P>|t|
tang	,078	,115	2,73	,006
growth	-,061	,063	-3,94	,000
liquid	,048	,085	2,28	,023
size	,087	,018	19,92	,000
amm	,031	,212	0,59	,558
profit	,272	,240	4,55	,000
profit_1	,644	,444	5,84	,000
taxvar	,3E-04	,3E-04	1,08	,279
*dumvisc**	,493	,009	55,65	,000
*dumind**	-,027	,010	-2,64	,008
*dumnorth**	,166	,009	16,97	,000
*spa**	,076	,020	3,89	,000
*alnat**	-,182	,023	-7,9	,000

A marginal increase in profitability has a remarkable impact on the probability to be a AU, as shown by the value of $27,2\%$ of $dy/dprofit$ and of $64,4\%$ of $dy/dprofit\_1$. Among dummies, *dumvisc* clearly displays the highest marginal effect (49,3%), followed, in absolute terms, by *alnat* (-18,2%) an by *dumnorth* (16,6) while the marginal effect of *spa* and *dumind* is much less relevant.

6 Evaluating the results

We now evaluate results obtained in the previous section under the viewpoints of efficiency and equity. As it is well known, neutrality is the best synonymous of efficiency when business tax schemes are considered. A move from a totally biased tax scheme to a more neutral one, as it happened when the Italian Partial ACE was adopted, should encourage some firms to use more equity when it is rational to do so (Franzosi, 1999; BGP, 1999). More precisely, as indicated also by the simple model of section 2, firms having 'high enough' interest rates and 'low enough' transaction costs for equity-raising should be induced to use more equity than in the past. Since this incentive is passed on to corporations through the tax system it has also a distributional impact: tax liability may be diminished for firms which do not 'deserve' such a reduction according to some pre-specified criterion. Therefore a conflict between efficiency and equity issues may arise.

Results summarized in the previous section do not fully confirm the idea that the Italian partial ACE has been used by firms having 'high enough' interest rates and 'low enough' transaction costs. On the one hand, the role of profitability, of the tax position of the firm and of the legal type is demonstrated. On the other hand, it does not emerge a more intense use of the ACE by firms paying higher interest rates. While some of selected relevant effects, namely *tang*, *growth* and *liquid* may be poorly measured since only one-year data are available, this kind of data-problems does not seem to affect dramatically *size*

and on *dumnorth* which are naturally fairly stable in the short run. To be sure, to measure firm-dimension a definition alternative to the natural log of assets (which is *size*) often used in the literature is the number of employees. However, the latter is not available here. The best proxy available in the dataset is the natural log of the labour cost, which we denominate *loglav*. As shown in Appendix (see Table A.2.5) this is again positively related with y and statistically highly significant, thus excluding a measurement error at least for the firm-dimension.

The relationship between the use of the ACE and firm-dimension and location is precisely the source of the distributional problem: understandably, the fact that the tax liability of larger firms located in the North had been decreased by the application of the Italian partial ACE was not welcomed and this argument was used by policy makers to repeal the scheme. Therefore, it becomes crucial to understand why results were partly unexpected. If one retains the assumption that capital structure choices obey to some sort of cost-benefit analysis or utility maximization, two alternative interpretations arise. They have conflicting implications in terms of the long run distributional impact of the tax scheme .

The first possibility is that firms paying actually higher interest rates have not used the ACE simply because they were not fully aware of this possibility. We can define the latter as 'the ability of adjustment 'argument after BGP (1999) who note note that while ‹‹the primary aim of the reform was to boost companies capitalization (. . .) so far there is little evidence that this has happened›› and suggest that ‹‹ the ability of companies to make full use of the advantages of the fiscal system turns out to be of vital importance in determining the effect of the reform (...)›› and in the short run there might have been ‹‹a delay of companies to adjust their behavior to new fiscal environment››. The 'ability of adjustment' may explain results since usually larger firms have better tax pratictioners and consultants, while firms located in northern regions may benefit from a more business-friendly environment where information is available at lower costs and where public services are on average more efficient. If this is the case, however, the bias, i.e. the positive correlation between size and location in richest regions, on the one hand, and use of the ACE, on the other hand, would disappear in the long run. The choice to repeal the partial ACE scheme, therefore, would not be justified since it was based on temporary and not permanent distributional effects.

The second possible explanation is that in the model we have omitted some explanatory variables. For example, the capital structure may be a function of the property structure. Family-based firms, which are so common in the Italian economy, should be considered carefully for two reasons. First, they may be naturally less prone to retain profits since profits in this kind of firms represent the main flow of income to be used for family consumption and savings. Second, also raising external equity in this kind of companies may be problematic (not only because of high transaction costs but also) because of the fear to lose control of the firm. In other words there would be additional costs for internal equity-raising which offset higher interest rates and a limited substitutability between

external and internal equity. The link with results emerges if one accepts that smaller firms more often present a family-based property structure. If the latter influences the capital structure the positive correlation between the use of the ACE and the firm-dimension would probably not tend to disappear naturally in the long run. Small family-based companies would always be reluctant to use internal and external equity as an alternative to debt and therefore they would not benefit at all from reduced taxation even if they were aware of this possibility. Therefore, in distributional terms, keeping the Italian partial ACE scheme in operation would not have had in the long run effects dramatically different from those depicted here.

Unfortunately, the available literature does not provide a definitive answer about these two alternative explanations. No explicit attempt to take into account the property structure is made in the empirical literature about Italian firm's capital structure. Even if one accepts the assumption that family-based companies are more common within small corporations the first explanation can neither be accepted nor refused since the evidence about the relationship between size and capital structure is not clear cut. While there are studies where a negative relationship between size and leverage of Italian firms emerges (Panno, 2002), additional evidence goes toward the opposite direction (Staderini, 2001; however this author predicts a negative relationship between the use of the ACE and firm-dimension) or points at differentiation between long-term debt which would be positively related to size and short-term debt which would be negatively related to size (Hall et al., 2004). As for the 'ability of adjustment' argument, this has been postulated by the theoretical literature (BGP, 1999) but never tested.

7 Concluding remarks

This paper is the first attempt to provide an ex-post evaluation of the impact of the much debated Italian Partial ACE scheme in the period between 1997 and 2000. In its essence, this scheme allowed for partial deductibility of the cost of equity thus partially offsetting full deductibility of interests paid on debt and moving towards financial neutrality. Starting from a description of the Italian Partial ACE scheme which emphasizes the role of the interest rate and of the transaction cost of raising equity, we construct an econometric model to explain the choice to use the Italian Partial ACE by Italian corporations in year 2000.Applying this model to a sample containing more than 16.000 observations and controlling also for the tax position of the firm and the heterogeneity of legal types, we find that while, as expected, profitability is positively related to the probability to use the Italian Partial ACE in year 2000 (i.e. to be a AU) this probability is related in an unexpected way to proxies of the interest rate. In particular, the probability to be a AU is positively related to the firm-dimension and to the probability of the firm to be located in northern regions, while the opposite result was expected (Staderini, 2001) since both these features are negatively related to the interest rate. The latter results are

somehow worrying under a distributional perspective since larger firms located in richest regions do not apparently 'deserve' a tax reduction. However, the nature of these relationships can be explained on the basis of two alternative hypotheses whose implications are very different.

First it is possible that smaller firms and/or firms located in southern regions of Italy were simply slower to adjust to the changing tax environment (BGP, 1999) because of typical short-run asymmetries of information which would disappear in the long run. In this case the decision to repeal the scheme was not justified on equity grounds in the long run.

Alternatively, it is possible that smaller firms are naturally prone to use debt since they have a family-based property structure which sets upper boundaries to both internal and external equity. This would mean that even if the Italian Partial ACE scheme was not repealed it would have had the same adverse distributional impact, i.e. tax reductions would never be obtained by smaller firms.

The available literature does not provide a clear indication about the plausibility of these opposite explanations. Since the relationship between the property-structure, the size and the capital structure of the firm does not seem easy to capture, the natural way forward is to proceed in testing the 'ability of adjustment' argument by collecting information about the real reasons why smaller Italian corporations did not use the Italian Partial ACE as much as expected. In other words, it would be necessary to have access to the identity of firms which did not use the partial ACE even if they were potentially in a position to do so to understand the reasons of their choice.

On the other hand, results obtained here as well as the contradictory evidence emerging from the literature about the relationship between size and the capital structure of Italian firms motivate a search for a better understanding of this relationship taking as a possible starting point the analysis of the role played by the property structure.

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appendix

1) SAMPLE ANALYSIS

Table A.1.1: Descriptive statistics/1

Variable	Obs	Mean	Std. Dev.	Min	Max
tang	16069	.1902521	.1933196	.0000124	.9953218
growth	16069	.2463272	.3925563	-15.74543	1
liquid	16069	.4539736	.2719441	-.2834739	.9989504
size	16069	15.19592	1.883659	10.67941	23.05923
amm	16069	.0031034	.0551282	0	6.333228
profit	16069	.0825912	.0948549	-1.711866	1.192304
profit2	16069	.0146722	.7329561	-91.87821	8.448956
taxvar	16069	-1.539609	133.0354	-10501.6	4836.926
dumnorth	16069	.6227519	.4847129	0	1
dumvisc	16069	.2730101	.4455199	0	1
dumind	16069	.4722758	.4992463	0	1
spa	16069	.1984567	.3988502	0	1
alnat	16069	.0408862	.1980327	0	1

Table A.1.2:Descriptive statistics/2

Variable	Obs	Percentile	Centile	-- Binom. Interp. -- [95% Conf.	Interval]
tang	16069	50	.1243012	.1207946	.1273932
growth	16069	50	.1874439	.183407	.1915914
liquid	16069	50	.4694017	.463687	.4754051
size	16069	50	14.79817	14.76652	14.83109
amm	16069	50	0	0	0
profit	16069	50	.0580335	.0571254	.0589187
profit2	16069	50	.005269	.0049735	.0056079
taxvar	16069	50	.1174602	.1137881	.1204554
dumnorth	16069	50	1	1	1
dumvisc	16069	50	0	0	0
dumind	16069	50	0	0	0
spa	16069	50	0	0	0
alnat	16069	50	0	0	0

Table A.1.3: Collinearity diagnostics

Variable	VIF	1/VIF
size	1.56	0.639490
liquid	1.48	0.674373
spa	1.40	0.712938
tang	1.37	0.729056
profit	1.10	0.913173
dumvisc	1.08	0.929013
dumind	1.04	0.960312
dumnorth	1.03	0.973134
alnat	1.02	0.976163
growth	1.01	0.986598
profit2	1.00	0.998319
amm	1.00	0.998811
taxvar	1.00	0.999544
Mean VIF	1.16	

2) LOGIT ESTIMATION

Table A.2.1: Logit estimates

Number of obs = 16069
Wald chi2(13) = 2557.91
Prob > chi2 = 0.0000
Log likelihood = -8684.3612 Pseudo R2 = 0.2150

y	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
tang	.3140699	.1149483	2.73	0.006	.0887754	.5393644
growth	-.2470187	.0627047	-3.94	0.000	-.3699178	-.1241197
liquid	.1928869	.0846111	2.28	0.023	.0270521	.3587216
size	.3515436	.0176449	19.92	0.000	.3169602	.3861271
amm	.1240179	.2118736	0.59	0.558	-.2912467	.5392825
profit	1.093553	.2403879	4.55	0.000	.6224016	1.564705
profit2	2.591491	.4442311	5.83	0.000	1.720814	3.462169
taxvar	.0001227	.0001134	1.08	0.279	-.0000996	.000345
dumnorth	.6795076	.0411414	16.52	0.000	.598872	.7601432
dumvisc	2.257628	.0566599	39.85	0.000	2.146577	2.36868
dumind	-.1071439	.0405553	-2.64	0.008	-.1866309	-.027657
spa	.3056072	.0787068	3.88	0.000	.1513446	.4598698
alnat	-.786134	.1139996	-6.90	0.000	-1.009569	-.562699
_cons	-6.404472	.2687285	-23.83	0.000	-6.931171	-5.877774

Table A.2.2: Linktest after logit estimation

y	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	1.033856	.0219293	47.14	0.000	.9908753	1.076836
_hatsq	-.0571593	.0227808	-2.51	0.012	-.1018089	-.0125096
_cons	.0777565	.0362583	2.14	0.032	.0066915	.1488215

Table A.2.3: Classification table after logit estimation

Classified	D (True)	~D (True)	Total
+	5262	1362	6624
-	2766	6679	9445
Total	8028	8041	16069

Classified + if predicted Pr(D) >= .5
True D defined as y ~= 0

Sensitivity	Pr(+| D)	65.55%
Specificity	Pr(-|~D)	83.06%
Positive predictive value	Pr(D| +)	79.44%
Negative predictive value	Pr(~D| -)	70.71%
False + rate for true ~D	Pr(+|~D)	16.94%
False - rate for true D	Pr(-| D)	34.45%
False + rate for classified +	Pr(~D| +)	20.56%
False - rate for classified -	Pr(D| -)	29.29%
Correctly classified		74.31%

2) LOGIT ESTIMATION (continues)

Table A.2.4: Marginal effects after logit estimation

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
tang	.077987	.02854	2.73	0.006	.022043	.133931	.191408
growth	-.0613375	.01557	-3.94	0.000	-.091862	-.030813	.255068
liquid	.0478959	.02101	2.28	0.023	.006718	.089074	.460129
size	.0872922	.00438	19.92	0.000	.078703	.095881	14.6484
amm	.030795	.05261	0.59	0.558	-.072319	.133909	.002745
profit	.2715413	.05972	4.55	0.000	.154498	.388585	.084191
profit2	.643496	.11019	5.84	0.000	.427523	.859469	.012662
taxvar	.0000305	.00003	1.08	0.279	-.000025	.000086	-1.53098
dumnorth*	.1660881	.00979	16.97	0.000	.146908	.185269	.598326
dumvisc*	.4929067	.00886	55.65	0.000	.475546	.510267	.229860
dumind*	-.0265873	.01005	-2.64	0.008	-.046293	-.006882	.451511
spa*	.0762156	.01961	3.89	0.000	.037783	.114648	.107241
alnat*	-.1816143	.0234	-7.76	0.000	-.227478	-.13575	.038983

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Table A.2.5: Logit estimates, loglav replacing size

	Number of obs = 14857
	Wald chi2(13) = 2286.46
	Prob > chi2 = 0.0000
Log likelihood = -8152.1424	Pseudo R2 = 0.2045

y	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
tang	.1232179	.1277416	0.96	0.335	-.1271511	.3735869
growth	-.2366083	.0721019	-3.28	0.001	-.3779254	-.0952913
liquid	-.0376629	.0915067	-0.41	0.681	-.2170126	.1416869
loglav	.1689962	.0152455	11.08	0.000	.1391156	.1988769
amm	.1499437	.2189205	0.68	0.493	-.2791325	.5790199
profit	.6419052	.2523655	2.54	0.011	.1472778	1.136533
profit2	2.897436	.4927125	5.88	0.000	1.931737	3.863135
taxvar	.0000878	.0000945	0.93	0.353	-.0000975	.0002731
dumnorth	.6899038	.0425407	16.22	0.000	.6065255	.7732821
dumvisc	2.26972	.0575043	39.47	0.000	2.157013	2.382426
dumind	-.1183615	.0429052	-2.76	0.006	-.2024541	-.0342689
spa	.7252558	.0757204	9.58	0.000	.5768466	.873665
alnat	-.7272443	.1139299	-6.38	0.000	-.9505427	-.5039458
_cons	-3.269662	.1989649	-16.43	0.000	-3.659626	-2.879698

3) PROBIT ESTIMATION

Table A.3.1: Probit estimates

Number of obs = 16069
Wald chi2(13) = 3098.08
Prob > chi2 = 0.0000
Log likelihood = -8708.9891 Pseudo R2 = 0.2128

y	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
tang	.1932625	.0684814	2.82	0.005	.0590415	.3274836
growth	-.1444129	.0332875	-4.34	0.000	-.2096553	-.0791705
liquid	.1169429	.0503382	2.32	0.020	.0182818	.215604
size	.2013015	.0101818	19.77	0.000	.1813455	.2212575
amm	.0697662	.1437811	0.49	0.628	-.2120396	.351572
profit	.6530295	.1394586	4.68	0.000	.3796956	.9263634
profit2	1.505721	.2443055	6.16	0.000	1.026891	1.984551
taxvar	.0000763	.0000665	1.15	0.252	-.0000542	.0002067
dumnorth	.4001679	.0241035	16.60	0.000	.3529258	.44741
dumvisc	1.323555	.0311153	42.54	0.000	1.26257	1.38454
dumind	-.0612803	.0239525	-2.56	0.011	-.1082262	-.0143343
spa	.1631369	.0462343	3.53	0.000	.0725193	.2537546
alnat	-.4519363	.0645717	-7.00	0.000	-.5784945	-.3253782
_cons	-3.708693	.1543103	-24.03	0.000	-4.011135	-3.40625

Table A.3.2: Linktest after probit estimation

y	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	1.042115	.0185795	56.09	0.000	1.0057	1.078531
_hatsq	-.1002625	.0154765	-6.48	0.000	-.1305958	-.0699291
_cons	.0555388	.0146655	3.79	0.000	.0267948	.0842827

Table A.3.3: Classification table after probit estimation

Classified	D	~D	Total
+	5193	1305	6498
-	2835	6736	9571
Total	8028	8041	16069

Classified + if predicted Pr(D) >= .5
True D defined as y ~= 0

Sensitivity	Pr(+| D)	64.69%
Specificity	Pr(-|~D)	83.77%
Positive predictive value	Pr(D| +)	79.92%
Negative predictive value	Pr(~D| -)	70.38%
False + rate for true ~D	Pr(+|~D)	16.23%
False - rate for true D	Pr(-| D)	35.31%
False + rate for classified +	Pr(~D| +)	20.08%
False - rate for classified -	Pr(D| -)	29.62%
Correctly classified		74.24%