

KILLING A SECOND BIRD WITH ONE STONE? PROMOTING FIRM GROWTH AND EXPORT THROUGH TAX POLICY

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Killing a second bird with one stone?

Promoting firm growth and export through tax policy*

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Abstract

In this paper we test whether policies that induce tangible asset growth among domestic companies are effective in increasing their entry into export markets. We solve the endogeneity problem inherent to the empirical investigation of the growth-export relationship by adopting an instrumental variable (IV) strategy that exploits an exogenous policy variation in corporate tax (CT) rate as an instrument for firm growth. A reduction of the CT rate in France is found increasing firm size and promoting through this channel export entry. Our result is robust to two alternative identification strategies: first we compare firms that enjoyed CT reduction against those that did not benefit from it, then we exploit the differential impact of statutory rate reduction on the firm-level effective marginal and average rates of taxation (EMTR and EATR) within the group of firms eligible for tax reduction. We conclude that the fiscal lever has a direct impact on firm growth and an indirect impact on export participation.

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1 Introduction

Export promotion 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 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. Therefore, the evaluation of policies that may affect directly or indirectly firm export is relevant for France and for other economies in post-crisis Europe, as they face the common challenge of triggering GDP growth by achieving greater international competitiveness. Because small and medium enterprises

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(SME) tend to be underrepresented in international trade despite their important role in the domestic economy, favorable fiscal policies should contribute to increase their participation in foreign markets. Our paper investigates the effects of the French reform of the SME corporate taxation regime implemented between 2001 and 2003. We show that the reduction of the CT rate introduced by this reform had a positive impact on asset growth and internationalization of domestic firms.

In addition to the policy relevance of our investigation, we contribute methodologically to the trade literature by addressing endogeneity issues arising when we attempt 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 is attributed to self-selection of best performers into foreign markets (e.g. Bernard and Jensen, 1999). 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 their probability to become exporters. Because firms 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' investments 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. Between 2001 and 2003 in France, the CT rate for SME was reduced from 33.33% to 15% for the part of profits not exceeding €38,120. Eligibility for such reduction was subject to two criteria. The first related to size by requiring firms' revenues 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 subsidiaries¹. These criteria provide an opportunity to construct two different, but not mutually exclusive, control groups against which to measure the impact of CT reduction on eligible firms. A third control group is constituted by those firms that were not effected 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

¹More 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).

find that the reform had 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 a 10% increase in investment determines an average increase of 3.6% in firms' probability to export. Hence, our main policy conclusion is that fiscal policies that foster asset growth are effective in promoting SME export.

These results 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 profits 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 reduction. For example, firms resorting more intensively to debt financing are less affected by CT reduction because they can discount interest rate payments from taxable profits. Again, firms whose assets have higher rates of fiscal depreciation can discount a greater proportion of capital expenditure from profits. 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 size (and growth) as a mere reflection of 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 fixed level of 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 this theoretical insight.

The rest of the paper is organized as it 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 FICUS database on which we base our analysis and our empirical strategy. Section 4 presents the results we obtain from DiD and IV models. Section 5 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 up to the point 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, 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 profitable to acquire further capital assets even if these 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 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 profits, 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 different 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 this concern by applying 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 taxation and cost of capital without taxation (King and Fullerton, 1984; Devereux and Griffith, 2003). Accordingly, we expect that higher EMTRs are associated with lower levels of capital as firms reduce their investments 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 on debt to finance investment have lower effective rates because they are expected to discount interest rate payments from taxable profits. In addition, firms that invest in capital goods with higher rates of fiscal depreciation can discount the cost of investment from taxable profits 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 rates of investment (Bond and Xing, 2010; Arnold *et al.*, 2011), while the second relies on the differential impact that CT reduction within the same country induces on firms’ EMTR and EATR. Because the latter approach is based on exogenous policy variations, it leads to more robust causal inference. Using this methodology, previous studies have shown that CT reductions positively impact on investment: Becker *et al.* (2006) find a positive impact on FDI in Germany, while Simmler (2013) compares the effect of CT change on German firms’ investments in the case of binding and non-binding financial constraints. Exploiting only differences in asset composition, Cummins *et al.* (1995) find that in the US firms’ investments are sensitive to unanticipated changes in corporate taxation.

2.2 Firm growth, productivity and export: some empirical issues

By electing the individual enterprise as its main unit of analysis, ‘New-new Trade Theory’ has inspired intense scrutiny of firm-level determinants and effects of export. 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 causality². 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. The main prediction of this model is that when firms anticipate future expansion into foreign markets (triggered by the abatement of trade costs), they undertake productivity enhancing investment before starting to export. It follows that a simple test of Granger causality would attribute a positive impact of productivity change (the antecedent event) on export (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 intro-

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

duced by a series of Free Trade Agreements between the US and Canada³. 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 is that export entry causes positive changes in labor productivity, even if the effect differs across firms with different initial productivity levels. 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, the IV estimates obtained by Lileeva and Trefler would be a lower bound for the real effect of (perspective) export entry on productivity. These authors relate their findings to the complementarity between export entry and productivity enhancing investment.

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 extent 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. They interpret this pattern 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 investments. 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 for 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), that is likely to be a concern for our focus on growth and export as much as it is for studies on export and productivity⁴. We contend that the eligibility (or the intensity) of CT

³In their model causality depends on the complementarity between productivity enhancing investment and market expansion.

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

reduction is an appropriate instrument for firm growth because it affects the NPV of future investments, while it does not relate directly with the probability of export entry⁵.

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 this 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 methods

3.1 Data

The *Fichier complet unifié de Suse* (FICUS) is a database compiled by the French National Statistical Office (INSEE) that covers over 4 millions enterprises in manufacturing and services approximating the universe of French firms for the period 1996-2007⁶. We choose to limit our analysis to the manufacturing sector as it fits more closely the theoretical underpinning 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

⁵We 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.

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

296,715 firms⁷.

FICUS integrates data on balance sheet items collected for fiscal purposes with survey data. In this database we observe $immocor_{it}$: the book value of the tangible assets of firm i at time t . 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 ($Exp_{it} = 1$) those firms with positive revenues from foreign sales ($caexport_{it} > 0$). Data on firms' financial structure and on asset composition are used to compute the effective marginal rate EMTR and the effective average rate EATR of corporate taxation. Details on the construction of these variables are left to the Appendix (A.3).

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 revenues 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 revenues ($catotal_{it}$), to identify those that do not benefit from CT reductions. Ineligible firms are identified as those with average pre-reform revenues above the threshold, with a judicial form that is not subject for CT, or those that belong to foreign or domestic business groups. Although, the latter condition is more restrictive than the letter of the fiscal law, we are confident that the number of firms that we incorrectly identify as ineligible is not large enough to compromise the validity of the results⁹.

Within the set of the ineligibles we identify different but not-mutually exclusive groups of firms excluded from the tax reduction for violating the same condition. We define as 'Large' those firms with pre-reform average revenues above €7,630,000, as 'Business group' the ones affiliated to a group, and as 'Non-liable' those that are not liable for corporate taxation. Within the set of eligible firms, we identify a smaller group which includes only companies with average profit below the €38,120 threshold. Since the reduced tax rate applies only to profits below this threshold, these are those firms that benefit from the full 50% cut in the average and marginal statutory rates, both passing from 33.33% to 15%. Table 1 shows that their change in effective tax rates is slightly higher than the overall sample of eligible firms.

⁷From the whole sample of manufacturing firms we only discard those that switch between the treated and control groups over the period of our analysis (26,088 firms counting for 8.08% of the manufacturing sector).

⁸Tangible assets includes land, building, equipment and machinery and assets under construction.

⁹According 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 does 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.

Table 1: Tax gain from the reform (sample with selection)

	$\Delta EATR$			$\Delta EMTR$		
	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.

Finally, 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 2 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 represents 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 largely 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 by 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).

Table 2: Descriptive statistics, 1996-2007

		Nb firms	Tangible asset			Export propensity		
			Mean	sd	N	Mean	sd	N
All sample	without selection	296,715	715	18,010	1,618,708	0.167	0.373	1,619,340
	with selection	121,955	888	20988	1114414	0.188	0.390	1115255
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.

3.2 Does CT reduction promote growth? A DiD approach

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 depend 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.

Therefore, by using DiD to estimate the impact of CT reduction on firm growth we do not constraint the outcome variable (i.e., firms’ size) to have the same expected value in the groups of treated and untreated firms. We assume instead that any deviation in the common trend of firm growth across the two groups 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:

$$Tangibles_{it} = \alpha + \beta Eligible_i + \gamma(Eligible_i \times Post_{02}) + \sum_{t=98}^{'07} \delta_t + \sum_{s=16}^{36} \delta_s + \epsilon_{it} \quad (1)$$

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 β and γ 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 δ_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:

$$Tangibles_{it} = \alpha + \delta_i + \gamma(Eligible_i \times Post_{02}) + \sum_{t=98}^{07} \delta_t + \epsilon_{it} \quad (2)$$

where the interpretation of γ remains unchanged.

When we estimate specifications 1 and 2 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 γ 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 1 and 2 by comparing the group of treated firms ($Eligible_{it} = 1$) 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 γ 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 ('sample without selection') and on the sample obtained by dropping firms created after 2001 or that ceased their activity before 2003 ('sample with selection'). When the model is estimated on the 'sample without selection' average firms' size across groups is affected by post-reform entry and exit of firms. On the contrary in the 'sample with selection' coefficients are identified only by the impact of the reform on the evolution of those firms that were 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 unobserved policies or shocks whose timing overlaps with that of the CT reform. If this is 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 firms¹⁰. 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 reform of the statutory rate

¹⁰Because the reduced rate applies only to the first €38,120 of profits, 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 average statutory rate.

induces the following changes in effective rates:

$$\Delta EMTR_{i,pre/post} = EMTR(33.3\%)_i - EMTR(15\%)_i$$

$$\Delta EATR_{i,pre/post} = EATR(33.3\%)_i - EATR(15\%)_i$$

where $EMTR(\tau)_i$ and $EATR(\tau)_i$ are respectively the Effective Marginal and Average Rates of firm i calculated when the statutory rate is τ . The specification of the DiD regression with firm FE that we use for robustness check is:

$$Tangibles_{it} = \alpha + \delta_i + \gamma_1(\Delta TAX_i \times Post_{02}) + \sum_{t=98}^{07} \delta_t + \epsilon_{it} \quad (3)$$

ΔTAX_i is either $\Delta EMTR_{i,pre/post}$ or $\Delta EATR_{i,pre/post}$. Because ΔTAX_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 γ to be positive and statistically different from zero, because firms that enjoy greater reductions in effective rates should be more responsive to the policy.

3.3 Asset growth and export entry, an IV approach

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 IV-FE. This estimator first applies within-group transformation to the data so that to eliminate firm-specific time-invariant 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:

$$Exp_{it} = \alpha + \zeta \hat{T}_{it} + \sum_{t=98}^{07} \delta_t + \tilde{\epsilon}_{it} \quad (4)$$

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:

$$\tilde{T}_{it} = \alpha + \gamma \tilde{Exp}_{it} + \sum_{t=98}^{07} \delta_t + \tilde{v}_{it} \quad (5)$$

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 specifications¹¹. In this model, we use variations in tangible asset explained by the CT reform as instruments for asset growth. While the within-group transformation prevents omitted variable bias, the IV strategy makes sure that estimates on ζ in the second-stage model are not driven by reverse causality. Because the coefficients are identified by time-variations within individual firms' series, the coefficient ζ 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 DiD models we estimate model 4 on different samples obtained by pooling eligible firms together with firms belonging to different control groups. For robustness check we also estimate model 4 on the group of eligible firms only, and we substitute $\Delta TAX_{i,pre/post}$ to EP_{it} in 5 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-exporters¹². 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. The model assumes the following specification:

$$\Delta Exp_{i,pre/post} = \alpha + \zeta_1 \hat{\Delta T}_{i,pre/post} + \Delta \epsilon_i \quad (6)$$

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:

$$\Delta Tangibles_{i,pre/post} = \alpha + \gamma_1 Eligible_i + \Delta v_i \quad (7)$$

notice that in models 6 and 7 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 model 7 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 6 on the group of eligible firms only, by using ΔTax_i in 7 as an external instrument for $\Delta Tangibles_{i,pre/post}$.

¹¹FE-IV estimation is implemented by using the user-written command `xtivreg2` in Stata (Schaffer, 2005).

¹²Permanent non-exporters are firms that never export before 2001, or those that never export after 2002. Permanent exporters are firms that after the reform in 2003 export during all following periods.

4 Results

4.1 Graphical evidence

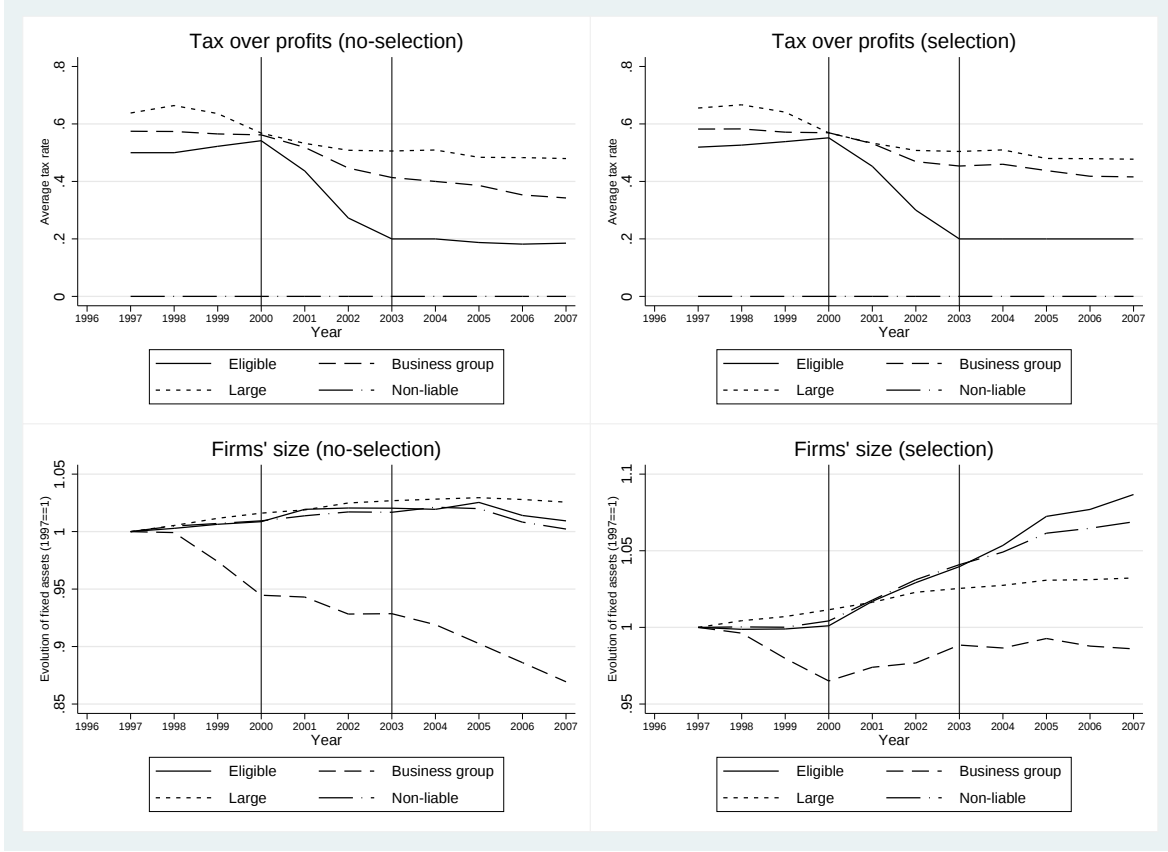
We begin this section by showing in fig.1 the evolution over the years of the median ‘backward’ tax rate (upper panels) and of the median firms size (lower panels) computed for different groups of firms¹³. Plots on the left-hand side are constructed using all the firms in the database, while plots on 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 $Tangibles_i$ ¹⁴. 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 firm size. 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 off 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

¹³By 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 profits. These rates are called ‘backward’ because they are the outcome of past firms’ investment choices. On the contrary EMTR and EATR are defined as ‘forward’ rates since they measure the impact of taxation on firms’ future investment.

¹⁴Each series is normalized by dividing the median of $Tangible_i$ by its initial value. This makes it easier to check the common trend assumption visually.

Figure 1: Evolution of tax rates and firm size, treated vs controls

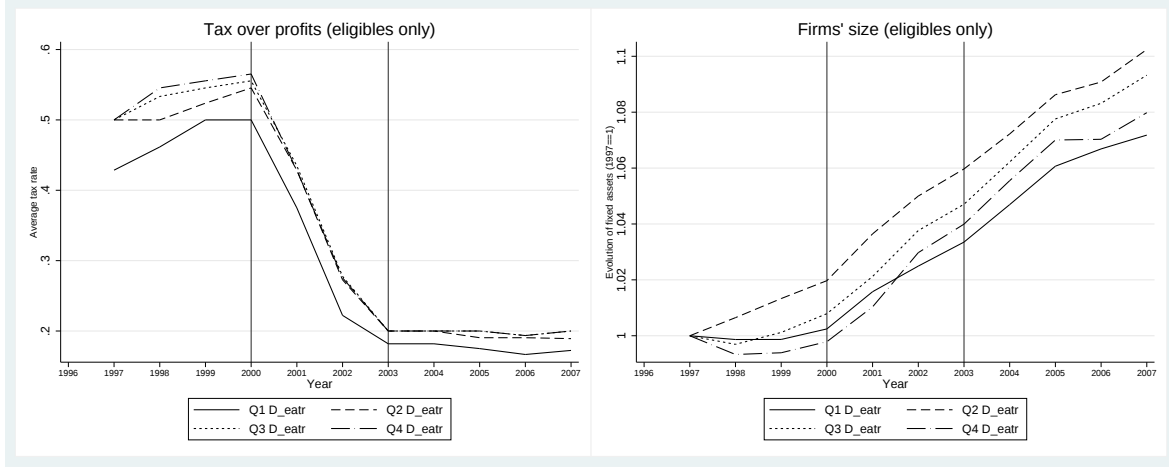


Note : We compare the unbalanced sample (“no selection”) to a sample in which we control that firms are present at least one year before the reform and one year after (“selection”). The latter sample therefore contains only surviving firms after the reform and does not include entrants after the reform.

similar to the one for eligible firms.

Because our robustness checks are conducted by exploiting the different impact that the change in the statutory rate had on the effective rates of eligible firms, in fig. 2 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. The figure confirms that firms in higher quartiles of $\Delta EATR_{i,pre/post}$ are those that benefit relatively more from a change in the statutory rate.

Figure 2: 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).

Another confirmation of the positive impact of the reform on firm growth emerges from the right-hand-panel. Firms that had the greater 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 1th quartile).

4.2 Regression results from DiD models

We now introduce the main results of our analysis, starting from the output of DiD regressions (models 1 to 3). 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 headings of the columns indicate which control group is used¹⁵. For each different control group we report both estimates from model 1 (OLS) and from model 2 (FE).

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 specification is estimated by excluding post-reform entrants (i.e., sample with selection) the estimated impact of the reform is positive and

¹⁵The heading ‘Untreated’ indicates that we compare the eligible firms against all the ineligible firms.

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								
<i>Eligible</i>	0.218*** (0.008)		-3.158*** (0.019)		-3.952*** (0.017)		0.749*** (0.007)	
<i>Eligible * Post₀₂</i>	-0.048*** (0.007)	0.038*** (0.005)	0.280*** (0.019)	0.082*** (0.011)	-0.101*** (0.015)	0.039*** (0.009)	-0.018*** (0.006)	0.033*** (0.005)
<i>Constant</i>	4.020*** (0.006)	3.919*** (0.002)	7.419*** (0.019)	4.375*** (0.003)	8.201*** (0.016)	4.340*** (0.003)	3.556*** (0.004)	3.692*** (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
N. (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								
<i>Eligible</i>	0.153*** (0.011)		-3.230*** (0.022)		-3.910*** (0.019)		0.782*** (0.009)	
<i>Eligible * Post₀₂</i>	0.046*** (0.006)	0.039*** (0.004)	0.140*** (0.015)	0.081*** (0.010)	0.098*** (0.013)	0.039*** (0.009)	0.048*** (0.005)	0.035*** (0.004)
<i>Constant</i>	4.216*** (0.008)	4.159*** (0.002)	7.629*** (0.021)	4.663*** (0.003)	8.299*** (0.018)	4.636*** (0.003)	3.640*** (0.006)	3.904*** (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
N. (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.

significant. According to the estimates obtained from the sample with selection, the reform induces an average increase in tangible asset of about 4%¹⁶. 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 profits. 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 profits 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 3 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

¹⁶Because we estimate a log-level model we can interpret the coefficient as percentage change induced on the dependent variable.

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 dummies 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 invalidity of the common trend assumption as it is clearly shown in fig.1; 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 profits 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 both in 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 full cut in the average statutory rate, causing a mean change in effective average rate of 14.7% ($\Delta EATR_i$), and a mean change in effective marginal taxation 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 adjustments in the size of investment projects that are already implemented, 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 profits below €38,120)

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

4.3 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* on $Eligible_i * Post_{02}$, and those obtained from second-stage regressions of *Exp_i* on the predicted values of *Tangibles*.

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). However, this estimate is much less precise than those obtained against other control groups and for this reason we are cautious in attributing economic meaning to this difference.

The results from the estimation of model 7 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

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: $\Delta Export_{t,t-1}$)								
<i>Tangibles(log)</i>	0.366*** (0.055)		0.450*** (0.068)		0.919*** (0.219)		0.323*** (0.059)	
<i>Eligible * Post₀₂</i>		0.039*** (0.004)		0.083*** (0.010)		0.040*** (0.009)		0.035*** (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
N	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*** (0.111)		0.573*** (0.175)		0.366*** (0.106)		-0.972 (0.916)	
<i>Eligible</i>		0.025*** (0.005)		0.032*** (0.008)		0.025*** (0.005)		-0.011 (0.009)
<i>Constant</i>	-0.068*** (0.020)	0.173*** (0.003)	-0.096*** (0.033)	0.166*** (0.007)	-0.055*** (0.019)	0.174*** (0.003)	0.210 (0.183)	0.209*** (0.008)
R^2	-0.947	0.001	-1.156	0.001	-0.749	0.001	-4.055	0.000
N	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.

(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 followed to construct the estimation sample for this specification that retains insufficient observations in the control group to identify correctly the impact of the reform on asset growth¹⁷. 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 aims 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 profits below €38,120, and by using the interactions of $\Delta EATR_i$ and $\Delta EMTR_i$ with the *Post₀₂* 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 7, 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

¹⁷Table 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.

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)

IV Stage:	EATR		EMTR	
	2nd	1st	2nd	1st
FE models (dependent: $\Delta Export_{t,t-1}$)				
<i>Tangibles(log)</i>	0.408*** (0.074)		0.363*** (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* (0.085)		0.173** (0.087)	
$\Delta EATR_i$		2.206*** (0.403)		
$\Delta EMTR_i$				0.422*** (0.079)
<i>Constant</i>	-0.012 (0.016)	-0.164** (0.064)	-0.016 (0.016)	0.138*** (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 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' tangible assets. When we focus on the sample of eligible firms with average profits below €38,120 we find that 50% cut in the CT rate is associated with a mean reduction of 14.7% in firms' specific Effective Average Tax Rates (EATR), and a mean reduction of 8.6% in their Effective Marginal Tax Rates (EMTR). In turn, these changes in effective rates cause respectively 36% and 4% asset growth. Because changes in EATRs are expected to impact firms' decisions to undertake new investment projects rather than to adjust the scale of existing ones, we argue that the economically significant increase in assets

that we found associated with a reduction in EATR may suggest that the reform encouraged SME to acquire capital goods associated with new projects.

The entry into foreign markets may be one of these projects. Indeed, when we use the CT reform as an instrument for asset growth, we find that increases in tangible assets positively affect firms' probability of exporting. On average, 10% increase in tangible assets is associated with 4% increase in the probability of exporting in each single year, and with 1.5% increase in the probability that a 'permanent' non-exporter enters 'permanently' into exporting.

Our results 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, the 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, our results suggest that policies encouraging SME growth are effective alternatives in fostering their participation in foreign markets.

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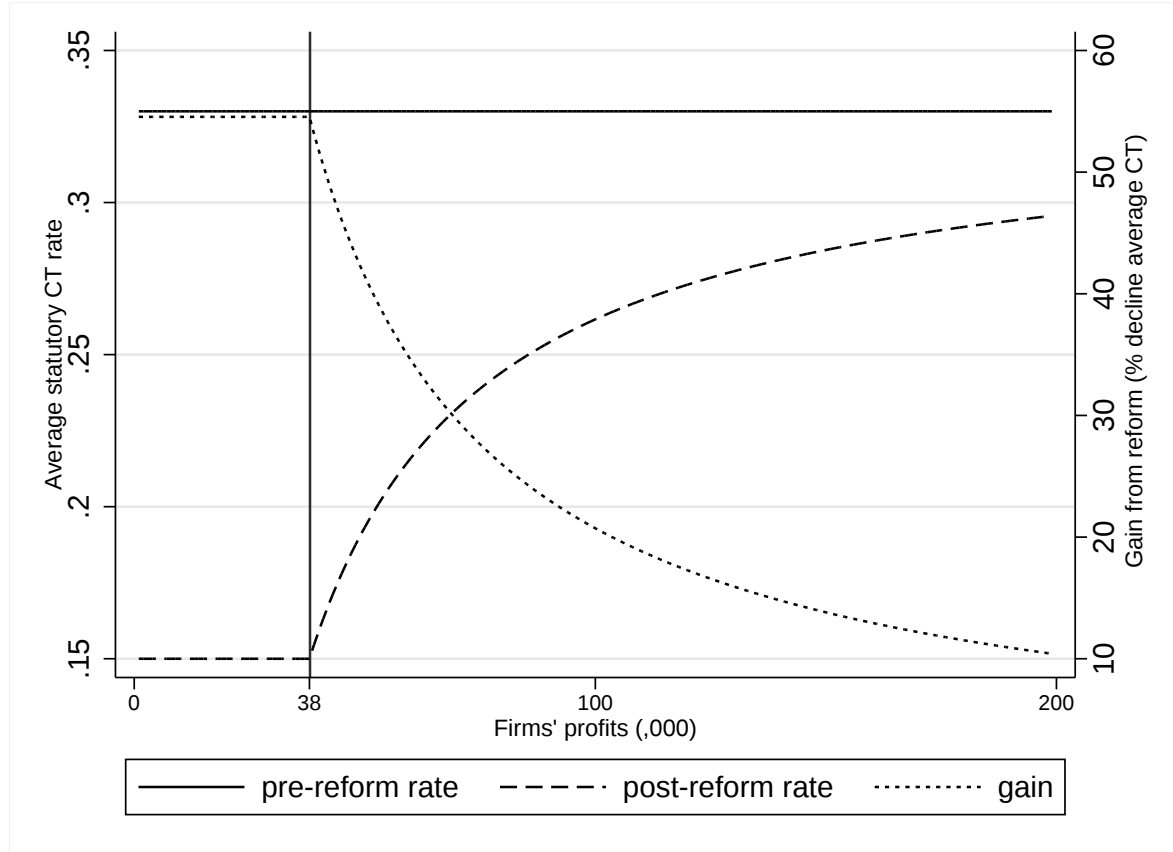
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Appendix

A1. Expected gain from the reform and firm profit.

Figure 3: Pre- and post-reform average statutory CT rates by levels of firm profit



A2. Variables and descriptive statistics

Tax ratio (tax over profit)

Ratio of corporate tax expenses over total profits.

Tangible assets $Tangibles_{it}$

Log of the book value of tangible assets ($immocor_{it}$).

Export propensity Exp_{it}

Binary variable that takes the value 1 if the firm's sales abroad ($caexpor$) are positive in year t , and zero otherwise.

We trim the extreme percentiles for each variable (1%) and we deflate at the sectoral level.

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).

A3. The construction of the EMTR and of the EATR

In the presence of corporate taxation, investment at the margins must yield higher returns than in absence of CT. This implies that in the presence of decreasing return to capital, corporate taxation reduces the optimal level of investment. EMTR captures the difference between the return of investment with taxation ($\tilde{p}$) and without taxation ($\bar{r}$):

$$EMTR = \frac{\tilde{p}_f - \bar{r}}{\tilde{p}_f}$$

according to the formulation of Devereux and Griffith (2003), $\tilde{p}_f$ is given by:

$$\tilde{p}_f = \frac{1 - A_f}{(1 - t)(1 - in)}[i + \delta_f(1 + in) - in] - \frac{F(1 + i)}{(1 + t)(1 + in)} - \delta_f \quad (8)$$

where $\bar{r}$ is the average real return of capital, $in = .025$ is the inflation rate, $i = [(1 + \bar{r})(1 + in) - 1]$ is the nominal interest rate (and firms' cost opportunity), and t is the statutory CT rate. The two firm-specific parameters are: A_f that is the net present value of the depreciation allowances per unit of investment, and δ_f that is the economic depreciation of firms' asset. Both depend on firms' asset composition. Following the approach of Egger *et al.* (2009) we obtain A_f and δ_f as:

$$A_f = A_m * \theta_{mf} + A_b * \theta_{bf} + A_i * \theta_{if}$$

$$\delta_f = \delta_m * \theta_{mf} + \delta_b * \theta_{bf} + \delta_i * \theta_{if}$$

where θ_{mf} , θ_{bf} and θ_{if} are the shares of machineries, buildings and intangibles over the total asset of firm f . FICUS data provides information on the composition of firms' asset into tangible and intangible asset. To disaggregate further tangible assets into buildings and machineries we use industry shares obtained from McKenzie *et al.* (1998) by multiplying them with firm-specific shares of tangible asset. A_m , A_b and A_i are net present values of depreciation allowances calculated with asset-specific linear depreciation rates as reported in the *Bulletin Officiel des Finances Publiques*¹⁸. $\delta_m = .1225$, $\delta_b = .0361$ and $\delta_i = .15$ are the standard parameters used in the tax literature for the economic depreciation of machineries, buildings and intangibles.

Firms' financial structure (i.e., proportion of debt financing) modify the *EMTR* through the term F in equation 8:

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

we calculate the effective marginal tax rate $EMTR_f$ of firm f as:

$$EMTR_f = EMTR_{sf} * (1 - lev) + EMTR_{df} * (lev)$$

where $EMTR_{sf}$ is the rate assuming self financing, $EMTR_{df}$ is the one assuming debt financing, and lev is the proportion of debt financing of firm f .

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):

$$R = (1 - i)^{-1} \{ (1 + in)(i + \delta)(1 - t) - (1 - A_f)[(1 + i) - (1 + in)(1 - \delta_f)] \} + F \quad (9)$$

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

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

where $R^* = \frac{p-r}{1+r}$ is the NPV of the investment without tax, and R_f is the post-tax net present values of the investment. At the denominator $p = .2$ is the pre-tax real return on capital set at the standard value used in the literature on effective taxation (Egger *et al.*, 2009).

¹⁸bofip.impots.gouv.fr/bofip/4520-PGP?datePubl=17/04/2013.

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