# Killing a second bird with one stone?

# Promoting firm growth and export through tax policy*

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**Abstract**

Is a preferential tax regime for small and medium enterprises an effective tool to sustain countries' extensive margins of trade? This paper answers this question by exploiting a policy experiment in France. We find that the introduction of a reduced corporate tax (CT) rate promotes SMEs' capital accumulation, and through this channel, their export participation. Our estimates show that a 50% reduction in the CT rate increases export propensity of SMEs between 8 and 15%.

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## 1 Introduction

Achieving greater international competitiveness is an important objective for economies affected by prolonged slowdowns of the internal demand. In France, the urgency to foster domestic firms' internationalization has arisen to the forefront of the policy debate after the recent release of the Gallois report (Gallois, 2012). This report mentions a competitiveness gap between France and some other European countries such as Germany or Sweden, as revealed by a decrease in the French share of EU exports and a negative trade deficit at the national level. This loss in terms of relative

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competitiveness is largely explained by the decline in the *absolute* number of French exporting firms over 2000-2009, and at an accelerating pace since 2007 (Gaulier *et al.*, 2010). The recent financial crisis further marginalized small exporters, as they were not able to adapt as well as large firms did, and were forced to exit foreign markets (Bricongne *et al.*, 2010). Because small and medium enterprises (SME) tend to be under-represented in international trade despite their important role in the domestic economy, they constitute a fundamental resource to sustain countries' extensive margins of trade. Indeed, overwhelming empirical evidence shows that larger and more productive firms self-select into exporting (e.g Bernard and Jensen, 1999). On this basis, the EFIGE report (Altomonte *et al.*, 2012), stemming from a large-scale research project on European firms' competitiveness, recommends the removal of the institutional and fiscal barriers to SME growth as a strategy to unleash the potential of small domestic companies in international markets: "Central for the promotion of export growth is setting the right conditions for firms to grow and export. It is crucial to remove incentives for firms to stay small. Important factors hampering firm growth are taxes and social and labour regulation" (Altomonte *et al.*, 2012, p.x). Still, there is insufficient empirical evidence on the indirect impact of fiscal policies on export participation through firm growth, which would support such strategy.

Our paper investigates the effects of a fiscal reform in France that progressively reduced the rate of Corporate Taxation (CT) for SME. We show that the tax reduction had a positive impact on these firms' performance by promoting their growth as well as their participation in foreign markets. Our contribution to the economic literature is twofold. On one hand, we evaluate the effectiveness of reductions in CT as a tool to promote the growth and exports of small firms. On the other hand, we contribute methodologically to the trade literature by addressing endogeneity issues arising when attempting to estimate the impact of asset growth on firm export. Abundant empirical evidence has established that exporters are larger and more productive than non-exporters (e.g., Bernard *et al.*, 1995; ISGEP, 2008), and that much of this difference can be attributed to self-selection of the best perform-

ers into foreign markets. If the ex-post impact of export entry on firm growth and productivity (i.e., the so called learning-by-exporting effect) has been extensively investigated (e.g Clerides *et al.*, 1998; Wagner, 2002; Girma *et al.*, 2004), much less attention has been paid to the impact of ex-ante firm growth on the probability to become exporters. Because firm growth is affected by unobservable factors such as managerial choices and profit opportunities, it is difficult to identify its causal effect on export entry. In addition, firms' investment and employment policies are likely to reflect their strategy with regard to future expansion in foreign markets; as a consequence reverse causality impedes the correct identification of the impact of ex-ante firm growth on export (Lileeva and Trefler, 2010).

In this paper we attempt to solve these issues by exploiting the reform of the SME CT rate as an *exogenous* shock affecting firm investment in fixed asset, and through this channel SME export status. In France between 2001 and 2003, the CT rate for SME was reduced from 33.33% to 15% for the part of profit not exceeding €38,120, with the stated objective of strengthening SME growth and capital structure (Raspiller, 2007). Eligibility for such reduction was subject to two criteria. The first was related to size, by requiring firms' revenue not to exceed €7,630,000; the second restricted the group of the beneficiaries to independent firms only, with the purpose of preventing opportunistic fractioning of large enterprises into smaller subsidiaries[1]. These criteria provide an opportunity to construct two different, however not mutually exclusive, control groups against which to measure the impact of CT reduction on eligible firms' performance. A third control group is constituted by those firms that were not affected by the reform because they were not liable for corporate taxation.

By adopting a simple Difference-in-Differences (DiD) strategy we compare the evolution of firms' size in the group of treated firms (eligible for CT reduction) against each group of untreated firms. Once we control for firm heterogeneity by panel fixed-effect estimation, we find that the reform produced a significant and positive impact on firms' tangible asset growth. This result validates the use of a

dummy for CT reduction to instrument for firm tangible assets' growth in IV models on export participation. Next, estimates obtained from IV models suggest that 10% increase in investment determines an average increase of 3.7% in firms' probability to export. Hence, our main conclusion is that policies that foster asset growth are effective in promoting SME export participation.

These findings are confirmed when instead of comparing treated and untreated firms we exploit the heterogeneous impact of the reform within the group of eligible firms with average pre-reform profit below €38,120. Heterogeneity within this group is determined by the fact that firms with different asset composition and financial structure benefit to different extents from CT reductions. For example, firms resorting more intensively to debt financing are less affected by cuts in taxation, because they can discount interest rate payments from taxable profit. Again, firms whose assets have higher rates of fiscal depreciation can discount a greater proportion of capital expenditure from profit. Following the approach of Egger *et al.* (2009), we capture this heterogeneity by computing effective marginal tax rates (EMTR) and effective average tax rates (EATR) for individual firms.

Most of the theoretical literature on firm heterogeneity and trade has conceived firm size (and growth) as a mere reflection of their unobserved efficiency. For example, in the seminal model of Melitz (2003) size is solely determined by the innate productivity of the firm and by its access to foreign markets. However, some authors point out that firm capability to produce larger volumes of output constitutes itself an advantage for perspective exporters as they can spread more thinly the fixed costs of exporting over larger volumes of sales (e.g., Wagner, 1995). An alternative explanation for a positive impact of tangible asset growth on export propensity emerges from the model of Blum *et al.* (2013). This model does not feature constant marginal cost of production as it is common in trade models with heterogeneous firms. On the contrary, by allowing marginal costs to increase in output quantity for a given level of fixed capital, they show that firms with more capital have a cost-advantage in producing larger volumes of output to serve foreign markets. We interpret our

findings in the light of these theoretical insights.

The rest of the paper is organized as follows. In section 2 we review the literature on corporate taxation and firm investment behavior. In this section we also discuss the nature of the empirical issues arising when we investigate the relationship between firm export status, size and productivity. Section 3 describes the data and the construction of the effective rates of taxation. Section 4 describes the DiD strategy that we adopt to test the impact of CT reduction on tangible assets' growth, and the IV approach to estimate the impact of ex-ante growth on export propensity and entry. Section 5 estimates the results we obtain from DiD and IV models. Section 6 concludes by interpreting our results in the light of the theoretical literature and by drawing some policy implications.

# 2 Literature review

## 2.1 Corporate taxation and firm growth

According to Neoclassical Theory firms adjust capital so that the net present value (NPV) of the marginal investment equals the 'user cost of capital', that is the rental price of a capital good. With corporate taxation the marginal returns of capital are lower because part of the income generated by capital goods is absorbed by taxation. Hence in the presence of decreasing returns to factors of production, taxation reduces the levels of capital set by individual firms, because their marginal investment must yield a greater income to equal the user cost of capital. Along these lines, fiscal policies that reduce CT rates are expected to promote firms' investment in tangible assets, as lower taxation makes it profitable to acquire further capital assets even if they yield lower income at the margin.

Since the 1980s, this theoretical framework has contributed to promote a downward trend in corporate taxation across countries, that has been often accompanied by the introduction of a more favorable CT regime for SME (Nam and Radulescu, 2007). The aim of these policies is to support entrepreneurship, firm growth, and

job creation (Chen *et al.*, 2002). With lower CT, firms have also fewer incentives to use debt financing for discounting interest rates payments from taxable profit, and a less leveraged financial structure is believed to increase their resilience to contractions in the credit supply. Fiscal policies targeted to SME can also be seen as a tool to correct for market failures that more severely beset small and medium enterprises. For example SME have a limited access to debt financing, and therefore to the fiscal gains related to the deduction of interest expenses. Large firms are also better equipped to develop complex tax avoidance strategies (Nam, 2013; Slemrod and Venkatesh, 2002). Because firms with diverse financial structure and asset composition are differently impacted by CT rates, a proper evaluation of the effect of CT reduction on firm investment must consider these factors.

The methodology developed by Egger *et al.* (2009) responds to these concerns by bringing at the firm-level measures of marginal and average effective taxation that are more commonly computed at the country- and at the industry-level. The Effective Marginal Tax Rate (EMTR) captures the distortion introduced by taxation as the difference between cost of capital with and without taxation (King and Fullerton, 1984; Devereux and Griffith, 2003). Accordingly, we expect that higher EMTRs are associated with lower levels of capital, because firms that are more affected by taxation reduce their investment at the margin. The Effective Average Tax Rate (EATR) captures instead the difference between the infra-marginal return of a discrete investment project with or without taxation, and it is expected to affect firms' discrete decisions about undertaking new projects (Devereux and Griffith, 1999). These rates are also referred to as 'forward rates' because they are meant to evaluate the effective tax burden on a hypothetical investment project, and they are exogenous with respect to the tax planning activities of a firm. This burden changes according to the statutory tax rate, but also according to the financial structure of the firm and to its asset composition. For example, firms that rely more intensively on debt to finance investment have lower effective rates because they can discount interest rate payments from taxable profit. In addition, firms that invest in capital

goods with higher rates of fiscal depreciation can discount the cost of investment from taxable profit more rapidly over time.

From an empirical perspective two approaches have been used to estimate the impact of corporate tax on capital accumulation. The first exploits variations across countries in tax rates and in rates of investment (Bond and Xing, 2010; Arnold *et al.*, 2011), while the second relies on the differential impact that CT reductions induce on firms' EMTR and EATR within the same country. Because the latter approach is based on exogenous policy variations, it leads to more robust causal inference. By using this methodology, previous studies have shown that CT reductions promote investment: Becker *et al.* (2006) find a positive impact on FDI in Germany, while Simmler (2013) compares the effect of CT change on German firm investment in the case of binding and non-binding financial constraints. Exploiting only differences in asset composition, Cummins *et al.* (1995) find that the investment of US firms responds positively to unanticipated changes in corporate taxation.

## 2.2 Firm growth, productivity and export: empirical issues

Much of the empirical literature that investigates whether firm heterogeneity is the cause or the consequence of export entry is based on some form of Granger test of causality[2]. However, the dynamic model proposed by Costantini and Melitz (2008) questions the validity of empirical strategies that infer causality from the sequencing of export entry and productivity growth in longitudinal datasets. This model predicts that firms undertake productivity-enhancing investment before starting to export, whenever managers anticipate future policies that abate trade costs and make exporting a profitable option. It follows that a simple test of Granger causality would attribute a positive impact of productivity change (the antecedent event) on export entry (the posterior event), while it would wrongly reject that foreign market participation fosters productivity improvements.

The strategy introduced by Lileeva and Trefler (2010) addresses this issue. In this paper the effect on productivity is identified by instrumenting export entry

with tariff cuts introduced by a series of Free Trade Agreements between the US and Canada. This instrument is exogenous as it does not depend on firms' strategies, and it satisfies the exclusion restriction by not affecting productivity growth directly. The main finding obtained through this IV strategy is that export entry causes positive changes in labor productivity, even if the effect differs across firms with different initial productivity levels[3]. Although the authors are convincing about the exogeneity of the instrument, their identification strategy still relies on the assumption that tariff cuts are unanticipated. If this assumption does not hold, firms may invest to raise productivity before entering into export, as they predict lower trade costs in the future. Consequently if anticipation happens, the IV estimates obtained by Lileeva and Trefler would be a lower bound for the real effect of (perspective) export entry on productivity.

A more descriptive contribution on the relationship between export, productivity and investment is provided by Fabling and Sanderson (2013). This article aims to assess the different extents to which self-selection, learning-by-exporting and investment dynamics account for productivity differences between exporters and non-exporters. By proposing a DiD methodology with matching, this paper supports the view that self-selection of the most productive firms into exporting is the main explanation for the superior attributes of exporters. With regards to the dynamics of input adjustment, they find that employment growth predicts entry into exporting of previous non-exporters. On the contrary, investment in capital asset is undertaken only by incumbent exporters before adding new export destinations. This pattern is interpreted as an indication that firms adjust capital only after entering into export because they need to acquire information on their profitability on foreign markets before making irreversible investment. However, this evidence does not exclude that ex-ante firm growth fosters export entry. For admission of the authors, their empirical methodology is not adequate to infer causality between investment and export. In other words, this article does not answer the question of whether policies that promote ex-ante firm growth are effective in promoting export

participation of domestic firms.

This is the question we attempt to answer in our paper. The IV strategy that we adopt is very similar to the one of Lileeva and Trefler (2010), but our research question concerns the opposite direction of causality. We exploit an exogenous change in CT rates to instrument endogenous firm growth in tangible assets and identify the effect of this factor on their propensity to export. This strategy is necessary to address the issue highlighted by Costantini and Melitz (2008), which is likely to be a concern for our focus on export and growth as much as it is for studies on export and productivity[4]. We contend that the eligibility (or the intensity) of CT reduction is an appropriate instrument for firm growth because it affects the NPV of future investment, while it does not relate directly to the probability of export entry[5].

To the best of our knowledge, the only existing firm-level study on the impact of corporate taxation on export is Federici and Parisi (2012). These authors exploit cross sectional differences in EATR to estimate the impact of taxation on Italian firms' export propensity and intensity. They find that effective rates of corporate taxation are positively associated with export propensity and export intensity. The authors interpret the positive effect of taxation on export by arguing that exporters have greater scope to shift the tax burden on foreign consumers. However, this result is at odds with the negative impact of corporate taxation on firm performance predicted by investment models, and it is liable to depend on firm-level heterogeneity that is not controlled for in the cross-sectional setting of their study. Our methodology addresses most of the empirical issues left unresolved in that paper. First, we control for firm-level unobservables in a panel setting by estimating fixed-effect models. Second, we do not rely on cross-sectional differences in effective tax rates but we exploit an exogenous policy change in CT to estimate the effect of taxation on firm growth. Third, we investigate a specific channel through which corporate taxation affects export participation by using variations of CT as an instrument to test the impact of firm growth on export propensity. These methodological differences are likely to explain why we obtain results that are opposite to those presented

by Federici and Parisi.

# 3 Data and measures of taxation

## 3.1 Data

The *Fichier complet unifié de Suse* (FICUS) is a database assembled by the French National Statistical Office (INSEE) whose coverage approximates the universe of French firms for the period 1996-2007. This dataset provides information for over 4 million enterprises in manufacturing and services[6]. We choose to limit our analysis to the manufacturing sector as it fits more closely the theoretical underpinnings of our hypothesis on the impact of CT reduction on firm growth and export entry. Thanks to a unique fiscal identification number (siren code) that changes across groups of longitudinal observations associated with different firms, this database can be structured as a panel with each observation corresponding to a firm-year couple. The final sample comprises 296,715 firms[7]. FICUS integrates data on balance sheet items collected for fiscal purposes with survey data. In this database we observe the book value of the tangible assets of firm $i$ at time $t$ (*immocor* in the database). Deflated values of this variable are log transformed to obtain $Tangibles_{it}$[8]. The growth rate of firms' tangible assets between time $s$ and time $t$ is computed as the difference $\Delta Tangibles_{t-s} = Tangibles_{it} - Tangibles_{is}$ with $s < t$. We identify as current exporters ($Exp_{it} = 1$) firms with positive revenue from foreign sales (*caexport* in the database).

According to the tax bulletin of October 2002, the 2001 French Fiscal Law requires firms eligible for reduced CT to comply with the following conditions: (i) their revenue must not exceed €7,630,000, (ii) they must have a judicial form liable for corporate taxation (i.e., SARL, SA, SCA), and (iii) their majority shareholder must not be a business group (DGI, 2002). Unfortunately, FICUS does not provide specific information on firms' CT regime. We rely instead on a set of variables concerning firms' judicial form ($cj_{it}$), affiliation to business groups ($appgr_{it}$) and

total revenue ($catotal_{it}$), to identify those that do not benefit from CT reductions[9]. Ineligible firms are identified as those with average pre-reform revenue above the threshold, with a judicial form that is not liable for CT, or those that belong to foreign or domestic business groups. Although the last condition that we impose to select eligible firms in our sample is more restrictive than the letter of the fiscal law, we are confident that the number of firms that we incorrectly identify as ineligibles is not large enough to compromise the validity of our results[10].

**Table 1: Descriptive statistics, 1996-2007**

| | | Num. firms | Tangible asset | | | Export propensity | | |
|---|---|---|---|---|---|---|---|---|
| | | | Mean | St.Dev | Obs. | Mean | St.Dev | Obs. |
| **All sample** | without selection | 296,715 | 715 | 18,010 | 1,618,708 | 0.167 | 0.373 | 1,619,340 |
| | with selection | 121,955 | 888 | 20,988 | 1,114,414 | 0.188 | 0.390 | 1,115,255 |
| **All eligible** | without selection | 122,841 | 188 | 397 | 699,440 | 0.239 | 0.426 | 699,129 |
| | with selection | 52,113 | 223 | 402 | 494,007 | 0.263 | 0.440 | 493,818 |
| **All controls** | without selection | 173,874 | 1,116 | 23,889 | 919,268 | 0.113 | 0.317 | 920,211 |
| | with selection | 69,842 | 1,418 | 28,116 | 620,407 | 0.128 | 0.334 | 621,437 |
| - Non-liable | without selection | 156,250 | 100 | 1,452 | 821,188 | 0.044 | 0.205 | 821,027 |
| | with selection | 60,900 | 115 | 1,673 | 547,788 | 0.047 | 0.212 | 547,706 |
| - Large | without selection | 10,874 | 15,125 | 92,650 | 59,430 | 0.822 | 0.382 | 60,435 |
| | with selection | 7,074 | 15,839 | 98,264 | 49,456 | 0.828 | 0.377 | 50,510 |
| - Business Group | without selection | 9,384 | 1,167 | 2,403 | 38,650 | 0.479 | 0.500 | 38,749 |
| | with selection | 3,607 | 1,455 | 2,592 | 23,163 | 0.512 | 0.500 | 23,221 |

Notes. The sample 'with selection' contains only firms that are present before the reform and survive after, that is present before 2001 and after 2002. Tangible asset values are expressed in thousand euros.

Within the group of ineligible firms we identify different but not-mutually exclusive subgroups according to which eligibility condition is violated. We define as 'Large' those firms with pre-reform average revenue above €7,630,000, as 'Business group' the ones affiliated to a group, and as 'Non-liable' those whose judicial form is not subject to corporate taxation. Within the set of eligible firms instead, we identify a smaller group which includes only companies with average profit below the threshold of €38,120. Since the reduced tax rate applies only to the profit below the threshold, this group identifies firms that benefit from the full 50% cut in the average and marginal statutory rates, both passing from 33.33% to 15%. Finally, for each group we create a second sample ('sample with selection') which only includes firms operating both before and after the reform, that is with at least one observation before 2001 and after 2002. Table 1 presents descriptive statistics for tangible asset ($immocor_{it}$) and export propensity ($Exp_{it}$), for the whole sample and

for different subgroups of eligible and non-eligible firms, with or without selection. Eligible firms represent 41.40% of our sample, that is 122,841 in total. They are smaller but twice as export-oriented than those in the overall control group. Still the export propensity of non-eligible firms widely differs across subgroups, ranging from 0.82 for the 'Large' ones to 0.04 for those included in the 'Non-liable' group. The latter is mostly composed of very small unipersonal firms subject to personal income taxation. The sample with selection includes a higher proportion of larger and more export-oriented firms, because it excludes companies that are closer to failure (i.e., not present in the period after the reform) or very young (i.e., not observed in the period before the reform).

### 3.2 Computation of the effective tax rates

This section describes the methodology to compute the firm-specific effective rates of taxation $EMTR$ and $EATR$. These rates are used to identify the heterogeneous effect of the reform on investment across eligible firms. Indeed, taxation affects firms' cost of capital differently according to their capacity to discount capital expenditure, and to shield profit through debt financing. In the absence of taxation, investment at the margin yields a return that equals the opportunity cost of capital ($\bar{r}$). With taxation the marginal investment must yield a greater return ($\tilde{p}$) to compensate for the part of profit absorbed by taxation. The EMTR measures the distortion that taxation induces on investment as the difference between the return of capital at the margin with taxation ($\tilde{p}$) and without taxation ($\bar{r}$):

$$EMTR_i = \frac{\tilde{p}_i - \bar{r}}{\tilde{p}_i}$$

where the subscript $i$ identifies each firm. According to the formulation of Devereux and Griffith (2003), $\tilde{p}_i$ is computed as:

$$\tilde{p}_i = \frac{1 - A_i}{(1-\tau)(1-in)}[i + \delta_i(1+in) - in] - \frac{F(1+i)}{(1+\tau)(1+in)} - \delta_i \qquad (1)$$

where $\bar{r}$ is the average real return of capital, and $in$ is the inflation rate. By following Egger *et al.* (2009) these two parameters are respectively set at 0.05 and 0.025, and they are used to compute the nominal interest rate (and firms' opportunity cost) $i = [(1 + \bar{r})(1 + in) - 1]$. The parameter $\tau$ is the statutory CT rate. Eventually, $A_i$ and $\delta_i$ are two firm-specific variables that measure respectively the net present value of the depreciation allowances per unit of investment, and the economic depreciation of firms' asset. Following the approach of Egger *et al.* (2009), we obtain $A_i$ and $\delta_i$ as:

$$A_i = A_m * \theta_{mi} + A_b * \theta_{bi} + A_I * \theta_{Ii}$$

$$\delta_i = \delta_m * \theta_{mi} + \delta_b * \theta_{bi} + \delta_i * \theta_{Ii}$$

where $\theta_{mi}$, $\theta_{bi}$ and $\theta_{Ii}$ are the shares of machineries, buildings and intangibles over the total assets of firm $i$. FICUS data provide information on the composition of firms' assets into tangible and intangible. To disaggregate further tangible assets into buildings and machineries we use industry shares obtained from McKenzie *et al.* (1998) by multiplying them with the firm-specific shares. $A_m$, $A_b$ and $A_I$ are the net present values of depreciation allowances calculated with asset-specific linear depreciation rates as reported in the *Bulletin Officiel des Finances Publiques*[11]. $\delta_m = 0.1225$, $\delta_b = 0.0361$ and $\delta_i = 0.15$ are the standard parameters used in the tax literature for the economic depreciation of machineries, buildings and intangibles. Firms' financial structure (i.e., the proportion of debt financing) enters into the computation of the $EMTR$ through the term $F$ in equation 1:

$$F = \begin{cases} 0, & \text{if investment is self-financed;} \\ \frac{(1-\tau\delta)[i-i(1-\tau)]}{1+i}, & \text{if investment is financed through debt;} \end{cases}$$

we calculate the effective marginal tax rate $EMTR_i$ of firm $i$ as:

$$EMTR_i = EMTR_{si} * (1 - lev_i) + EMTR_{di} * (lev_i)$$

where $EMTR_{si}$ is the rate obtained by assuming complete self-financing, $EMTR_{di}$ is the one obtained by assuming complete debt-financing, and $lev_i$ is the proportion of debt financing of firm $i$ computed as the debt share over total assets. To calculate the EATR we start instead from the net present value of an investment project in the presence of taxation (Devereux and Griffith, 2003):

$$R = (1-i)^{-1}\{(1+in)(i+\delta)(1-\tau) - (1-A_i)[(1+i) - (1+in)(1-\delta_i)]\} + F \quad (2)$$

as for the EMTR, the firm-specific return to investment $R_i$ is calculated as a weighted average of $R$ in case of self-financing and in case of debt-financing. The $EATR_i$ is eventually obtained as:

$$EATR_i = \frac{R^* - R_i}{p/(1+r)}$$

where $R_i$ and $R^* = \frac{p-r}{1+r}$ are respectively the NPV of the investment with and without tax, and $p = 0.2$ is the standard parametrization of the pre-tax real return of capital (Egger *et al.*, 2009). For each firm, we compute $EMTR(\tau_{pre})_i$, $EATR(\tau_{pre})_i$, $EMTR(\tau_{post})_i$ and $EATR(\tau_{post})_i$, where $\tau_{pre}$ and $\tau_{post}$ refer to the statutory rates to which firm $i$ is subject before and after the reform. To compute the rates, we use pre-reform averages of firms' asset composition and financial structure. This is done to exclude from the computation the effect of changes in these attribute that are due to firms' adaptation to the new fiscal regime. Indeed, we are solely interested in identifying the heterogeneous impact of the reform across firms with different *initial* asset composition and financial structure. Hence, for each firm we obtain a unique (i.e., time-invariant) couple of indicators of marginal and average tax gains $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$, that are respectively computed as:

$$\begin{aligned} \Delta EMTR_{i,pre/post} &= EMTR(\tau_{pre})_i - EMTR(\tau_{post})_i \\ \Delta EATR_{i,pre/post} &= EATR(\tau_{pre})_i - EATR(\tau_{post})_i \end{aligned}$$

where $\tau_{pre} = 0.33$ for all firms, $\tau_{post} = 0.33$ if the firm is ineligible for CT reduction, $\tau_{post} = 0.15$ if the firm is eligible for CT reduction and the average pre-reform profit $\bar{AP_i}$ is below the threshold of €38,120, and $\tau_{post} = 0.15 * \left(\frac{38{,}120}{\bar{AP_i}}\right) + 0.33 * \left(\frac{\bar{AP_i} - 38{,}120}{\bar{AP_i}}\right)$ if the firm is eligible for reduction but the pre-reform average profit is above the threshold to which the reduced tax rate applies. This approach implies that for ineligible firms both $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$ equal zero, while for eligible firms these vary with asset composition, financial structure, and average levels of pre-reform profit. Table 2 reports summary statistics of $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$ for all eligible firms and for eligible firms with average pre-reform profit below the threshold of €38,120.

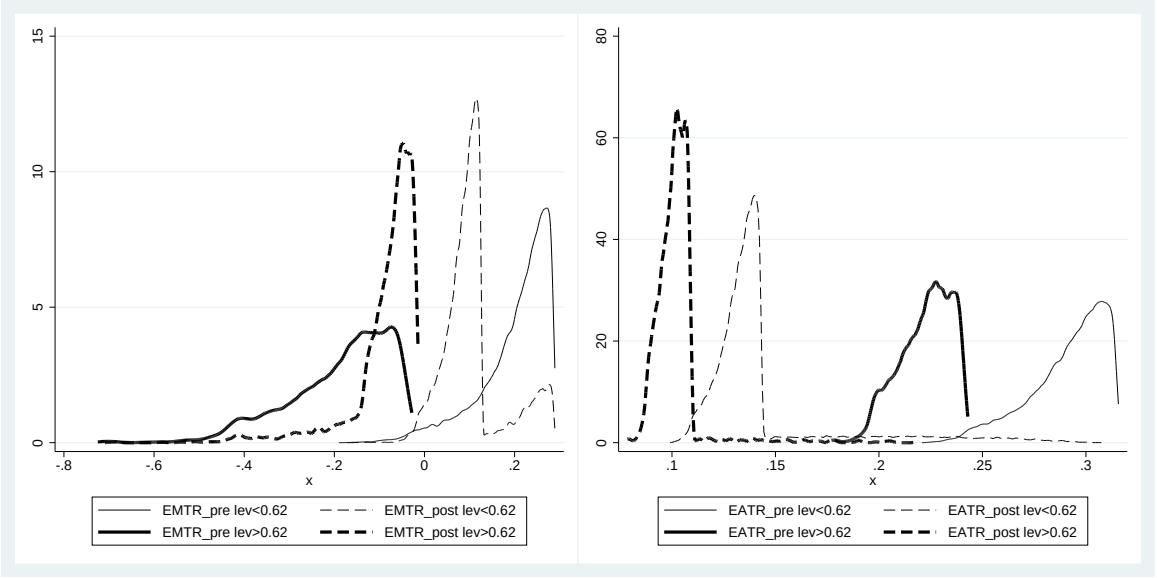
**Table 2: Tax gain from the reform (sample with selection)**

| | ΔEATR | | | ΔEMTR | | |
|---|---|---|---|---|---|---|
| | Mean | sd | N | Mean | sd | N |
| All eligible | 0.147 | 0.031 | 432,594 | 0.090 | 0.068 | 432,733 |
| Eligible below threshold | 0.158 | 0.012 | 360,628 | 0.108 | 0.061 | 360,628 |

Notes. We consider only the sample of firms that are present before the reform and survive after, that is present before 2001 and after 2002.

Table 2 shows that the greater reduction in effective taxation accrues to the eligible firms with average pre-reform profit below the threshold. This evidence conforms to the progressivity of the average statutory tax rate that responds to the primary aim of the policy to support the smallest firms[12]. The extent to which eligible firms resort to debt financing is another important factor in determining the effective rates; we expect firms with higher initial levels of debt financing to benefit the least from a reduction in CT, because these are the ones that can discount greater interest rate payments form taxable profit. Indeed, one of the declared objectives of the reform was to encourage small firms to shift their financial structure from debt to equity financing (Raspiller, 2007). Figure 1 shows the empirical distributions of EMTR and EATR for firms with different initial levels of leverage, separately plotted for the periods before and after the introduction of the reduced CT rate.

**Figure 1: Distributions of EATR and EMTR by firms' initial leverage**

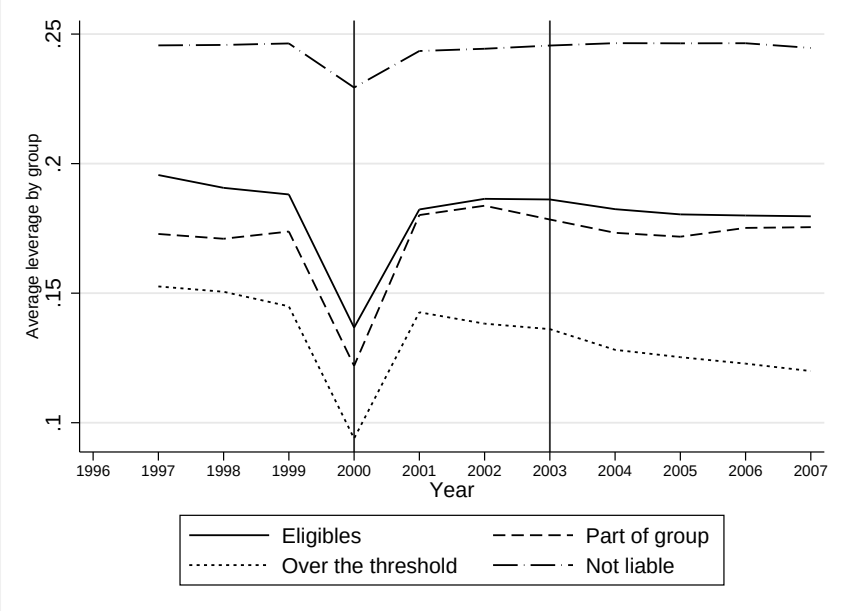



Notes. The figure shows kernel densities of EMTR and EATR for the period before 2001 (pre) and after 2002 (post), estimated using the epanechnikov function and an optimal bandwidth using the *kdensity* Stata command default option. We plot the empirical distributions separately for firms below and above the median pre-reform level of leverage (0.62). Negative values of EMTR can be interpreted as a subsidy, however they strivtly depends on the parameter that we used for the cost of capital without taxation (0.05).

Kernel densities show that the cut in the statutory rate reduces firms' heterogeneity with respect to both the average and the marginal effective rates of taxation. Indeed, the dispersion of the distribution of both EMTR and EATR is much lower after the reform. This can be easily explained by the fact that if the statutory rate is lower, firm heterogeneity with respect to their vulnerability to taxation becomes less important. Second, firms that resort more intensively to debt financing have lower average EMTR and EATR, consistently with the 'shielding' function of debt financing. An interesting aspect that emerges by looking at the left panel of Figure 1 is that the reform has opposite effects on the distributions of EMTR for firms with higher or lower proportions of debt financing; for firms with lower initial leverage the distribution of EMTR the distribution shifts toward lower values, while the contrary happens for firms with higher initial leverage. This is because, when taxation is high, the cost of capital at the margin decreases in the level of debt as the deduction of interest rate expenses from taxable profit offsets the costs of debt

financing completely. On the contrary, with a low statutory rate firms that maintain high levels of debt may have higher cost of capital at the margin, because interest rate expenditure is not completely offset by the possibility of declaring lower taxable profit. Therefore, the reform moves the EMTR in the right direction according to the declared objective of encouraging enterprises to reduce their reliance on debt, by removing the distortions introduced by the taxation on firms' financial structure.

**Figure 2: Evolution of leverage by groups of firms**




Notes. Leverage is computed as the ratio of firms' debt over total assets. The figure plots the evolution of the mean values of leverage computed within the group of firms eligible for CT reduction and within different control groups.

When we investigate the impact of tangible asset growth on export propensity, we use alternatively a dummy identifying eligibility for CT reduction $Eligible_i$, or the tax gain variables $\Delta EMTR_{i,pre/post}$ and $\Delta EATR_{i,pre/post}$ as instruments for the growth of tangible assets[13]. These instruments allow to identify the effect of asset growth on export propensity under the assumption that a variation in CT affects firm exports only thought its pro-growth effect. The previous considerations about the potential impact of the reform on firms' financial structure generate concerns with regard to the existence of a second channel through which the reform may affect export participation. Indeed, if firms' financial structure is itself a determinant of export

behavior, then the exclusion restriction is violated. We investigate the severity of this issue by comparing the evolution of firms' leverage in the group of treated firms (*Eligibles*) against each subgroup of ineligible ones (Figure 2).

Figure 2 plots the evolution over time of the mean levels of leverage computed within each group. If the mean leverage of eligible firms were to evolve differently from the other groups after 2001 (i.e., the first year in which the reduced rate was introduced), we would have a clear indication that the exclusion restriction is violated. Despite the existence of initial differences across groups, we find that eligible firms do not change their patterns of financing after the reform, as their average leverage follows a trend similar to those of ineligible firms. Initial differences across groups do not constitute a problem as we will be able to control for them by including firm-level fixed effects in first-stage regressions[14]. Hence, there is no evidence that the reform succeeded in inducing eligible firms to reduce their debt share. This may suggest that the tax reduction was not strong enough to foster changes in firms' financial structure, or rather that SME targeted by this policy have limited scope for substituting debt with others sources of financing. We conclude that the impact of the reform on financial structure does not threaten the validity of our IV strategy.

# 4 Methods

## 4.1 Does CT reduction promote firm growth?

Difference-in-differences identifies the effect of a policy 'treatment' by comparing the post-policy change of an outcome variable within the group of treated firms against the change that takes place within the group of untreated firms. The main advantage of this estimator over other policy evaluation techniques is that its validity does not rely on firms' random assignment to the treatment like in randomized controlled experiments, or on the assumption that we can approximate random assignment by conditioning the probability of treatment on a set of observable variables like in

propensity score matching. Nevertheless, identification of the causal impact relies on the assumption that in the absence of treatment the outcome variable would have followed a trend common to both treated and untreated firms (Angrist and Pischke, 2008).

Therefore, by using DiD to estimate the impact of CT reduction on firm growth we do not constraint the outcome variable (i.e., firm size) to have the same expected value across the groups of treated and untreated firms. We assume that any deviation in the common trend of growth across the two groups of firms is fully explained by the impact of the policy. Although we cannot implement formal tests to verify the validity of the common trend assumption, we will be checking its plausibility by looking at how the median value of firm size evolves in each group before the reform. A similar pre-reform evolution in the two groups would indicate the appropriateness of the DiD estimator. From a practical perspective DiD can be easily implemented by OLS estimation of the following model on the pooled sample of treated and untreated firms:

$$Tangibles_{it} = \alpha + \beta Eligible_i + \gamma(Eligible_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \sum_{s=16}^{36} \delta_s + \epsilon_{it} \quad (3)$$

where $Eligible_i$ is a dummy variable that assumes value 1 if firm $i$ is eligible for reduced CT and 0 otherwise, $Post_{02}$ is a variable that assumes value 1 if $t > 2002$ and 0 otherwise, $\sum_{t=98}^{'07} \delta_t$ and $\sum_{s=16}^{36} \delta_s$ are respectively full sets of year and sectoral dummies. The coefficients $\beta$ and $\gamma$ are respectively the pre-reform difference in expected size across groups and the average treatment effect of the policy:

$$\begin{aligned}
\beta &= \mathbb{E}[Tangibles_{it}|Eligible_i = 1, t < 2002] - \mathbb{E}[Tangibles_{it}|Eligible_i = 0, t < 2002] \\
\gamma &= \{\mathbb{E}[Tangibles_{it}|Eligible_i = 1, t > 2002] - \mathbb{E}[Tangibles_{it}|Eligible_i = 1, t < 2002]\} - \\
&\quad \{\mathbb{E}[Tangibles_{it}|Eligible_i = 0, t > 2002] - \mathbb{E}[Tangibles_{it}|Eligible_i = 0, t < 2002]\}
\end{aligned}$$

This specification controls for pre-reform differences across groups by including the term $Eligible_i$. However, the panel structure of our dataset can be better exploited to control for unobserved heterogeneity at a finer level of aggregation by substituting $Eligible_i$ with a full set of firm-specific fixed-effects $\delta_i$. These dummies control for all time-invariant firm-specific factors that determine differences in size across individual firms. Hence the fixed-effect (FE) specification of the DiD regression is written as:

$$Tangibles_{it} = \alpha + \delta_i + \gamma(Eligible_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \epsilon_{it} \tag{4}$$

where the interpretation of $\gamma$ remains unchanged. When we estimate specifications 3 and 4 we drop the observations relative to the years 2001-2002 because the reform was initiated in 2001 and completed in 2003. In this way the coefficient $\gamma$ truly captures changes in firms' size from periods in which the taxation rate was 33.3% (i.e., from 1997 to 2000) to periods in which it was reduced (i.e., from 2003 to 2007). We first estimate both specifications 3 and 4 by comparing the group of treated firms ($Eligible_i = 1$) against the whole group of ineligible firms, and then against each one of the different control groups that we described in the previous section. This strategy allows to evaluate the reliability of the estimates of $\gamma$ in the light of the evidence regarding the validity of the common trend assumption for different groups of firms. Lastly, we repeat this battery of estimations on the whole sample ('without selection') and on the sample obtained by dropping firms created after 2001 or that ceased their activity before 2003 ('sample with selection'). In the first case (without selection) average firms' size across groups is affected by post-reform entry and exit of firms. On the contrary, in the second case (with selection) coefficients are identified only by the impact of the reform on the evolution of those firms that where already present in pre-reform periods and that survive after the change in taxation.

Arguably, the group of eligibles is large enough to include firms subject to un-

observed policies or shocks whose timing overlaps with that of the CT reform. If this were the case, the previous approach may wrongly attribute to the reform the effect induced by other factors on firm growth. In order to dissipate this concern we check the robustness of our results by exploiting heterogeneity in the average and marginal effective rates of taxation (EATR and EMTR) within the group of eligible firms[15]. These rates reflect the different impact that CT has on the NPV of future investment opportunities for firms with different financial structure and asset composition. We believe that heterogeneity in effective rates is less likely to be affected by policies or shocks excluded from our analysis. The specification of the DiD regression with firm FE that we use for robustness check is:

$$Tangibles_{it} = \alpha + \delta_i + \gamma_1(\Delta TAX_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \epsilon_{it} \tag{5}$$

where $\Delta TAX_i$ is either $\Delta EMTR_{i,pre/post}$ or $\Delta EATR_{i,pre/post}$. Because $\Delta TAX_i$ is a continuous variable, the impact of the reform on asset growth of firm $i$ is given by $\gamma_i = \gamma_1 \times \Delta TAX_i$. If the reform is effective in promoting growth we expect the coefficient $\gamma$ to be positive and statistically different from zero, because firms that enjoy greater reductions in effective rates should be more responsive to the policy.

### 4.2 Asset growth and export entry

In this section we describe two different two-stage least square (2SLS) models that we use to estimate the causal impact of asset growth on export participation. The first model is estimated by Fixed Effects Instrumental Variable (FE-IV). This estimator first applies within-group transformation to the data so as to eliminate firm-specific fixed effects from the right-hand-side of the model, and then it instruments the endogenous covariate with the fitted values from a first-stage regression on exogenous variables. The second-stage model can be written as:

$$\tilde{Exp}_{it} = \alpha + \zeta \hat{T}_{it} + \sum_{t=98}^{'07} \delta_t + \tilde{\epsilon_{it}} \tag{6}$$

where $Exp_{it}$ is a dummy variable that assumes value 1 if firm $i$ exports at time $t$ and 0 otherwise, and $\tilde{Exp}_{it}$ is its within-group transformation. The term $\hat{T}_{it}$ is the fitted value from the following first-stage regression:

$$\tilde{T}_{it} = \alpha + \gamma \tilde{EP}_{it} + \sum_{t=98}^{'07} \delta_t + \tilde{v}_{it} \tag{7}$$

where $\tilde{T}_{it}$ and $\tilde{EP}_{it}$ are respectively the within-group transformations of $Tangibles_{it}$ and of the interaction term $Eligible_i \times Post_{02}$ previously used in DiD specifications[16]. In this model, we use variations in tangible assets explained by the CT reform as instruments for asset growth. While the within-group transformation prevents omitted variable bias, the IV strategy makes it sure that estimates on $\zeta$ in the second-stage model (equation 6) are not driven by reverse causality. Because the coefficients are identified by time-variations within individual firms' series, the coefficient $\zeta$ can be interpreted as the marginal effect of tangible asset growth in time $t$ on the probability that firm $i$ is an exporter in the same period. As for the DiD models, we estimate equation 6 on different samples obtained by pooling eligible firms together with firms belonging to different control groups. As a robustness check we also estimate equation 6 on the group of eligible firms only, and we substitute $\Delta TAX_{i,pre/post}$ to $EP_{it}$ in 7 as an instrument for $\tilde{T}_{it}$.

We estimate a second 2SLS model that captures more directly the impact of asset growth on export *entry*. To do so we keep only firms that are permanent non-exporters before the reform, and those that become permanent exporters after the reform or that remain permanent non-exporters[17]. We decide to focus on permanent exporters and non-exporters to capture more specifically the impact of asset growth on entry into exporting as a strategic decision of the firm rather than as an occasional activity (Blum *et al.*, 2013). The model assumes the following specification:

$$\Delta Exp_{i,pre/post} = \alpha + \zeta_1 \hat{\Delta T}_{i,pre/post} + \Delta \epsilon_i \tag{8}$$

where $\Delta Exp_{i,pre/post}$ is a dichotomous variable that assumes value 1 for non-exporters

that enter into export after the reform, and value 0 for those that remain non-exporters. The term $\hat{\Delta T}_{i,pre/post}$ is the predicted change in average tangible asset from before to after the reform that is obtained from the estimation of the following first-stage model:

$$\Delta Tangibles_{i,pre/post} = \alpha + \gamma_1 Eligible_i + \Delta v_i \tag{9}$$

notice that in equations 8 and 9 we drop the time subscript $t$ as we retain a unique observation per firm and we estimate the regression at the cross-sectional level. Hence, in equation 9 we can directly use $Eligible_i$ instead of the interaction term as an exogenous instrument for the change in tangible assets. As for previous exercises we repeat the estimation of the IV model on the group of eligible firms only, by using $\Delta Tax_i$ as an external instrument for $\Delta Tangibles_{i,pre/post}$ in equation 9.

# 5 Results

## 5.1 Graphical evidence

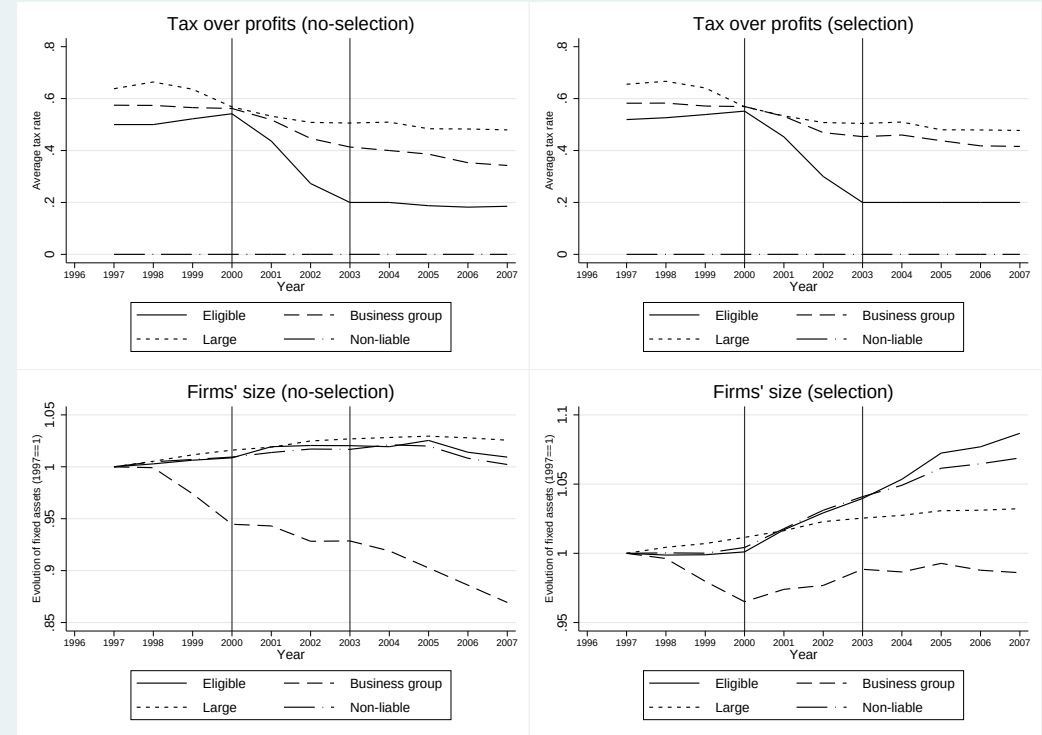
We begin this section by showing in Figure 3 the evolution of the median 'backward' tax rate (upper panels) and of the median firm size (lower panels) computed for different groups of firms over the years[18]. Plots on the left-hand side are constructed using all the firms in the database, while plots on the right-hand side are based only on those firms that we observe both before and after the reform. The sharp reduction in the median tax rate between 2001 and 2003 for the group of eligible firms indicates that this group correctly identifies those firms that benefit from CT reduction. On the contrary, the decrease that we observe for 'Large' and 'Business group' firms is explained by the fact that since 1999 there was also a progressive cut in the social contribution tax affecting all firms liable for CT. These plots also inform our choice to exclude the years 2001 and 2002 from DiD regressions. Indeed by looking at the 'Eligible' line it is clear that the last pre-reform year and the first post-reform year

are respectively 2000 and 2003.

In the lower panels we show normalized series of median firm size as measured by the variable $Tangibles_{it}$[19]. Compared with the plot obtained on the sample with selection (bottom-right panel), the plot based on the sample without selection (bottom-left panel) presents a slower growth dynamics for all groups. This is due to the entry of small firms in later periods that is not controlled for in the sample without selection. We must consider this factor in DiD analyses, because if tax reduction encourages greater entry in the group of eligible firms, this would bias downward the estimated impact of the reform on the size of incumbents. In the bottom-right panel it is clear that eligible firms are those that experienced the fastest growth over the period. Although, the growth of eligible firms peaks in coincidence with the reform period, we also observe a similar dynamics for 'Non liable' firms. The faster growth of eligibles as compared with this control group is more evident in later years, suggesting that the reduced rate of taxation might induce a lagged response in terms of growth. The graphical analysis is also used to flag the control groups for which the common trend assumption is less tenable. Firms that are part of a business group present a pre-reform trend that diverges from the one of eligible firms. For this reason we expect DiD to overestimate the impact of the reform when eligibles are compared to this control group. The other two groups appear instead appropriate controls for conducting DiD analyses, since their pre-reform size dynamic is very similar to the one of eligible firms.

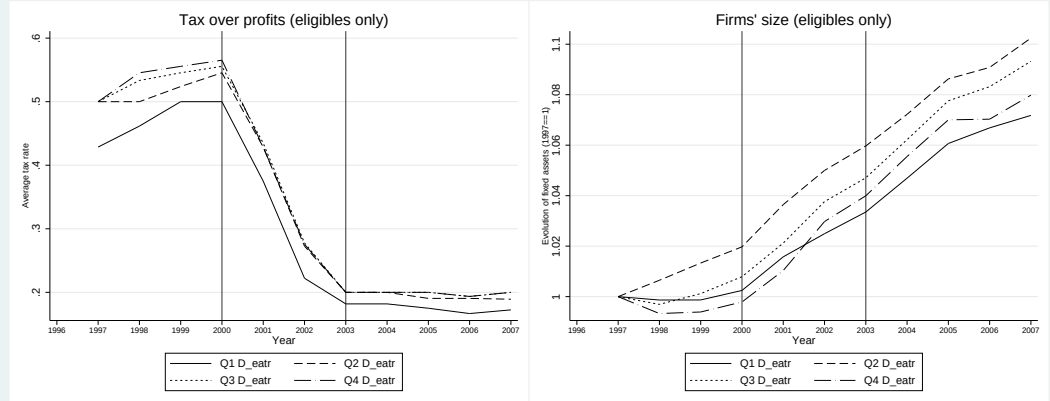
Because our robustness checks are conducted by exploiting the differential impact that the change in the statutory rate had on the effective rates of eligible firms, in Figure 4 we present the plots for groups of eligible firms divided by quartiles of $\Delta EATR_{i,pre/post}$ (sample with selection). The left-hand-side panel shows the extent to which the changes in the average effective tax rate coincide with changes in 'backward' taxation and the right-hand-side considers the evolution of firms' size at different quartiles of $\Delta EATR$. The figure confirms that firms in higher quartiles are those that benefit relatively more from a change in the statutory rate.

**Figure 3: Evolution of tax rates and firm size, treated vs controls**




Note : We compare the unbalanced sample ("no selection") to a sample in which we control that firms are present at least one year before the reform and one year after ("selection"). The latter sample therefore contains only surviving firms after the reform and does not include entrants after the reform.

**Figure 4: Evolution of tax rates and firm size, within eligible (below €38,120 of profit)**




Note : We compare the evolution of average tax rate and size across different quartiles of the gain in effective average tax rate ($D\_eatr$). Firms with the highest gain belong to the fourth quartile (Q4 $D\_eatr$).

Indeed, firms that had the greatest reduction in EATR (i.e., belonging to the 4th quartile), experienced faster expansion of tangible asset from 2001 onwards compared with firms least affected by the reform (i.e., belonging to the 1st quartile).

## 5.2 Regression results from DiD models

We now introduce the main results of our analysis, starting from the output of DiD regressions (Equations 3 to 5). Table 3 collects all the estimates from DiD models: the upper and the lower panels refer respectively to estimates obtained on the sample without selection and on the sample with selection. In addition, the column headings indicate which control group is used[20]. For each different control group we report both estimates from model 3 (OLS) and from model 4 (FE).

**Table 3: CT reform and firms' tangible asset (treated vs. controls)**

| Control group: | Untreated | | Business group | | Large | | Non-liable | |
|---|---|---|---|---|---|---|---|---|
| Estimator: | OLS | FE | OLS | FE | OLS | FE | OLS | FE |
| **Sample without selection** | | | | | | | | |
| *Eligible* | 0.218*** | | -3.158*** | | -3.952*** | | 0.749*** | |
| | (0.008) | | (0.019) | | (0.017) | | (0.007) | |
| $Eligible * Post_{02}$ | -0.048*** | 0.038*** | 0.280*** | 0.082*** | -0.101*** | 0.039*** | -0.018*** | 0.033*** |
| | (0.007) | (0.005) | (0.019) | (0.011) | (0.015) | (0.009) | (0.006) | (0.005) |
| *Constant* | 4.020*** | 3.919*** | 7.419*** | 4.375*** | 8.201*** | 4.340*** | 3.556*** | 3.692*** |
| | (0.006) | (0.002) | (0.019) | (0.003) | (0.016) | (0.003) | (0.004) | (0.002) |
| Year FE | yes | yes | yes | yes | yes | yes | yes | yes |
| $R^2$ (no-selection) | 0.114 | 0.955 | 0.354 | 0.957 | 0.420 | 0.959 | 0.135 | 0.938 |
| Obs. (no-selection) | 1,233,040 | 1,233,040 | 619,852 | 619,852 | 595,941 | 595,941 | 1,156,461 | 1,156,461 |
| **Sample with selection** | | | | | | | | |
| *Eligible* | 0.153*** | | -3.230*** | | -3.910*** | | 0.782*** | |
| | (0.011) | | (0.022) | | (0.019) | | (0.009) | |
| $Eligible * Post_{02}$ | 0.046*** | 0.039*** | 0.140*** | 0.081*** | 0.098*** | 0.039*** | 0.048*** | 0.035*** |
| | (0.006) | (0.004) | (0.015) | (0.010) | (0.013) | (0.009) | (0.005) | (0.004) |
| *Constant* | 4.216*** | 4.159*** | 7.629*** | 4.663*** | 8.299*** | 4.636*** | 3.640*** | 3.904*** |
| | (0.008) | (0.002) | (0.021) | (0.003) | (0.018) | (0.003) | (0.006) | (0.002) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ (selection) | 0.134 | 0.946 | 0.408 | 0.947 | 0.459 | 0.950 | 0.164 | 0.920 |
| Obs. (selection) | 843,356 | 843,356 | 436,285 | 436,285 | 423,674 | 423,674 | 787,078 | 787,078 |

Notes. Significance levels denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level.

The OLS estimate of the coefficient on $Eligible * Post_{02}$ is significantly negative when it is estimated on the sample without selection that includes all untreated firms. As it has been shown in the graphical analysis, this coefficient is likely to be driven by greater entry in the group of eligibles after the reform. Because new firms tend to be smaller than incumbents, entry would lead to a misleading picture of the effect of CT reduction on firm size. On the contrary, when the same speci-

fication is estimated by excluding post-reform entrants (i.e., sample with selection) the estimated impact of the reform is positive and significant. According to the estimates obtained from the sample with selection, the reform induces an average increase in tangible asset of about 4%[21]. This result is confirmed when we use FE models that identify the coefficients by giving greater weight to variations within individual firms' longitudinal series than to variations across firms. Although the effect appears quantitatively modest, it should be remembered that the reduced taxation introduced by the reform applies only to the first €38,120 of profit. Therefore, when we estimate the impact of the reform on the whole group of eligible firms, we tend to underestimate the effectiveness of tax reduction, because for firms with profit greater than €38,120 the reduction in average taxation can be much smaller than the full 50% cut enjoyed by firms below this threshold (see Figure 8 in the Appendix).

As a standard robustness check, we look at the coefficients obtained by comparing the group of treated firms with the different control groups ( 'Large', 'Business group' and 'Non-liable' ). By focusing our attention on the sample with selection, we find that the positive impact of the reform is found also when we use 'Large' firms only and 'Non-liable' firms only as control groups. FE estimates appear more stable across different control groups than those obtained by OLS, and this is due to the greater effectiveness of firm-level fixed effects in controlling for unobserved heterogeneity across firms within the same group. Instead, when we compare eligibles against 'Business group' firms, the estimated coefficients on $Eligible * Post_{02}$ are greater than those obtained by including other control groups in the estimation sample. This is explained by the violation of the common trend assumption as it is clearly shown in Figure 3; the descending trend of firm size experienced by this control group leads to overestimate the impact of the reform.

Table 4 shows the coefficients obtained by restricting the estimation sample to the group of eligible firms with profit below €38,120; here we identify the impact of the reform by exploiting heterogeneous variations across firms in $EATR$ and

$EMTR$. This robustness check confirms the positive impact of the reform on firm growth as the coefficients on $\Delta EATR * Post_{02}$ and $\Delta EMTR * Post_{02}$ are positive and significant in both OLS and FE models. Indeed, these estimates reveal that across firms affected by the same cut in the statutory rate, those that experienced the greater reduction in the effective rates grew faster than the others. As expected, the impact of the reform on firm size is larger in this sample, where all firms enjoyed a 50% cut in the average statutory rate, corresponding to an average reduction in EATR of 14.7% ($\Delta EATR_i$), and a reduction in EMTR of 8.6% ($\Delta EMTR_i$). According to our estimates, these changes in effective rates are respectively associated with an increase of tangible asset of 36% (for $\Delta EATR_i$=14.7%) and of 4%. (for $\Delta EMTR_i$=8.6%)

The large difference between the two effects is consistent with the argument developed by Devereux and Griffith (2003) on the different kind of investment decisions that are affected by the two rates. Indeed, a reduction in marginal effective taxation ($EMTR$) is expected to cause mostly upward adjustment in the size of current investment projects, while a reduction in $EATR$ may push firms into implementing new projects whose average NPV becomes positive with lower CT. Therefore we expect firms that enjoy greater reductions in $EATR$ to increase their stock of tangible asset relatively more than those experiencing an equivalent change in $EMTR$.

**Table 4: CT reform and firms' tangible asset (eligibles with profit below €38,120)**

| | EATR | | EMTR | |
|---|---|---|---|---|
| Estimator: | OLS | FE | OLS | FE |
| $\Delta EATR$ | -4.761*** | | | |
| | (0.635) | | | |
| $\Delta EATR * Post_{02}$ | 2.690*** | 2.515*** | | |
| | (0.413) | (0.355) | | |
| $\Delta EMTR$ | | | -0.227* | |
| | | | (0.123) | |
| $\Delta EMTR * Post_{02}$ | | | 0.581*** | 0.558*** |
| | | | (0.081) | (0.069) |
| $Constant$ | 5.033*** | 4.179*** | 4.306*** | 4.179*** |
| | (0.100) | (0.004) | (0.015) | (0.004) |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.094 | 0.896 | 0.093 | 0.896 |
| Obs. | 282,201 | 282,201 | 282,201 | 282,201 |

Notes. Significance levels denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level.

### 5.3 Asset growth and export propensity

The evidence presented in the previous section confirms that $Eligible_i * Post_{02}$, $\Delta EMTR_i$ and $\Delta EATR_i$ are strong instruments for tangible asset growth. In Table 5 we show the estimates obtained from first-stage regressions of $Tangibles_{it}$ on $Eligible_i * Post_{02}$, and those obtained from second-stage regressions of $Exp_{it}$ on the predicted values of $Tangibles_{it}$.

**Table 5: Export entry and firms' tangible asset (treated vs. controls)**

| Control group: | Untreated | | Business group | | Large | | Non-liable | |
|---|---|---|---|---|---|---|---|---|
| IV Stage: | 2nd | 1st | 2nd | 1st | 2nd | 1st | 2nd | 1st |
| **FE models (dependent: $\Delta Export_{t,t-1}$ )** | | | | | | | | |
| $Tangibles(log)$ | 0.366*** | | 0.450*** | | 0.919*** | | 0.323*** | |
| | (0.055) | | (0.068) | | (0.219) | | (0.059) | |
| $Eligible * Post_{02}$ | | 0.039*** | | 0.083*** | | 0.040*** | | 0.035*** |
| | | (0.004) | | (0.010) | | (0.009) | | (0.004) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | -0.393 | 0.124 | -0.447 | 0.116 | -2.050 | 0.125 | -0.302 | 0.127 |
| Obs. | 837,688 | 837,688 | 431,606 | 431,606 | 418,541 | 418,541 | 785,902 | 785,902 |
| F | 288.356 | 2602.978 | 108.366 | 1233.805 | 55.682 | 1313.013 | 332.665 | 2534.487 |
| **Models in differences (dependent: $\Delta Export_{00-04}$ )** | | | | | | | | |
| $\Delta Tangibles_{00-04}$ | 0.430*** | | 0.573*** | | 0.366*** | | -0.972 | |
| | (0.111) | | (0.175) | | (0.106) | | (0.916) | |
| $Eligible$ | | 0.025*** | | 0.032*** | | 0.025*** | | -0.011 |
| | | (0.005) | | (0.008) | | (0.005) | | (0.009) |
| $Constant$ | -0.068*** | 0.173*** | -0.096*** | 0.166*** | -0.055*** | 0.174*** | 0.210 | 0.209*** |
| | (0.020) | (0.003) | (0.033) | (0.007) | (0.019) | (0.003) | (0.183) | (0.008) |
| $R^2$ | -0.947 | 0.001 | -1.156 | 0.001 | -0.749 | 0.001 | -4.055 | 0.000 |
| Obs. | 52,141 | 52,141 | 28,376 | 28,376 | 45,721 | 45,721 | 25,052 | 25,052 |
| F | 14.990 | 29.066 | 10.775 | 17.389 | 12.032 | 25.779 | 1.127 | 1.495 |

Notes. Significance level denoted as: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level.

In second-stage regressions we find that changes in tangible assets are positively associated with firms' probability to serve foreign markets across all control groups. The second-stage estimates on $Tangibles$ obtained by comparing eligible firms against the overall groups of 'Untreated' firms, or against the subgroups of firms belonging to 'Business group' and 'Non-liable' firms approximate 0.4, suggesting that a 10% increase in tangible asset increases the probability of exporting on average by 4%. The coefficient obtained on the estimating sample including 'Eligibles' and 'Large' firms is higher (0.9). Still, comparability across control groups is restricted because of large differences in initial propensity to export (see Table 1).

The results from the estimation of model 9 on export entry are reported in the lower panel of Table 5. Estimates from this model appear in line with those obtained on export propensity when we compare eligibles against all control groups except

for 'Non liable' firms. When we use this control group, the $F$ statistics from the first-stage regression is very small (1.4) suggesting that the instrument is weak in this sample. The weakness of the instrument is likely to depend on the methodology that we follow to construct the estimation sample for this specification that retains insufficient observations in this particular control group to identify correctly the impact of the reform on asset growth[22]. Therefore, we conclude that this battery of regressions provides convincing evidence that tangible asset growth increases firms' propensity to export, and that this channel can be exploited by policies that aim at promoting domestic firms' access to foreign markets.

Table 6 presents the output from replicating the analysis within the group of eligible firms with average profit below €38,120, and by using the interactions of $\Delta EATR_i$ and $\Delta EMTR_i$ with the $Post_{02}$ dummy as instruments in first-stage regressions. Second-stage estimates on *Tangibles* are very similar to those that we obtained by comparing eligible and ineligible firms in FE models. When we bring this robustness check to model 9, we find that tangible assets' growth still increases the probability of 'permanent' entry into exporting. However, the effect that is found within this group of firms is smaller than the one obtained on the whole sample (i.e., estimates of the coefficient are respectively 0.15 and 0.17 when $\Delta EATR_i$ and $\Delta EMTR_i$ are used as instruments). This may be caused by the rare occurrence of 'permanent' entry among firms in this control group. We conclude that tangible assets' growth has a stronger positive impact on small firms' probability of exporting while its impact is weaker when we look at small firms' probability of becoming 'permanent' exporters.

**Table 6: Export entry and growth (within eligible, below €38,120 of profit)**

| | EATR | | EMTR | |
|---|---|---|---|---|
| IV Stage: | 2nd | 1st | 2nd | 1st |
| **FE models (dependent: $\Delta Export_{t,t-1}$)** | | | | |
| $Tangibles(log)$ | $0.408^{***}$ | | $0.363^{***}$ | |
| | (0.074) | | (0.060) | |
| $\Delta EATR_i * Post_{02}$ | | $2.517^{***}$ | | |
| | | (0.331) | | |
| $\Delta EMTR_i * Post_{02}$ | | | | $0.558^{***}$ |
| | | | | (0.064) |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | -0.363 | 0.113 | -0.277 | 0.113 |
| N | 281,994 | 281,994 | 281,994 | 281,994 |
| F | 93.727 | 786.070 | 99.744 | 789.507 |
| **Models in differences (dependent: $\Delta Export_{00-04}$)** | | | | |
| $\Delta Tangibles_{00-04}$ | $0.152^{*}$ | | $0.173^{**}$ | |
| | (0.085) | | (0.087) | |
| $\Delta EATR_i$ | | $2.206^{***}$ | | |
| | | (0.403) | | |
| $\Delta EMTR_i$ | | | | $0.422^{***}$ |
| | | | | (0.079) |
| $Constant$ | -0.012 | $-0.164^{**}$ | -0.016 | $0.138^{***}$ |
| | (0.016) | (0.064) | (0.016) | (0.010) |
| $R^2$ | -0.067 | 0.002 | -0.091 | 0.002 |
| N | 16,170 | 16,170 | 16,170 | 16,170 |
| F | 3.237 | 29.984 | 3.934 | 28.712 |

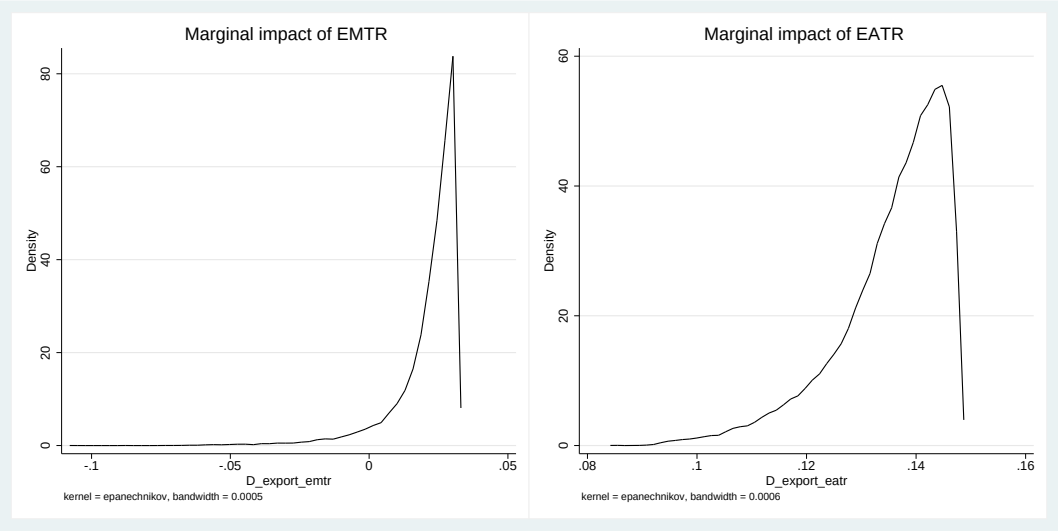
Notes. Significance levels denoted as: $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$. Cluster-robust standard errors in parentheses with clustering unit set at the firm-level.

## 5.4 Evaluating the overall impact of the reform

After determining that the reduction in the CT rate promoted SME investment, and that the growth in tangible assets impacted positively on export propensity, we are left to assess the indirect effect of the reform on SME participation to international trade. We have shown that a unique change in the statutory rate translates into heterogeneous reductions of effective rates across firms with different asset composition and financial structure. Therefore the reform had a different impact on the export propensity of firms experiencing different changes in effective taxation $\Delta EATR_i$ and $\Delta EMTR_i$. In order to assess whether our results are valid for most firms of our sample, we compute the treatment effect of the reform on export propensity at each point of the distributions of gains in effective tax rates. More precisely, the treatment effect on firm $i$ is $TE_{EATR,i} = \hat{\gamma}_{EATR} \times \Delta EATR_i \times \hat{\zeta}$ and $TE_{EMTR,i} = \hat{\gamma}_{EMTR} \times \Delta EMTR_i \times \hat{\zeta}$, where $\hat{\gamma}_{EATR} \times \Delta EATR_i$ and $\hat{\gamma}_{EMTR} \times \Delta EMTR_i$ are respectively the predicted changes in the tangible assets of firm $i$ caused by the average and marginal effective tax gains. These are multiplied by the estimated marginal effect of tangible asset growth on export propensity ($\hat{\zeta}$) reported in the upper panel

of Table 6[23].

**Figure 5: Heterogeneous impact of the reform on export entry**




Notes. The two plots show the kernel densities of $TE_{EMTR,i}$ (left panel) and $TE_{EATR,i}$ (right panel). These are obtained on the population of firms eligible for the tax cut and with average pre-reform profit below the threshold of €38,120.

The right panel of Figure 5 shows the distribution of $TE_{EATR,i}$ across eligible firms with profits below €38,120. The effect of the reform on export propensity ranges from +8% to +15% with the majority of firms concentrating in the range between +12% and +14%. On the contrary, $TE_{EMTR,i}$ ranges from -10% to +3%, with the majority of firms concentrating in the upper part of the distribution. The impact of the reform on exports differs between the average and the marginal taxation channels. This is due to the different impact of changes in EATR and EMTR on investment. A reduction of the cost of capital at the margin ($\Delta EMTR$) causes an upward adjustment of firms' capital stock due to the upscaling of current projects, while a reduction in average taxation ($\Delta EATR$) induces firms to undertake new discrete investment projects that were previously unprofitable (Devereux and Griffith, 2003). Because a reduction in infra-marginal taxation induces greater expansion in tangible assets, then $TE_{EATR,i}$ are much higher than $TE_{EMTR,i}$[24]. Firms with negative values of $TE_{EMTR,i}$ are those for which the cost of capital at the margins increases after a reduction of taxation, given their intensive use of debt financing.

With lower taxation their user cost of capital is higher, because higher costs of debt financing are not fully compensated by the tax-shield function of debt embodied in the equation 1. If these firms cannot adjust their financial structure by reducing debt, we expect them to downscale investment at the margin and reduce their export participation.

# 6 Conclusions

By comparing firms that benefit from a favorable tax regime to those excluded from it, we provide evidence that reductions in CT rates are effective policies to promote the growth of small and medium enterprises and through this channel their export participation. We also highlighted that similar fiscal measures would have an heterogeneous impact on firms, depending on their different ability to shield profit from taxation by using debt financing and discounting investment costs over time. When we focus on firms with average pre-reform profit below the threshold to which the tax cut applies (€38,120), we find that 50% reduction in the average statutory rate corresponds on average to 16% reduction in the Effective Average Tax Rate (EATR). A firm experiencing such a reduction increases its stock of tangible assets of 40% and its probability of exporting by 16%.

Our conclusions are particularly in line with a recent model in the trade literature that introduces increasing marginal costs of production in the Melitz framework (Blum *et al.*, 2013). As predicted by this model, our estimates suggest that firms that increase their stock of tangible assets become more willing to serve foreign markets. If this is true, ex-ante differences in size, capital intensity and labor productivity between exporters and non-exporters are not only related to the fixed entry costs of exporting, but also to the different costs of producing greater volumes of output. While the literature is inconclusive on the merits of export promotion through subsidies, the descriptive evidence on self-selection of larger firms into foreign markets hinted at the removal of fiscal barriers to SME growth as a strategy to promote

export participation (Altomonte *et al.*, 2012). Our results confirm this statement by exploiting a policy experiment that allows us to control for reverse causality and confounding factors.

# Notes

[1]More precisely, for eligible firms the "issued capital must be fully paid up, and at least 75% of it must be held continuously by individuals or by companies that themselves satisfy these conditions" (Raspiller, 2007).

[2]For a review of the studies adopting this methodology see Wagner (2007).

[3]This finding is interpreted in the light of the complementarity between productivity enhancing investment and market expansion.

[4]Indeed, in their model productivity is positively affected by investment in new technologies.

[5]We expect export entry not to be directly affected by CT reduction because the profit margins on domestic and foreign sales are affected in the same way.

[6]FICUS excludes only firms that opt for the micro-BIC or the micro-BNC fiscal regimes. These firms have fewer than 10 employees and revenue below €81,500 (manufacturing) or €32,600 (services).

[7]From the whole sample of manufacturing firms we drop firms that switch between the groups of firms eligible and ineligible for CT reduction over the period of our analysis (26,088 firms counting for 8.08% of the manufacturing sector).

[8]Tangible assets include land, building, equipment and machinery and assets under construction.

[9]See Table 8 for details on the construction of all variables.

[10]According to the law the 'independence' condition is still satisfied if the business group controlling the firm is owned at least for the 75% by a single individual. Unfortunately, our data do not allow to check this condition, so we decide to exclude from eligibility all companies belonging to a business group, representing 11.35% of firms complying with the other 2 criteria.

[11]`bofip.impots.gouv.fr/bofip/4520-PGP?datePubl=17/04/2013`.

[12]See Figure 8 in the Appendix.

[13]All these variables are interacted with a dummy for the post-reform period.

[14]Figures 6 and 7 in the Appendix, show the evolution of $lev$ by groups of eligible firms belonging to different quartiles of $\Delta EMTR_{f,pre/post}$ and $\Delta EATR_{f,pre/post}$. The plots confirm that eligible firms experiencing greater reductions in effective tax rates do not decrease their leverage levels faster than the other groups.

[15]Because the reduced rate applies only to the first €38,120 of profit, we conduct our robustness

check only on eligible firms below this threshold, so that all the firms in the estimation sample are subject to the same average reduction in the statutory rate.

[16]FE-IV estimation is implemented by using the user-written command xtivreg2 in Stata (Schaffer, 2005).

[17]Permanent non-exporters are firms that never export before 2001, or those that never export after 2002. Permanent exporters are firms that export during all periods after 2002.

[18]By adopting the terminology of Egger *et al.* (2009), we define as 'backward' rates of taxation the rates obtained by dividing current tax payments by current profit. These rates are called 'backward' because they are the outcome of firms' past investment. On the contrary EMTR and EATR are defined as 'forward' rates since they measure the impact of taxation on firms' future investment.

[19]Each series is normalized by dividing the median value of $Tangible_{it}$ within each subsample by its initial value. This makes it easier to check the common trend assumption visually.

[20]The heading 'Untreated' indicates that we compare the eligible firms against all the ineligible firms.

[21]Because we estimate a log-level model we can interpret the coefficient as percentage change induced on the dependent variable.

[22]Table 7 in Appendix shows that in the group of 'Non liable' firms we have the greatest proportion of permanent non-exporters before the reform (92%), of these non-exporters only a very small fraction (1%) transit to a 'permanent' exporter status after the reform.

[23]$\hat{\zeta}$ is set at 0.4 on the basis of the the point estimates of the coefficient of *Tangibles* that are obtained in second stage regressions on $\Delta Export_{t,t-1}$.

[24]Indeed in Table 6 we show that the first-stage coefficient of $\Delta EATR_i * Post_{02}$ on $Tangible_i$ is five time larger than the one of $\Delta EMTR_i * Post_{02}$.

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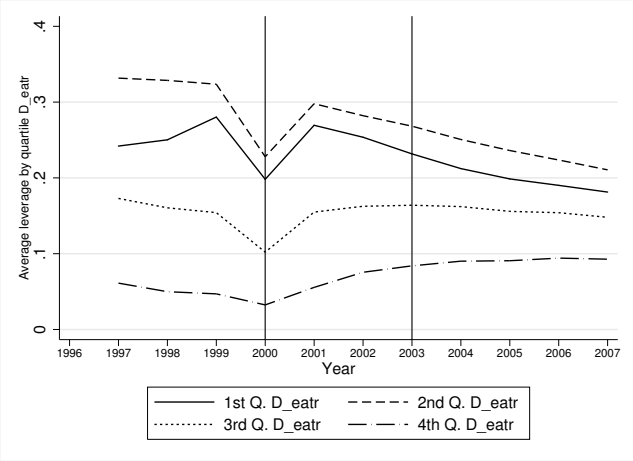
# Appendix

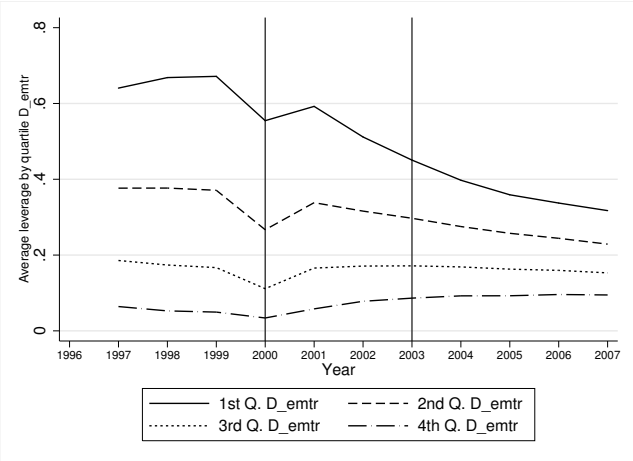
## Evolution of leverage by quartiles of $\Delta EATR$ and $\Delta EMTR$

**Figure 6: Evolution of leverage by quartiles of $\Delta EATR$**




Notes. Leverage is computed as the ratio of firms' debt over total assets. The figure plots mean values of leverage computed within groups of eligible firms belonging to the same quartile of $\Delta EATR$. Firms in the first quartile are those experiencing the smaller reduction in effective average taxation between 2001 and 2003.

**Figure 7: Evolution of leverage by quartiles of $\Delta EMTR$**




Notes. Leverage is computed as the ratio of firms' debt over total assets. The figure plots mean values of leverage computed within groups of eligible firms belonging to the same quartile of $\Delta EMTR$. Firms in the first quartile are those experiencing the smaller reduction in effective marginal taxation between 2001 and 2003.

## Expected gain from the reform and firm profit

**Figure 8: Pre- and post-reform average statutory CT rates by levels of firm profit**

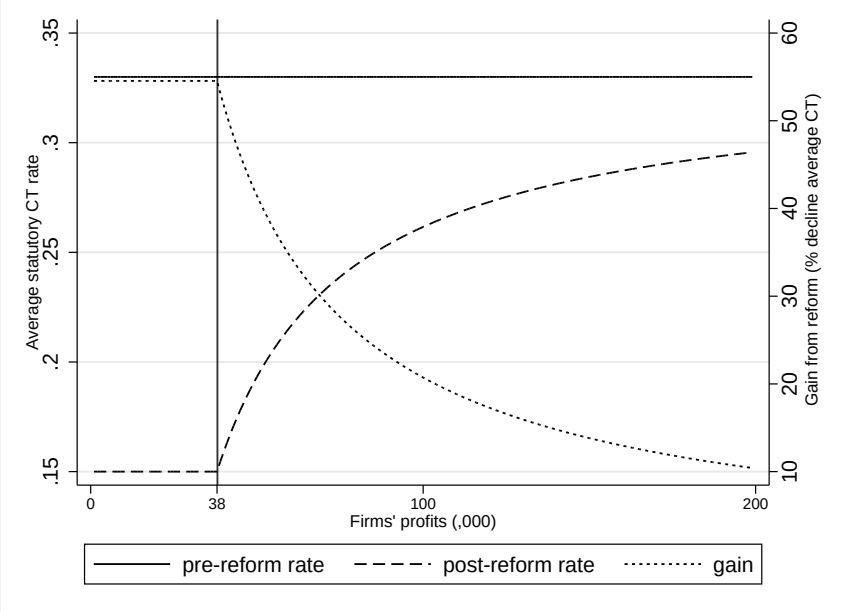


**Table 7: Permanent non-exporters and permanent exporters, balanced sample**

| | Share of permanent non-exporters before the reform | Share of permanent exporters after the reform if permanent non-exporter before |
|---|---|---|
| **All sample** | 0.663 | 0.034 |
| **All eligible** | 0.598 | 0.054 |
| Eligible below threshold | 0.656 | 0.047 |
| **All controls** | 0.720 | 0.021 |
| Non-liable | 0.924 | 0.011 |
| Business group | 0.263 | 0.103 |
| Large | 0.117 | 0.178 |

Note. The balanced sample comprises firms present in all years before the reform (1998-2000) and after the reform (2004-2007).

**Table 8: Variables**

| Variable | Description | Construction from FICUS database |
|---|---|---|
| Tax ratio | Ratio of corporate tax expenses over total profit. | $impoben_{it}/(resubic_{it} + impoben_{it})$ |
| $Tangibles_{it}$ | log of the book value of tangible assets | $log(immocor_{it})$ |
| $Exp_{it}$ | Binary variable, firms with positive foreign sales | $= 1$ if $caexpor_{it} > 0$, 0 otherwise |
| $elj_i$ | Identifier for judicial form | $= 1$ if $cj_{it} \in [5399, 5800]$, $cj_{it} = 5308$ or $cj_{it} != 5498$ |
| $elo_i$ | Identifier for 'Business group' | $= 1$ if $appgr_{it} = 0$, 0 otherwise |
| $elc_i$ | Identifier for 'Large' group | $= 1$ if $catotal_{it} <=$ €7,630,000, 0 otherwise |
| $Eligible_i$ | Eligibility dummy | $= 1$ if $elj_{it} = 1$, $elo_{it} = 1$ and $elc_{it} = 1$, 0 otherwise |
| $Post_{02}$ | Reform dummy | $= 1$ if $t > 2002$, 0 otherwise |

Note. The balanced sample comprises firms present in all years before the reform (1998-2000) and after the reform (2004-2007). We trim the extreme percentiles for each variable (1%) and we deflate at the sectoral level.