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Nicola Branzoli
Antonella Caiumi

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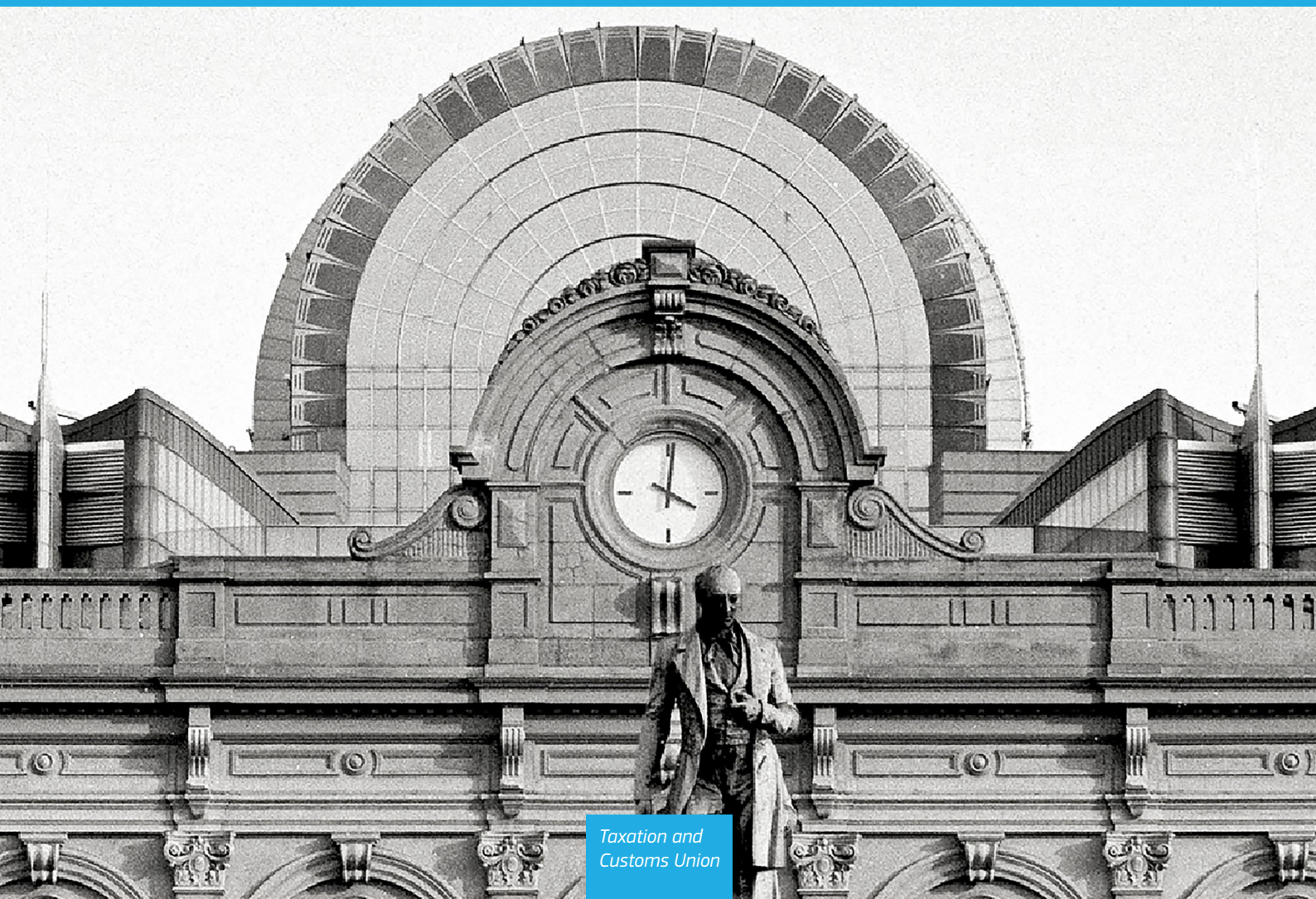

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How effective is an incremental ACE in addressing the debt bias?

Evidence from corporate tax returns

Nicola Branzoli and Antonella Caiumi *

January 2, 2018

Abstract

The Allowance for Corporate Equity (ACE) introduced in Italy in 2011 has decreased the fiscal distortion between the costs of equity and debt by introducing the deductibility from taxable income of a notional return on capital increases. In this paper we estimate the impact of the ACE on the leverage ratio of Italian manufacturing firms. Using a novel instrumental variable approach to identify the causal effect, we find that the introduction of the incremental ACE has substantially reduced the leverage ratio of its beneficiaries. The effect of the reform increases with age and decreases with the size of the enterprise. These results suggest that an incremental ACE may be an effective policy tool to reduce the leverage ratio of European firms.

Keywords: Allowance for Corporate Equity, corporate leverage, debt-equity bias. JEL: G32, H25, H32

* Branzoli, Financial stability Directorate - Bank of Italy. E-mail:nicola.branzoli@bancaditalia.it. Caiumi, European Commission. E-mail: antonella.caiumi@ec.europa.eu. We would like to thank Giorgio Gobbi, Silvia Magri, Paolo Finaldi Russo, Stefania Zotteri, Gaëtan Nicodème, Martino Tasso, Giacomo Ricotti, Elena Pisano, Ernesto Zangari, Emilia Bonaccorsi di Patti and Francesco Columba for their insightful comments. The views expressed in this paper are those of the authors and shall not be attributed to the European Commission and Banca d'Italia.

1. Introduction

The deductibility of interest expenses from taxable income makes, *ceteris paribus*, debt cheaper than equity for firms. Numerous empirical studies (**Rajan & Zingales** (**1995**), **Graham** (**2008**)) have shown that fiscal incentives influence the choice of financial leverage and, in particular, that the deductibility of interest expenses increases firms' leverage (**Heidera & Ljungqvist** (**2015**), **Alberternst & Sureth-Sloane** (**2015**)).

Fiscal distortions of firms' capital structure have gained considerable attention in recent years because, through their effect on leverage, they can have an impact on the stability of the financial sector. Lever- age increases firms' default rate during economic downturns (**Molina** (**2005**), ***Carlinga et al.*** (**2007**), **Bonfim** (**2009**), **Löffler & Maurer** (**2011**)) and, thus, can amplify the consequences of economic slow- downs by worsening banks' balance sheet (**Sutherland & Hoeller** (**2012**)).

In this context, the Allowance for Corporate Equity (ACE, also called Notional Interest), originally proposed in 1991 by the Institute for Fiscal Studies (**Institute for Fiscal Studies** (**1991**), **Devereux & Freeman** (**1991**)), has attracted renewed attention and it has been quite widely advocated as the best available solution towards a more neutral tax system (**Mirrlees *et al.*** (*2011*), **de Mooij** (**2011**), **Mooij & Devereux** (**2011**), **Devereux & Vella** (**2014**), **Clausing *et al.*** (**2016**)). ACE favors the rebalancing of the financial structure of firms by allowing both the deductibility of actual debt financing costs and a notional deduction for equity financing costs. The European Commission proposal for a Consolidated Common Corporate Tax Base (CCCTB) includes a notional interest deduction on equity financing with some novel features in the form of an Allowance for Growth and Investment (AGI).

Several countries currently offer or have experienced in recent years ACE-type systems thus showing that ACE can be easily implementable (**International Monetary Fund** (**2016**)). Nonetheless, a major concern in adopting an ACE is its revenue impact due to the shrinking of the tax base, although this can be somewhat mitigated by designing the allowance in an incremental fashion.[1] Other issues arise if only a few countries adopt ACE-type regimes as a result of potential abuse opportunities that can be exploited by multinationals (**Hebous & Ruf** (**2017**)).

The Italian experience could be considered as a good practice to address the debt bias in the corporate sector (**Zangari** (**2014**)). In the aftermath of the financial crisis, Italy introduced the so called 'Aiuto alla crescita economica' (Aid to Economic Growth) which relies on an incremental ACE (also called soft ACE). The new regime grants a deduction only to the annual increase in equity, therefore limiting its downside effect on tax revenues. It also features some specific anti-abuse provisions.

The recent empirical literature on the economic effects of ACE-type reforms is scant and mainly points to lower effect in increasing companies' capitalization from an incremental ACE as opposed to a full ACE applied on the whole book value of equity (also called hard ACE). Few papers suggest a significant reduction in corporations' indebtedness as a result of the introduction of the Belgian (hard) ACE system. Studying all Belgian corporations, **Princen** (**2012**) finds an effect of 10 percentage points on financial leverage, **Panier *et al.*** (**2013**) reports an effect of

[1] See also **Klemm** (**2006**) and **Massimi & Petroni** (**2012**) for an overview of ACE systems in practice. Besides Italy, more recently, Cyprus (since January 2015), Turkey (since July 2015), Switzerland (Since 2016) have adopted incremental ACE-type regimes (**International Monetary Fund** (**2016**)). Denmark has announced the introduction of an incremental ACE in the coming years. Malta has proposed to introduce a notional interest deduction to address its relatively high corporate debt bias. Belgium has anticipated that the current full ACE regime will come closest to an AGI.

7 to 8 percentage points. Using data on German-based multinationals, **Hebous & Ruf** (**2017**) find comparable results for Belgium (11 percent- age points), but a somewhat lower effect in increasing capitalization following a soft ACE instead of an hard ACE (the Belgium case). Conversely, the effectiveness of the ACE in Belgium on SME's in- debtedness seems negligible (**Campenhout & Caneghem** (**2013**)). More recently, **Petutschnig & Rünger** (**2017**) show that the application of a soft ACE in Austria during the early 2000s could have increased corporate equity ratios by 5.5 percentage points.

This paper aims to contribute to this literature by examining the effect of the Italian ACE on debt choices of companies in the initial years of its implementation (2011-2013). Specifically, our main objective is to investigate whether the reform effectively reduced the leverage ratio of its beneficiaries and whether it reached the most undercapitalized firms, as it is sometimes objected that the ACE is mainly a tax relief for profitable and large firms.

A key issue in our analysis is that the new tax deduction is granted to firms increasing their capital; therefore the ACE relief is automatically available to opting companies. The self-selection created by firms' choice to increase their capital to benefit from the deduction makes a simple comparison between the leverage of firms benefiting from the ACE deduction (the treated firms) and the leverage of firms not benefiting from the ACE deduction (the untreated firms) open to significant critiques.[2] The aforementioned studies on the effect of the ACE exploited an identification strategy based upon cross-country control group comparison (**Princen** (**2012**), **Panier *et al.*** (**2013**)) or on within-multinational-group comparisons (**Hebous & Ruf** (**2017**)). Such methodologies are, however, constrained by the availability of a reliable control group or applicable only to a subset of corporations. To overcome such limitations, we propose a novel identifying approach and provide estimates of the effects on corporate debt of the Italian incremental ACE.

Our identification strategy can be implemented relatively easily, it does not require a control group and can be applied virtually to all potential beneficiaries of an incremental ACE-type reform (not only, for example, to multinational corporations). First, we rely on the panel-level fixed-effect estimator developed in **Blundell & Bond** (**1998**), which is robust to a number of potential biases, such as selection on time invariant unobservable variables, high persistency in the dependent variable and the presence of large unobserved heterogeneity across firms. Second, we exploit an instrumental variable approach which is based on the theoretical literature on dynamic corporate structure (**Strebulaev & Whited** (**2012**)) together with the condition that a capital increase is needed to benefit from the ACE deduction. In a nutshell, our identification strategy is based on the fact that equity issuances financed by firm shareholders are costly, therefore past capital injections financed by the owners of the company reduce *ceteris paribus* the probability that a firm can make a new capital increase to benefit from an ACE deduction. At the same time, equity issuances by themselves do not affect the relative price of equity and debt, and therefore do not affect the target leverage of the firm. Therefore, past equity is- suances financed by firm shareholders provide a good instrumental variable, affecting the probability of treatment (benefiting from the ACE deduction) but not the outcome of interest (leverage). We inves- tigate the validity of these arguments studying the relationships between the probability of benefiting from the incremental ACE and past capital injections paid by firm

[2] For example, a firm might issue new capital instead of increasing its debt because it has fewer tangible assets and therefore face higher costs of borrowing from banks. In this case the leverage of treated and untreated firms may evolve differently because they have different levels of tangible assets and not because of the ACE (selection on observable variables). Or firms that benefit from the ACE might have more skilled managers, who are able to catch the opportunity to invest offered by the deduction and also reduce the leverage ratio (selection on unobservable variables).

shareholders and between leverage and past capital injections. Our results support the validity of our theoretical arguments, which we then use to address the main question of the paper.

We use confidential corporate tax return combined with financial statements from the national institute of statistics (ISTAT) database. Our database allows us to exactly identify beneficiary firms and, there- fore, obtain more reliable estimates of the impact of the ACE on the treated. At the current stage of the research, we restrict our sample to standalone firms. Therefore our estimates disregards issues related to anti-avoidance provisions targeting intra-group transactions. We find that the ACE has significantly reduced the leverage ratio of its beneficiaries, by almost 9 percentage points on average which is around 15 per cent of the average leverage ratio in our sample (roughly 50 per cent). As we discuss more in depth below, these estimates, validated through standard tests of the exogeneity of the instruments, are within the range of the results found in the aforementioned literature. Moreover, using sub-samples estimates based on firm age and size, our results indicate that the effect is larger for small and medium enterprises (SME's) and for mature firms. Italian SME's are those with the highest level of leverage in an international comparison (**Finaldi Russo & de Socio** (**2016**)), therefore our results suggest that the ACE has benefited the firms who had the greatest need to increase their capital.

Given the importance of leverage for many firms' outcomes, our estimates have several implications. For example, analyzing the universe of Italian limited liability companies reported in the Cerved database between 2009 and 2012, **Bonaccorsi di Patti *et al.*** (**2014**) find that a decrease of leverage of 10 percentage points reduces by 0.7 percentage points the probability that a firm defaults on its bank debt and is deemed irreversibly unable to repay the loan (i.e. the loans to the firm are reported as bad debt - *sofferenze* in Italian - in the Credit Register).[3] Taking into account that such probability was around 6 per cent in the same period, our results suggest that the ACE deduction can have reduced by one tenth the probability that its beneficiaries defaulted on their bank debt.

The rest of the paper is organized as follows. Section **2** reviews the tax treatment of equity and debt in Italy and presents our data. Section **3** discusses the identifications strategy. Section **4** presents the results and Section **5** concludes.

2 Institutional background and data

2.1 The tax treatment of equity and debt in Italy and the ACE reform

Since a major corporate tax reform in 2008 the tax deductibility of interest expense is capped by an earning stripping rule. Corporations can fully deduct interest expenses on debt from the taxable income up to the amount of interest income and similar revenues accrued in the same tax year. Any interest expense in excess can be further deducted up to 30 per cent of gross operating profits, and the remaining amount can be carried through in the future and added to the amount deductible in subsequent years. At the end of 2011, the Italian Government introduced - within a package of measures to stimulate the economy - a notional interest deduction on

[3] In the Italian Credit Register, a borrower is considered to have defaulted on its debt if total outstanding net bad loans are more than 10 per cent of the total net exposure of the borrower to the banking sector (*sofferenze rettificate* in Italian). A loan is considered bad if the borrower is deemed by the bank irreversibly unable to repay the debt (other less serious nonperforming categories are substandard, restructured and past-due). See **Bonaccorsi di Patti *et al.*** (**2014**) for more details.

capital increases, while keeping the corporate statutory rate unchanged. The reform was motivated by the need to boost the recapitalization of Italian corporations by reducing the favorable tax treatment of debt and, at the same time, alleviate the effective tax burden on the private sector in a period of economic distress. To alleviate the revenue loss from the new regime, not only the ACE allowance was designed in an incremental fashion, it was also combined with the existing limitation to interest deductibility.

The notional return was set to 3 per cent for the first three years (2011-2013) and it was increased to 4 per cent for 2014, 4.5 per cent for 2015 and 4.75 per cent for 2016 to strengthen the incentive effect of the new allowance on corporate financing decisions. Net capital increases are computed as the sum of new equity and profits retained minus the reduction in firm's own capital which has been distributed to shareholders. Other reduction to the ACE base stems from anti-abuse and anti-elusive rules.[4] In particular, anticascading rules impose that participations held within the group (domestic and foreign) have to be subtracted from the ACE base to avoid doubling the receipt allowance corresponding to the same initial increase in equity. However, the ACE base is capped at zero. This asymmetric feature of the ACE does not completely eliminate the possibility of such cascading, in particular in the case of participations financed by debt (**Zangari** (**2014**), **International Monetary Fund** (**2016**)). To address this opportunity for tax planning the ACE should give rise to addition to the tax base as in the AGI in the CCCTB proposal.

The ACE deduction is incremental, i.e. in all years the ACE applies to the net capital increases with respect to the amount of equity in 2010. A company is entitled to deduct the notional return times the amount of capital in excess of the level of 2010 in all years in which the capital increase is maintained (cfr. the example in Table **1**). The amount of the ACE allowance is only capped by the amount of the taxable income in a given tax year. For tax-exhausted firms, a carry-forward regime is envisaged without time limits.

After some years since its implementation, the generosity of the ACE has been cut down to limit its impact on tax revenues. More precisely, in 2017 a significant cut of the corporate statutory tax rate has been accompanied by a sharp reduction of the notional return, likely as a prelude to its repeal. The notional return is set to 1.6 per cent in 2017 and 1.5 per cent for 2018 and thereafter. Indeed, a stronger reduction in the notional return was bartered with the maintenance of the incremental structure of the ACE base, as it was originally proposed to move to an AGI-type system based on changes in the equity base over a rolling period (here of five years). In addition, some conditions about the type of investment have been added. Under a new limitation introduced by the budget law for 2017, the ACE base may be reduced based on the increase of investments in securities and financial instruments other than participations, as compared to the amount shown in the financial statements for 2010. The same rule applies also to intra-group lending. Therefore, the ACE benefit is currently restricted only to productive investments.

[4] New equity from shareholders living in so-called "tax heavens" and from profits retained for non-disposable reserves cannot be deducted. The sterilization of the ACE base also applies to the entity making contribution in cash to group companies, buying the business or parts of a business from other group companies, granting financing to other group companies. Finally, net equity issuance cannot exceed the outstanding value of firm's own capital.

An example of how the ACE deduction is computed				
Year	**2010**	**2011**	**2012**	**2013**
Capital level (in euro)	500,000	550,000	550,000	600,000
ACE deduction (in euro)	-	1,500	1,500	3,000

Table 1 *– **Description:** this table provides an example of how the ACE deduction is computed. An hypothetical firm with 500,000 euro of capital increases its capital of 50,000 euro in 2011 and make a second capital increase of 50,000 euro in 2013. The capital increase with respect to the level of 2010 (50,000 for 2011 and 2012, 100,000 for 2013), multiplied by the notional return (3 per cent), is deducted in all years.*

In this paper we focus on the effects of the introduction of the ACE on capital increases. As already argued, the reform has significantly reduced the tax distortion of equity versus debt for Italian firms. Figure **1** plots the cost of equity versus the cost of debt before and after the reform based upon conventional simplifying modeling assumptions (see **Caiumi *et al.*** (**2015**)). As the actual costs of equity and debt vary significantly across corporations, being influenced by firm sector, balance sheet characteristics, cash flows, age, reputation etc. these figures provide only suggestive evidence about the effect of the ACE on the relative cost of equity and debt. However, the graph clearly suggests that until 2011 investments financed with new equity cost significantly more than investments financed with debt. The tax-induced disincentive to equity financing has been remarkably lowered since the introduction of the ACE.

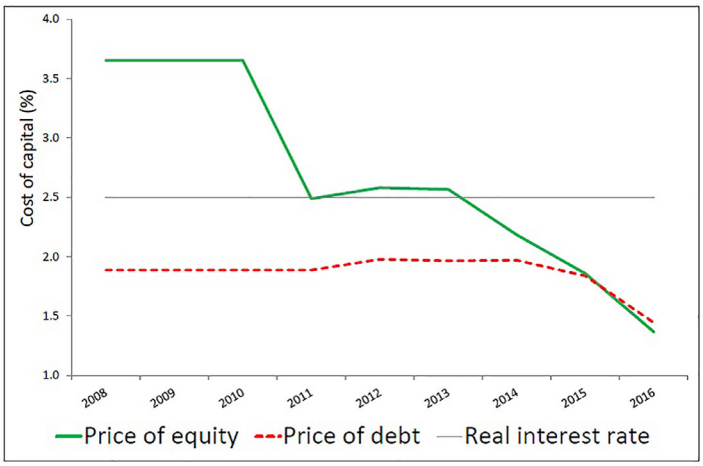

Figure 1 *– The real cost of equity (green) vs. debt (red). The graph plots the break-even return of a one-year investment financed entirely with equity (green line) or entirely with debt (red line). The cost of capital is computed applying the methodology used for calculating effective tax rates in a domestic setting following **Devereux & Griffith** (**2003**). Key features of the corporate income tax in Italy are considered. The cost- of-capital is computed for five capital goods with the following depreciation allowance and economic depreciation rate (in parenthesis): machinery 13.25% (17.5%), buildings 3,1% (4%), intangibles 33.3% (15.3%), inventory 0% (0%), financial assets 0% (0%)). The aggregate measure is obtained by assigning equal weight to the different capital goods. The inflation rate is set at 2%. The real interest rate is based on elaborations from the Bank of Italy's database. For more details see **Caiumi et al.** (**2015**).*

The Italian ACE-type regime has provided a powerful tax incentive to rely on equity instead of debt to finance investments. In 2011, around 16 per cent of all Italian corporations benefited

from the ACE reform, with an estimated tax revenue loss of roughly 613 million euros.[5] The key features of the ACE mechanism described above have contributed to the steady increase of both the number of beneficiaries and the reduction in the effective tax burden for opting corporations. In 2014, 31.1 per cent of corporations benefited from the deduction, which lowered their tax debt for the Imposta sul reddito delle Societá (IRES) by 5.4 percentage points. Also, the effective median IRES tax rate for the beneficiaries would have been 28.5 per cent in the absence of the reforms adopted in 2011, 2.3 percentage points higher than with the ACE deduction.

The characteristics of the ACE have made the deduction more attractive for profitable firms that can increase capital with their retained earnings. Moreover, limiting the tax break to new equity, the reform favors firms that have innovative projects because equity is a better source to finance innovative and risky projects (**Magri** (**2009**)). Finally, the reduction in the tax rate tends to be proportionally larger for small firms, making the ACE relatively less effective for larger firms.

The highest share of beneficiaries of the deduction are firms in the manufacturing and service sectors, of small and medium size and located in the Northern regions. More than 70 per cent of the corporations exporting outside Italy, generally more productive and with higher growth than non-exporters, benefited from the ACE deduction.

2.2 Description of the dataset

We use confidential corporate tax return combined with financial statements from the national institute of statistics database. We decide to analyze capital firms belonging to the same sector to have a homogeneous sample of firms. In this way, our results cannot be driven by differences across sectors. We choose the manufacturing sector because it is the sector that absorbed the largest share of the reduction in tax income by the Government due to the ACE reform (see **ISTAT** (**2016**)).

We start from the universe of Italian manufacturing capital corporations, excluding individual enterprises and partnerships. To be included in the analysis, capital corporations must have strictly positive total assets, no inconsistencies in the items of the financial statement and have all variables used in the empirical model for at least three consecutive years and within the first and the ninety-ninth percentile of their distributions. We exclude firms that are subject to insolvency proceedings (bankruptcy and liquidation) and those taxed at group level. The final dataset contains an unbalanced panel of 81,534 firms observed from 2008 to 2013,[6] roughly half of the total manufacturing Italian capital corporations according to data from Infocamere. The largest number of firms is lost when we require that all variables used in the empirical model must be reported for at least three consecutive years, and it is therefore a requirement concerning the quality of the data that we decided to maintain.

Each year, around one third of the sample benefits from the ACE deduction. The exact percentage slightly increases from 30 per cent in 2011 to 33 per cent in 2013.

Table **2** contains summary statistics about the main variables used in the analysis. Financial leverage is defined as the total level of debt, excluding trade debt, over the sum of the book value of equity and debt.[7]

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[5] The following data come from **ISTAT** (**2014**) and **ISTAT** (**2016**).

[6] Our data go back to 2006. However, since we have information for only 3 years after the introduction of ACE, we decide to censor the sample 3 years before the introduction of ACE.

[7] We have also performed the analysis using book leverage, finding similar results.

The table is organized in four panels. The upper panels contains summary statistics regarding firms that benefit from the ACE deduction, split between the period before the ACE reform (2008 to 2010, left panel) and the period after the ACE reform (2011 to 2013, right panel). The lower panels have the same structure and describe firms that do not benefit from the ACE reform. Looking at the various panels it is possible to compare treated and untreated firms in the pre-ACE period (the ACE deduction is the treatment) and to look at the evolution of the variables after the ACE reform for the two groups of firms.

Variable	Firms that use ACE									
	Pre-ACE period (2008-2010) (N.Obs. 89,351)					**Post-ACE period (2011-2013)** (N.Obs. 98,079)				
	Mean	**S.d.**	**Percentiles**			**Mean**	**S.d.**	**Percentiles**		
			25*th*	**50***th*	**75***th*			**25***th*	**50***th*	**75***th*
Financial leverage	48.8♦	34.2	14.1	53.2	80.4	45.7♯,♦	33.4	11.1	48.1	76.5
Age	11.5♦	11.6	3	7	17	13.6♯,♦	11.68	5	9	20
Size	2,500♦	12,358	410	938	2,207	2,753♯,♦	17,037	432	999	2,342
Profitability (ROA)	0.07♦	0.10	0.02	0.05	0.10	0.07♦	0.10	0.02	0.05	0.09
Tangibility	17.9♦	20.0	3.0	10.0	26.4	17.1♯,♦	19.8	2.6	9.2	25.2
Δ equity (%)	12.8♦	27.3	0.4	8.3	24.5	9.3♯,♦	25.5	0	5.8	18.5
Tax reduction due to ACE	-	-	-	-	-	5.6	0.11	0.9	2.1	5.2
	Firms that do not use ACE									
	Pre-ACE period (2008-2010) (N.Obs. 121,834)					**Post-ACE period (2011-2013)** (N.Obs. 128,859)				
	Mean	**S.d.**	**Percentiles**			**Mean**	**S.d.**	**Percentiles**		
			25*th*	**50***th*	**75***th*			**25***th*	**50***th*	**75***th*
Financial leverage	49.6	35.4	11.6	55.1	82.6	49.6	35.3	11.6	55.4	82.5
Age	9.9	10.8	2	6	14	12.1♯	10.9	5	8	16
Size	1,699	9,351	255	629	1,530	1,766	11,299	260	630	1,505
Profitability (ROA)	0.06	0.11	0.01	0.04	0.09	0.04♯	0.10	0	0.03	0.07
Tangibility	17.7	21.2	2.1	9.2	25.5	16.7♯	21.2	1.6	7.8	23.7
Δ equity (%)	7.6	28.4	-4.6	3.8	19.4	2.8♯	27.3	-8.2	1.4	13.2

Table 2 – Summary statistics. Notes: *leverage is defined as the total level of debt over the sum of the book value of equity and debt. Firm age is measured in years. Size is measured as the value of total assets (in thousands of euros). "Profitability", i.e. the return on assets, is net income over total assets. "Tangibility" is the ratio of tangible assets over total assets. "Tax reduction due to ACE" is the reduction measured in percentage points of the effective IRES tax rate due to the ACE deduction. The symbol "♯" indicates that the mean is statistically different from its value in the pre-ACE period. The symbol "♦" indicates that the mean is statistically different from its value among the group not benefiting from the ACE deduction in the same period.*

The t-tests for the equality of means suggest, in general, that all variables have different averages in the treatment vs. control groups, both in the pre-ACE period and in the post-ACE period. It is worth noting, however, that the mean leverage does not change in the two sub periods for the firms not benefiting from the ACE deduction, while it changes for the treatment group. The entire distribution of the leverage ratio of firms benefiting from the ACE has shifted to the left after 2011, while the distribution of the leverage ratio of firms not benefiting from the ACE has not changed. This suggests that the ACE had an effect on all corporations who applied for the

deduction. Moreover, the set of firms which have benefited from the ACE deduction are slightly larger and older than those who did not benefit from the deduction in the pre-reform period.

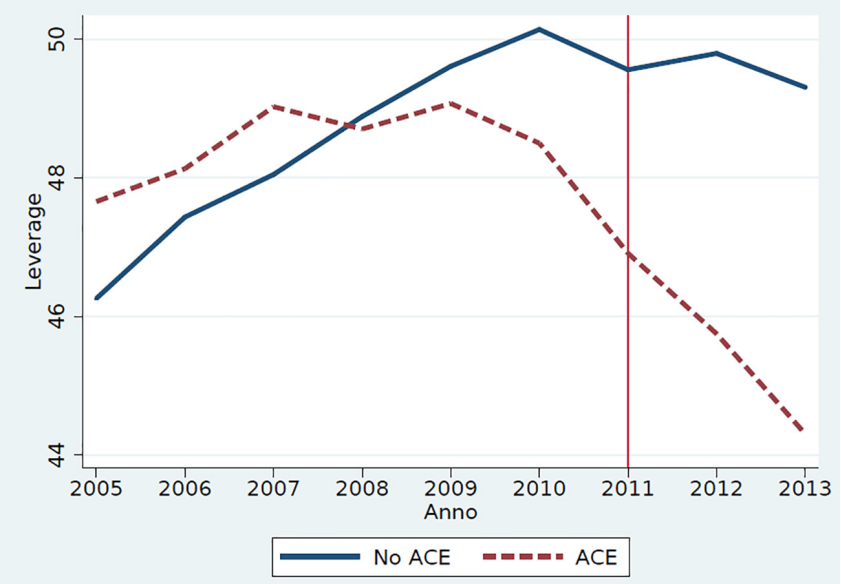

Figure 2 *– Time-series of the leverage ratios before and after the ACE of firms that benefit from the deduction (red) and those that do not benefit from the deduction (blue). Simple means within groups.*

Figure **2** plots the average leverage ratio for the groups of firms who applied for the ACE deduction and the firms which did not. It covers a slightly longer period than the one used in the analysis[8] to point out an interesting difference between the two groups of firms. Until 2007 the average leverage ratio of the two sets of firms shared a similar pattern. With the financial crisis, however, the leverage of the firms which would later use the ACE deduction had started to fall, while the leverage of the other group increased for two more years and then slightly decreases after 2011. The difference between the average leverage of the two sets of firms increased constantly since 2007, with an acceleration at the time of the introduction of the ACE.

Figure **2** confirms that firms which benefited from the ACE reform are not randomly sampled from the population of Italian firms. Therefore the simple correlation of the ACE deduction with the evolution of firm leverage would confound many factors. In the next section we discuss in detail the empirical strategy used to isolate of the effect of the ACE on leverage.

[8] As explained above in this section, we have information for 3 years after the introduction of ACE so we decide to focus the empirical analysis on the period of 3 years before and after the introduction of ACE.

3 Empirical specification and identification

3.1 A dynamic empirical model of leverage

Our econometric model for financial leverage takes the following form:

$$Lev_{i,t} = \alpha + \beta D\left(ACE = 1\right)_{i,t} + \sum_{j=1}^{T} \rho_j Lev_{i,t-j} + \sum_{j=0}^{T} \gamma_j X_{i,t-j} + \mu_i + \varepsilon_{i,t}$$

where $Lev_{i,t}$ is leverage of firm *i* in year *t*. The variable $D\left(ACE = 1\right)_{i,t}$ is a dummy equal to 1 if the firm has benefited from the ACE deduction during year *t*. As explained in Section **2.1**, the Italian ACE is *incremental*, i.e. a firm can deduct the notional return multiplied by the amount of capital in excess of the level of 2010 in each year in which the capital increase is maintained. Therefore the variable $D\left(ACE = 1\right)_{i,t}$ is equal to one in the year when the firm has made a capital increase and in all subsequent years, unless the firm reduces its capital to a level below the one in 2010. The parameter of interest, β, is therefore a measure of the average ACE effect across firms and over the years in which the firms have benefited from the ACE deduction.

We include lagged values of firm leverage $Lev_{i,t-j}$ and in the matrices $\sum_{j=0}^{T} \gamma_j X_{i,t-j}$ contemporaneous and lagged firm characteristics. We control for standard firm observables used in the empirical literature (**Graham & Leary** (**2009**), **Heidera & Ljungqvist** (**2015**)): profitability (ROA), age, firm size (log of total assets and dimensional category), tangibility (tangible assets over total assets).[9] We explore specifications with *T* between 3 and 6 and always include year, region and sector fixed effects.[10] The variables μ_i and $\varepsilon_{i,t}$ in eq.(**3.1**) represent a firm-specific, time-invariant unobserved component and an error term respectively. Throughout the paper we show the results with robust standard errors, but we have also checked the robustness of our results clustering at firm level.

Because the level of leverage is affected by μ_i at all dates, the lagged dependent variables are endogenous by assumption. This bias is corrected using the two-step GMM estimator in **Blundell & Bond** (**1998**), which involves first-differencing eq.(**3.1**) to remove the panel-level effects (μ_i) and using instruments to form moment conditions for the endogenous variables.[11] Our main concern is the endogeneity of $D\left(ACE = 1\right)_{i,t}$ which may be correlated with $\varepsilon_{i,t}$. Firms applying for the ACE deduction may have specific reasons to do it, such as the prospect of a productive investment or the arrival of a talented manager. These reasons may also affect leverage, confounding their effects with the ACE deduction. To handle the endogeneity of $D\left(ACE = 1\right)_{i,t}$ we use instruments based on the economics of new equity issuances financed by firms' shareholders discussed in the next section.

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[9] We do not consider the market-to-book value (a proxy for firm investment opportunities) because our data mostly consider privately held firms.

[10] For lagged firms' characteristics, we use data that pre-dates the start of the analysis. For example, when we analyze leverage in 2008, we use firms' information going back to 2002 for the specification with $T = 6$. For sector fixed effects, we use 2 digits NAICS codes.

[11] We prefer their estimator to the standard estimator of **Arellano & Bond** (**1991**) because the latter can perform poorly if the autoregressive parameters are large or the variance of μ_i across *i*'s is significantly larger than the variance of the ε's. Below we will show that leverage is highly persistent. Furthermore, given that we include a large number of manufacturing corporation, the variance of μ_i is likely to be large.

3.2 Identification strategy

To evaluate the effect of the ACE on the leverage ratio we employ an instrumental variable (IV) approach. In this section we provide theoretical and empirical support for the use of past injections of capital by firms' shareholders as IVs.

Our arguments are twofold. First, shareholders' past injects of new capital are costly and therefore re- duce the current ability of the firm to raise new capital. Hence past injections of capital by shareholders affect firms' ability to benefit from an incremental ACE deduction. Second, according to the dynamic corporate finance literature (**Strebulaev & Whited** (**2012**)) firms have a target level of leverage which is affected by the relative price of equity and debt, not by injections of new capital *per se*. Contemporaneous shareholders' decisions to inject new capital may be correlated with factors changing the relative price of equity and debt, however in such cases the firm is likely to raise new capital quickly to benefit from these factors. This suggests that past injections of capital are less likely related to changes in the target leverage. We investigate the validity of these arguments by empirically showing that share- holders' past injections of new capital have a long-lasting negative autocorrelation but the correlation between past injections of capital and leverage, conditional on current capital increases, is not significant. Although the absence of correlation does not imply independence, this empirical evidence support the reliability of our theoretically-motivated arguments and the identification strategy used. Finally, we corroborate our strategy through the Sargan-Hansen test for the validity of the exclusion restrictions in the empirical section.

3.2.1 Past capital increases and the decision to benefit from the ACE deduction

Capital is expensive, therefore *ceteris paribus* firm shareholders prefer to increase capital with a single issuance, giving up the so-called "option value" of a capital increase, rather than with many issuances over time (**Abel & Eberly** (**1999**)). This suggests that, controlling for other factors, past capital injections made by firms' shareholders reduce the ability of the firm to make a new capital increase to benefit from an incremental ACE deduction because the economic costs of a capital increase has been borne in the (recent) past.

We support this argument estimating a dynamic model for the ACE deduction with firm fixed effects. The dependent variable is a dummy variable equal to one when the firm has applied for the ACE deduction, and the explanatory variables are lagged values of firm leverage, return on assets (ROA), firm size (log of total assets), tangibility (tangible assets over total assets), year, region and sector fixed effects. Our focus is on the relationship between the lagged values of a dummy variable equal to one when firm's shareholders have injected new capital into the company and the ACE deduction. Table **3** presents the results from a linear probability model, Table **9** in the appendix reports the results of a probit model.[12]

Past capital increases are negatively related with the current use of the ACE, indicating that firms whose shareholders have increased its capital in the past are less likely to raise new capital to benefit from the ACE.[13] Doing it would be costly for shareholders, and these costs have been already been disbursed in the recent past. As one would expect, the correlation tends to decrease in magnitude as we look at more lagged decisions.

[12] A complete list of parameter estimates can be found in Table **8** in Appendix **B**.

[13] These results are also consistent with the presence of capital adjustment costs, which create periods of inaction in any investment decision (**Dixit & Pindyck** (**1994**)).

The bottom part of Table **3** presents additional results. Small and medium firms[14] have been more likely to apply for the ACE, as highlighted in Section **2.1**.

Linear probability model			
Dep. variable: $D(ACE=1)_{i,t}$	(1)	(2)	(3)
Dummy capital increases…			
…in year *t* – 1	-0.027***	-0.023***	-0.023***
	(0.003)	(0.004)	(0.004)
…in year *t* – 2	-0.020***	-0.022***	-0.022***
	(0.003)	(0.004)	(0.004)
…in year *t* – 3	-0.014***	-0.020***	-0.019***
	(0.002)	(0.003)	(0.003)
…in year *t* – 4		-0.021***	-0.020***
		(0.003)	(0.003)
…in year *t* – 5		-0.016***	-0.016***
		(0.003)	(0.003)
…in year *t* – 6		-0.008***	-0.006***
		(0.003)	(0.002)
Age	-0.002***	-0.001***	-0.002***
	(0.0001)	(0.0001)	(0.0001)
Dummy firm type:			
Small	0.066***	0.067***	0.066***
	(0.004)	(0.005)	(0.005)
Medium	0.113***	0.108***	0.106***
	(0.011)	(0.014)	(0.013)
Large	0.059*	0.013	0.009
	(0.033)	(0.042)	(0.043)
N.Obs.	181,899	113,735	113,735

Table 3 *– Notes: parameter estimates of the model:*

$$D(ACE=1)_{i,t} = \varphi + \sum_{j=1}^{T} \delta_j D(Equity\ issuance=1)_{i,t-j} + \sum_{j=0}^{T} \theta_j \tilde{X}_{i,t-j} + \tilde{\mu}_i + \omega_{i,t}$$

The period analyzed is 2008-2013. The matrix $\tilde{X}_{i,t-j}$ *contains additional control variables. All specifications include an intercept, firm age, total assets (in logs), three lags of firm leverage and three lags of the ratio of tangible assets over total assets. We always include firm, region, sector and year fixed effects and a fixed effect for firm size (micro, small, medium and large firms). Table* **8** *in the Appendix reports the estimates about these variables. Column (3) includes additional controls related to whether the firm performs knowledge-intensive activities and whether the firm is foreign owned. When needed, lagged firms' characteristics pre-dates 2008. Robust standard error in parenthesis. ***: Significant at 1 percent; **: Significantat 5 percent; *: Significant at 10 percent.*

[14] The classification uses the definition of the European Union. The base type is micro firm. Thus the least likely firms to have applied for the ACE are micro and large firms, consistently with the effects of the ACE we find below.

3.2.2 Past capital increases and leverage

We have supported the argument that past decisions to underwrite new equity by firms' shareholders affect firms' ability to benefit from an incremental ACE regime. We now provide evidence that capital increases do not affect the outcome of interest, i.e. leverage.

Both static and dynamic theories of leverage conclude that every firm has a target level of leverage (**Graham & Leary** (**2011**) and **Strebulaev & Whited** (**2012**)) whose specific value depends on the relative price of equity and debt. Capital increases themselves do not affect this relative price, but they can be correlated with factors changing the optimal leverage, such as a new patent or the hiring of a skilled manager. In such cases the firm should be relatively fast in raising new capital to profit from these factors. In other cases capital injections are used to grow and are followed by debt increases that align leverage to its target level.

These arguments suggest that a limited number of lags of capital increases may be correlated to the current level of leverage, but that injections of new capital should not be related to the leverage ratio when they are made far in the past.[15]

We analyze the correlation between leverage and past capital injections by shareholders estimating a dynamic tobit model with firm fixed effects for leverage ($Lev_{i,t}$). The explanatory variables included are the same as the one in the previous subsection (see Table **3**) and we add the contemporaneous dummy equal to one if the firm has increased capital in the current year.[16] This approach is essentially testing the absence of correlation between the IV and the outcome variable conditioning on the treatment variable (see **Angrist *et al.*** (**1996**)). The absence of correlation does not imply independence between the unobserved component of the outcome variable and the instrument but it is consistent with the theoretical arguments and support them.

The rich set of explanatory variables controls for many observable and unobservable firms' characteristics that do affect leverage and that can change over time, such as present and past levels of tangible assets, profitability, sector and opaqueness (size). Table **4** presents the results.[17]

[15] How many lags of capital increases matter for the current level of leverage may depend, for example, on shareholders' wealth or debt adjustment costs. Because a structural estimation of a dynamic model of leverage is beyond the scope of this paper, we limit the analysis to an empirical investigation of the significance of past capital increases on the current level of leverage.

[16] We have also experimented a specification with the contemporaneous dummy ACE instead of the one for capital increases, and the results are quantitatively close to the ones shown in Table **4**.

[17] A complete list of parameter estimates can be found in Table **10** in Appendix **B**.

	Tobit model		
	Dep. variable: $Lev_{i,t}$		
	(1)	(2)	(3)
Dummy capital increases…			
…in year *t* – 1	-0.248**	-0.126	-0.121
	(0.11)	(0.14)	(0.14)
…in year *t* – 2	-0.002	-0.111	-0.112
	(0.11)	(0.08)	(0.13)
…in year *t* – 3	-0.113	-0.172	-0.170
	(0.11)	(0.13)	(0.13)
…in year *t* – 4		-0.120	-0.117
		(0.32)	(0.13)
…in year *t* – 5		-0.171	-0.164
		(0.12)	(0.12)
…in year *t* – 6		-0.032	-0.036
		(0.12)	(0.12)
N.Obs.	175,291	99,784	99,784

Table 4 *– Notes: parameter estimates of the tobit model for leverage. The period analyzed is 2008-2013. All specifications include an intercept, three lags of firm leverage, three lags of profitability (ROA), three lags of log of total assets and three lags of the ratio of tangible assets over total assets. We always include firm, region, sector and year fixed effects. Table* ***10*** *in the Appendix reports the estimates about these variables. Column (3) includes additional controls related to whether the firm performs knowledge-intensive activities and whether the firm is foreign owned. See Table* ***3*** *for additional details.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

The estimates indicate that capital injections lagged more than one year are unrelated to the current level of leverage. This evidence is robust across specifications, holds also in different subsamples and if we use OLS estimates instead of the Tobit model (not shown).

Therefore we conclude that a good identification strategy to measure the treatment effect of the ACE deduction on firm leverage is to instrument the probability of using the ACE with two or more lagged values of capital issuances underwritten by firm shareholders. The set of variables added in column 3 does not change the parameter estimates nor it improves the fit of the model (not shown), therefore we decide to use the specification in column 2 for our main analysis. In the next section we present the results with three lags, however we have checked that the results remain similar using additional lags and excluding the first, which is significant at the 5 per cent level in one specification (see Column 1 of Table **4**).

4 Main results on the ACE reform

In this section we present the main results of the empirical analysis. Table **5** reports the effect of the dummy ACE on the leverage ratio.[18]

[18] A complete list of estimates can be found in Table **11** in Appendix **B**.

The identification strategy described in Section **3.2**, coupled with the overidentification tests used to validate the choice of instruments, allow us to interpret the IV parameters of columns 3 and 4 as estimates of the causal effect of the deduction on firms' capital structure. However, the comparison of the results of the OLS and the panel fixed effects models, presented in columns 1 and 2, is interesting in its own right because they are informative about the bias induced by time invariant unobserved firms' characteristics.

	Estimates of Eq.(3.1) **Dep. variable:** $Lev_{i,t}$			
			IV	
	OLS (1)	Panel FE (2)	(3)	(4)
$D(ACE=1)_{i,t}$	-3.215***	-3.488***	-8.928***	-12.584***
	(0.079)	(0.087)	(3.365)	(4.643)
$Lev_{i,t-1}$	0.711***	0.576***	0.749***	0.830***
	(0.003)	(0.004)	(0.138)	(0.153)
$Lev_{i,t-2}$	0.118***	0.152***	0.041	0.039
	(0.004)	(0.004)	(0.102)	(0.129)
$Lev_{i,t-3}$	0.049***	0.103***	0.127	0.041
	(0.003)	(0.003)	(0.100)	(0.121)
$Lev_{i,t-4}$				-0.073
				(0.063)
$Lev_{i,t-5}$				-0.075
				(0.061)
$Lev_{i,t-6}$				0.037
				(0.059)
N.Obs.	181,899	181,899	181,899	113,620
N.Firms	71,893	71,893	71,893	71,893
P-value Hansen test:	-	-	0.153	0.315

Table 5 *– Notes: estimates of the dynamic IV-model of the leverage ratio for the contemporaneous effect of the ACE deduction. The first two columns report OLS and panel FE models respectively. The third and fourth columns present the estimates obtained by instrumenting the dummy for the ACE deduction using past capital increases, as described in Section* ***3.2****. All specifications include an intercept, three lags of profitability (ROA) three lags of the ratio of tangible assets over total assets, the log of total assets. Additional results are reported in Table* ***11****. We always include firm, region and year fixed effects. Column (4) includes six lags of these variables instead of three. See Table* ***3*** *for additional details.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

The OLS estimate indicates the presence of a negative relationship between the ACE deduction and the level of leverage even when we control only for observable firm characteristics. The magnitude of the coefficient is similar to the difference in the leverage ratio of beneficiaries and non-beneficiaries (see Table **2**). Column 2 shows that controlling for firm time invariant unobserved characteristics have little effect on these results.

The coefficient about the impact of the ACE changes significantly when we control for time-varying unobserved firm characteristics, going from around -3.5 to -9. In all the IV specifications

the Hansen overidentification test indicates that the instruments are valid.[19] This suggests that the unobservable time-varying characteristics have a positive bias. This evidence can potentially have multiple explanations. It could be, for example, that a higher unobserved profitability of the firm increases both the probability of an ACE deduction and leverage because banks, relying on soft information, are more likely to grant loans to profitable firms. The inclusion of additional lags of leverage, some of which are significant, increases the effect to -12 percentage points. Thus we conservatively conclude that the ACE deduction has reduced the level of leverage of 9 percentage points on average across years and firms.

These results are in line with those found in the literature about full ACE regimes. For example, **Princen** (**2012**) finds that the Belgian ACE, which is considered to have neutralized the distortionary effect of corporate taxation between debt and equity financing, has lowered financial leverage of benefiting firms by 10 percentage points on average. Using data on German-based multinationals, **Hebous & Ruf** (**2017**) find an average effect of the ACE of 5 percentage points. However, estimates vary significantly at the country level. For instance, from a country-specific regression for Belgium yields a larger effect of about 11 percentage points. Our results are also quantitatively consistent with evidence about the distortionary effect of corporate taxation between debt and equity financing. A corporate tax rate of 25% can be responsible for leverage ratios that are around 7 percentage points higher compared to a system that is neutral between debt and equity (**International Monetary Fund** (**2016**)).

This coefficient is likely to provide a conservative estimate of the full effect of the ACE on firm lever- age. If firms need time to learn the effective change in the relative prices of equity and debt, they may adjust gradually to the new target leverage. *Ceteris paribus* the long-run effect of the ACE may therefore be larger than what we find for the first years of its implementation.

4.1 Results by firm characteristics

The relative price of equity and debt vary with various firm characteristics, such as the amount of tangible assets or firm reputation (which should be correlated with age). It would not be surprising to find that the same tax deduction might have different effects on the marginal cost of equity and therefore on the target leverage ratio of different firms.

We explore two main dimensions of heterogeneity of the effect of the ACE on the leverage ratio: firm size and age. We start by estimating Eq.(**3.1**) using different subsamples based on firms' size.[20] To handle the problem of attrition across groups, we use the classification of the firm in 2011 and keep it constant throughout the sample. Table **6** contains the results.

[19] We have experimented many specifications, using the instruments in several ways (only in the level equation, only in the difference equations and both). All give similar results in terms of parameter estimates and validity of the instruments.

[20] We use the definition of the European Commission. Micro enterprises are those with less than 10 employees, a turnover of less than 2 million euro or a balance sheet of less than 2 million euro; small enterprises are those with less than 50 employees, a turnover of less than 10 million euro or a balance sheet of less than 10 million euro; medium-sized enterprises are those with less than 250 employees, a turnover of less than 50 million euro or a balance sheet of less than 48 million euro. New firms are imputed to the group of their size at birth.

Estimates of Eq.(3.1) Sub-samples based on firm size	Dep. variable: $Lev_{i,t-1}$			
	Micro	**Small**	**Medium**	**Large**
$D(ACE=1)_{i,t}$	-11.772***	-8.847**	-7.887***	-8.187
	(4.220)	(3.814)	(3.375)	(4.390)
N.Obs.	152,474	25,642	3,476	307
N.Firms	60,994	9,488	1,294	117
P-value Hansen test (χ(88)):	0.205	0.277	0.689	0.248

Table 6 *– Notes: sub-sample results based on firm size in 2011. The empirical specification is the one of column (2) in Table **5**. See Table **5** for additional details. The complete list of results is contained in Table **12** in the Appendix.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

All groups of firms have reduced their leverage after the ACE except for the large firms, for which the effect is not significant. The point estimate for large firms is negative, therefore this lack of effect might be driven by the small number of firms present in our sample, which affects standard errors. This lack of significance on large firms might be driven by the exclusion of firms filing consolidated tax returns, which are usually large firms. It is generally more complex to evaluate the level of leverage at the group level, therefore we postpone the analysis of these firms to future developments of this project.

The largest coefficient is observed for the micro firms, with an average effect of more than 11 percentage points, and the smallest is observed on the medium firms. The over identification test is confirmed in all subsamples, corroborating our identification strategy. Table **7** contains the results using subsamples based on firm age.[21] We can observe a significant effect of leverage in all groups, with the average effect ranging from -7 percentage points for young firms, to more than 11 percentage points for old firms.

Estimates of Eq.(3.1) Sub-samples based on firm age			
	Young (5 years <)	**Mature**	**Old** (> 15 years)
$D(ACE=1)_{i,t}$	-6.930	-11.235***	-11.877***
	(5.711)	(2.161)	(3.085)
N.Obs.	50,476	75,470	55,139
N.Firms	24,147	27,580	19,983
P-value Hansen test (χ(88)):	0.325	0.173	0.385

Table 7 *– Notes: sub-sample results based on firm age in 2011. The empirical specification is the one of column (2) in Table **5**. See Table **5** for additional details. Table **13** contains the complete list of estimates.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

[21] To define age groups, we look at the distribution in 2011 and use as thresholds the 25*th* and 75*th* percentile. Groups are defined in 2011 and kept constant throughout. New firms are treated as young.

5 Discussion and final remarks

In 2011 the Italian Allowance for Corporate Equity (ACE) introduced the deductibility of a notional return on capital increases from taxable income. The reform successfully reduced the tax distortion between equity and debt created by the deductibility of interest expenses on debt.

We propose a novel instrumental variable approach to examine how the tax change affects corporates' debt choices. Our identification strategy exploit a key feature of the new incremental ACE mechanism jointly with the empirical findings suggesting that past capital increases through equity issuances financed by firm shareholders are costly and therefore tend to reduce the probability of new equity injections. Furthermore, equity issuances do not affect the relative price of equity and debt, and therefore the target leverage of the firm.

Using confidential Italian corporate tax return data combined with financial statements for a large panel of manufacturing companies during the fiscal years 2008-2013, we find that the introduction of the ACE deduction has significantly decreased the leverage ratio of Italian manufacturing firms. According to our estimates, the causal effect has been around 9 percentage points on average. The largest impact has been identified among SME's. These firms are indeed among those with the highest level of leverage in an international comparison (**Finaldi Russo & de Socio** (**2016**)), therefore our results suggest that the ACE has benefited the firms who had a greater need of recapitalization. Moreover, our findings are consistent with the recent empirical literature estimating the sensitivity of leverage to the full ACE reform in Belgium (**Princen** (**2012**), **Panier *et al.*** (**2013**), **Hebous & Ruf** (**2017**)), where the notional return was applied to the entire book value of equity ("hard ACE") instead of being incremental as in Italy ("soft ACE").

It shall be stressed that the reported estimates hold for the first three implementation years, when the favorable tax treatment of debt was reduced but not yet completely eliminated. The strengthening of the ACE in the next three years 2014-2016 (not covered in our sample) might have enhanced the potential debt-equity substitution effect. Conversely, the sharp reduction in the notional return as of 2017 might lower the permanent effect of the ACE on firm leverage. Discontinuous changes in the tax bene- fit might generate uncertainty about the continuation of the ACE system and, to the extent that capital increases are costly, negatively affect the take up rate (**Zangari *et al.*** (**2017**)). As the increase of Italian companies' capitalization remains a goal of tax policy in Italy, limiting the scope of the policy might hamper the policy outcome.

The estimated average effect of the ACE corresponds to a decrease of the probability of default on bank debt (*sofferenze* in Italian) of its beneficiaries by roughly one tenth. It is important, however, to keep in mind that the leverage ratio is crucial for many other firm decisions. For example, lower leverage facilitates an increase in debt maturity (**Magri** (**2010**)), thus helping to reduce debt service for a given amount borrowed, and decreases the cost of credit lines (**Panetta *et al.*** (**2009**)). The results found in this paper have therefore multiple ramifications. For example, our estimates imply that firms benefit- ing from the ACE deduction have reduced the cost of their credit lines on average by 1.43 percentage points. Quantifying the full benefits of the reform is a task we leave for future research.

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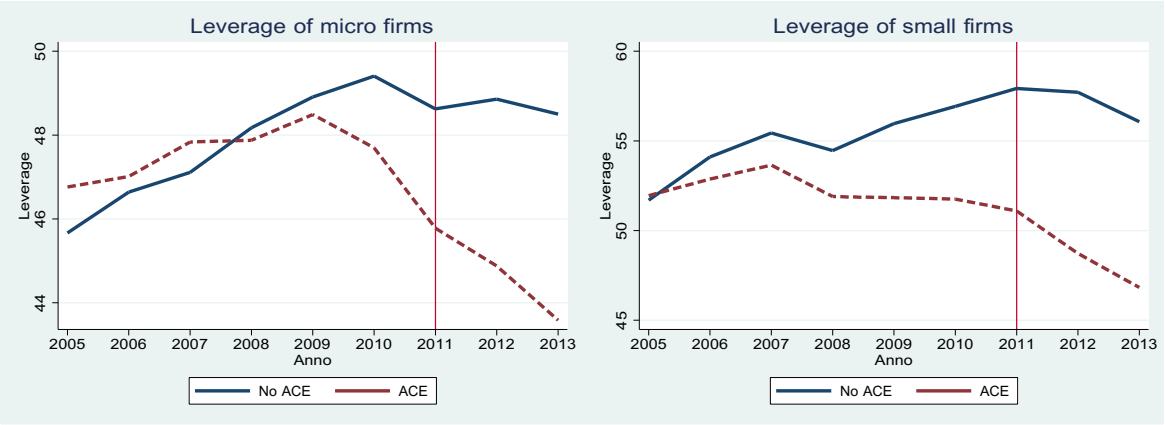
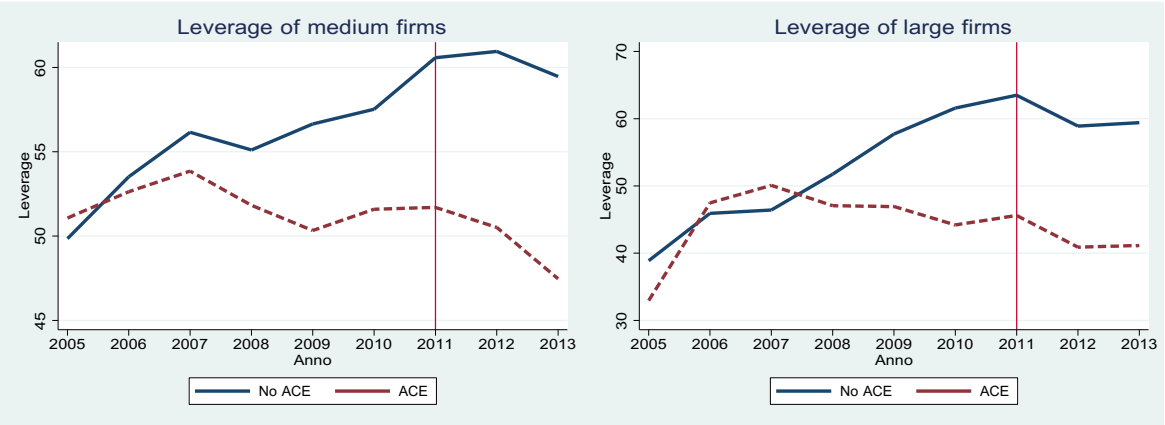
A Description of the data

B Additional evidence and results



(a) Micro firms (less than 10 employees, a turnover of less than 2 million euro or a balance sheet of less than 2 million euro).

(b) Small firms (with less than 50 employees, a turnover of less than 10 million euro or a balance sheet of less than 10 million euro).



(c) Medium firms (with less than 250 employees, a turnover of less than 50 million euro or a balance sheet of less than 48 million euro).

(d) Large firms.

Figure 3 *– Evolution of leverage for firms that benefit of the ACE deduction and those that do not benefit from the ACE deduction (mean within the sample). Evidence classified by firm dimension (using the definition of the European Commision).*

	Linear probability model		
	Dep. variable: $D(ACE=1)_{i,t}$		
	(1)	(2)	(3)
$Log(tot.assets)_{i,t-1}$	0.149***	0.142***	0.143***
	(0.007)	(0.007)	(0.010)
$Lev_{i,t-1}$	-0.632***	-0.813***	-0.803***
	(0.049)	(0.069)	(0.069)
$Lev_{i,t-2}$	0.362***	0.361***	0.365***
	(0.050)	(0.072)	(0.072)
$Lev_{i,t-3}$	0.419***	0.615***	0.619***
	(0.044)	(0.063)	(0.063)
$Tangibility_{i,t-1}$	-0.013	-0.017	-0.016
	(0.042)	(0.017)	(0.016)
$Tangibility_{i,t-2}$	-0.043***	-0.066***	-0.066***
	(0.013)	(0.018)	(0.018)
$Tangibility_{i,t-1}$	-0.013	0.013	0.014
	(0.010)	(0.015)	(0.015)
N.Obs.	181,899	113,735	113,735

Table 8 *– Notes: parameter estimates of the model:*

$$D(ACE=1)_{i,t} = \varphi + \sum_{j=1}^{T} \delta_j D(Equity\ issuance=1)_{i,t-j} + \sum_{j=0}^{T} \theta_j \tilde{X}_{i,t-j} + \tilde{\mu}_i + \omega_{i,t}$$

See Table ***3*** *for the details.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

	Probit model		
	Dep. variable: $D(ACE=1)_{i,t}$		
	(1)	(2)	(3)
Dummy capital increases…			
…in year $t-1$	-0.216***	-0.183***	-0.184***
	(0.02)	(0.03)	(0.03)
…in year $t-2$	-0.106***	-0.099***	-0.100***
	(0.02)	(0.03)	(0.03)
…in year $t-3$	-0.110***	-0.069**	-0.070**
	(0.02)	(0.03)	(0.03)
…in year $t-4$		-0.057**	-0.058**
		(0.03)	(0.03)
…in year $t-5$		-0.107***	-0.106***
		(0.03)	(0.03)
…in year $t-6$		-0.056**	-0.056**
		(0.02)	(0.02)
$Age_{i,t}$	-0.004***	-0.004***	-0.004***
	(0.0006)	(0.0008)	(0.0008)
$Small\ firm_i$	0.213***	0.213***	0.205***
	(0.022)	(0.028)	(0.028)
$Medium\ firm_i$	0.342***	0.395***	0.388***
	(0.054)	(0.066)	(0.0676)
$Large\ firm_i$	0.296**	0.273	0.282
	(0.149)	(0.193)	(0.194)
$Log(tot.assets)_{i,t-1}$	0.675***	0.694***	0.670***
	(0.054)	(0.071)	(0.072)
$Lev_{i,t-1}$	-0.839***	-0.990***	-0.987***
	(0.078)	(0.104)	(0.104)
$Lev_{i,t-2}$	0.698***	0.776***	0.782***
	(0.099)	(0.133)	(0.133)
$Lev_{i,t-3}$	0.572***	0.705***	0.704***
	(0.076)	(0.104)	(0.104)
$Tangibility_{i,t-1}$	-0.142	-0.232*	-0.227*
	(0.098)	(0.131)	(0.132)
$Tangibility_{i,t-2}$	-0.035	-0.080	-0.085***
	(0.122)	(0.167)	(0.167)
$Tangibility_{i,t-3}$	-0.092	0.094	0.100***
	(0.089)	(0.124)	(0.124)
N.Obs.	175,293	111,797	111,797

Table 9 *– ***: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

	Tobit model		
	Dep. variable: $Lev_{i,t}$		
	(1)	(2)	(3)
$Age_{i,t}$	-0.011***	-0.001	-0.001
	(0.002)	(0.002)	(0.002)
$Log(tot.assets)_{i,t-1}$	4.485***	3.806***	3.741***
	(0.138)	(0.197)	(0.198)
$Lev_{i,t-1}$	0.729***	0.729***	0.729***
	(0.002)	(0.004)	(0.004)
$Lev_{i,t-2}$	0.066***	0.073***	0.073***
	(0.002)	(0.003)	(0.003)
$Lev_{i,t-3}$	0.043***	0.038***	0.039***
	(0.002)	(0.003)	(0.004)
$ROA_{i,t-1}$	6.028***	0.240***	0.240***
	(0.223)	(0.564)	(0.564)
$ROA_{i,t-2}$	0.632***	0.412***	0.420***
	(0.011)	(0.068)	(0.069)
$ROA_{i,t-3}$	0.629***	0.587***	0.587***
	(0.010)	(0.051)	(0.057)
$Tangibility_{i,t-1}$	2.131***	2.888***	2.858***
	(0.267)	(0.365)	(0.365)
$Tangibility_{i,t-2}$	-1.397***	-1.965***	-1.974***
	(0.330)	(0.460)	(0.460)
$Tangibility_{i,t-3}$	0.595***	-0.385	-0.396
	(0.248)	(0.351)	(0.351)
Dummy firm type:			
$Small_i$	-0.455***	-0.572***	-0.557***
	(0.072)	(0.088)	(0.088)
$Medium_i$	0.171	0.114	0.050
	(0.186)	(0.230)	(0.231)
$Large_i$	3.223***	2.488***	2.514***
	(0.557)	(0.788)	(0.791)
N.Obs.	175,291	99,784	99,784

Table 10 *– Notes: parameter estimates of a tobit model for leverage. See Table* ***4*** *for the details.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

Estimates of Eq.(3.1) **Dep. variable:** $Lev_{i,t}$	Panel FE	IV	
	(2)	(3)	(4)
$Age_{i,t}$	2.742***	2.539***	0.412
	(0.993)	(0.954)	(0.652)
$Log(tot.assets)_{i,t-1}$	15.612***	16.141***	16.252***
	(1.980)	(2.000)	(2.764)
$ROA_{i,t-1}$	12.060***	12.565***	13.153***
	(1.187)	(1.221)	(1.508)
$ROA_{i,t-2}$	8.728***	8.323***	6.749***
	(1.005)	(1.013)	(1.306)
$ROA_{i,t-3}$	4.711***	4.381***	3.689***
	(0.838)	(0.844)	(1.126)
$Tangibility_{i,t-1}$	-4.159***	-4.170***	-3.357***
	(1.114)	(1.413)	(1.413)
$Tangibility_{i,t-2}$	-3.699***	-3.886***	-5.241***
	(0.829)	(0.832)	(0.992)
$Tangibility_{i,t-3}$	-1.626***	-1.612***	-2.048***
	(0.788)	(0.787)	(1.114)
Dummy firm type:			
$Small_i$	-1.262***	-1.131***	-1.103***
	(0.308)	(0.313)	(0.373)
$Medium_i$	-1.830***	-1.619*	-1.356
	(0.837)	(0.843)	(0.975)
$Large_i$	6.521	6.522**	3.983
	(2.894)	(2.911)	(3.442)
N.Obs.	180,447	180,447	113,620

Table 11 *– Notes: additional parameter estimates of the main dynamic model for the leverage ratio. See Table* ***5*** *for the main results.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

Estimates of Eq.(3.1)				
	Dep.variable: $Lev_{i,t}$			
	Micro	**Small**	**Medium**	**Large**
	(1)	(2)	(3)	(4)
$Age_{i,t}$	4.643**	-0.227	1.855	-0.157
	(1.799)	(0.548)	(2.059)	(2.779)
$Log(tot.assets)_{i,t-1}$	15.807***	2.028	56.120**	21.874
	(2.344)	(22.389)	(28.094)	(75.824)
$Lev_{i,t-1}$	0.536***	0.681***	0.398***	0.259
	(0.027)	(0.038)	(0.137)	(0.252)
$Lev_{i,t-2}$	0.082***	0.093***	0.016	0.115
	(0.006)	(0.019)	(0.035)	(0.100)
$Lev_{i,t-3}$	0.018***	0.052***	0.029	-0.049
	(0.005)	(0.015)	(0.023)	(0.055)
$ROA_{i,t-1}$	11.081***	27.533***	15.781	-1.158
	(1.365)	(4.448)	(13.735)	(30.282)
$ROA_{i,t-2}$	8.240***	7.145*	-1.430	21.006
	(1.077)	(3.908)	(5.960)	(25.720)
$ROA_{i,t-3}$	4.143***	7.347**	3.597	-3.863
	(0.890)	(3.058)	(5.086)	(22.617)
$Tangibility_{i,t-1}$	-4.184***	0.288	-1.851	-25.648
	(1.178)	(3.206)	(8.058)	(26.664)
$Tangibility_{i,t-2}$	-3.856***	-2.791	4.579	4.715
	(0.894)	(2.077)	(6.869)	(17.271)
$Tangibility_{i,t-3}$	-1.541***	0.924	-5.039	-20.905
	(0.856)	(1.731)	(6.657)	(15.997)
N.Obs.	151,045	25,619	3,476	307

Table 12 *– Notes: additional sub-sample results based on firm size in 2011. See Table* ***6*** *for the main results.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

	Estimates of Eq.(3.1)		
	Dep. variable: $Lev_{i,t}$		
	Young (5 years <)	**Mature**	**Old** (> 15 years)
	(1)	(2)	(3)
$Log(tot.assets)_{i,t-1}$	17.572***	15.911***	20.129***
	(2.271)	(3.071)	(4.794)
$Lev_{i,t-1}$	0.619***	0.610***	0.636***
	(0.016)	(0.015)	(0.020)
$Lev_{i,t-2}$	0.088***	0.090***	0.109***
	(0.009)	(0.009)	(0.013)
$Lev_{i,t-3}$	0.029***	0.027***	0.025***
	(0.007)	(0.008)	(0.010)
$ROA_{i,t-1}$	16.147***	13.490***	13.711***
	(1.731)	(1.561)	(1.982)
$ROA_{i,t-2}$	12.294***	8.840***	7.491***
	(1.668)	(1.434)	(1.726)
$ROA_{i,t-3}$	5.634***	5.482***	3.988***
	(1.466)	(1.252)	(1.539)
$Tangibility_{i,t-1}$	-7.990***	-5.115***	-0.87
	(1.883)	(1.770)	(1.780)
$Tangibility_{i,t-2}$	-4.135**	-3.234**	-5.838***
	(1.651)	(1.251)	(1.248)
$Tangibility_{i,t-3}$	-0.907	-2.524*	-1.226
	(1.495)	(1.396)	(1.207)
Dummy firm type:			
$Small_i$	-1.861**	-1.582***	-0.354
	(0.729)	(0.514)	(0.439)
$Medium_i$	-4.323	-1.414	-0.492
	(2.318)	(1.266)	(1.277)
$Large_i$	7.521	6.795	2.557
	(5.958)	(4.384)	(2.330)
N.Obs.	50,476	74,832	55,139

Table 13 *– Notes: additional sub-sample results based on firm age in 2011. See Table* ***7*** *for the main results.*

****: Significant at 1 percent; **: Significant at 5 percent; *: Significant at 10 percent.*

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