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## Corporate Taxation and Exports

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### Abstract

The paper analyses the relationship between corporate taxes and exports at firm level. We use an integrated dataset that combines, for the period 2004-2006, survey data (*Indagine sulle Imprese Manifatturiere*) and company accounts for the manufacturing sector to estimate a Probit and a Tobit model. Our results suggest that export participation as well as export intensity increase with corporate taxation. Consistently with recent developments of the corporate tax incidence theory, this finding can be traced out to the greater ability of exporting firms to shift the tax burden on international markets, compared to domestic firms. Calculation of the average and marginal corporate tax rates uses the methodology recently developed by Egger et al. (2009) which allows deriving firm-specific effective corporate tax rates.

*Keywords:* corporate taxation, exports, effective tax rates

*JEL Classification:* H25, H32; F14

### 1. Introduction

There is a growing body of literature analyzing the export behaviour of firms. Mostly, researchers have investigated the differences between exporters and non-exporters with regard to readily identifiable firm characteristics. Firm specific attributes and sector wide characteristics have been used to model export propensity, and among these, productivity, firm size, firm age, product and export market diversification have been focused upon. At the sector level, measures of concentration or competition have received the maximum attention. Exporters tend to be larger, more productive, use more capital intensive production and employ a more highly skilled workforce (see, e.g., Bernard and Jensen 1995, 1999, 2007; Eaton, Kortum and Kramarz 2004, 2008; Wagner 2007; Mayer and Ottaviano, 2007; Greenaway and Kneller 2007 for a survey of the literature).

Theoretically, productivity, used as a proxy for efficiency, is considered the key factor determining the difference in export behavior of firms. Successful export performance is due to certain firms having high

enough productivity to overcome the costs of exporting (see, e.g., Bernard et al. 2003; Melitz 2003; Melitz and Ottaviano 2008).

This paper is motivated by new insights in the light of the recent heterogeneous firm's literature, initiated by Melitz (2003)<sup>1</sup>. This literature has extensively analyzed firms export behavior unveiling a number of new and interesting stylized facts and what it adds to our understanding of export activity is that a combination of sunk costs and heterogeneity in the underlying characteristics of firms explains why not all firms export.

Despite an overlap in the vector of determinants across studies, the international evidence on export activity determinants is mixed. Results from different countries and industries point in different directions. Our aim is to add new insights on the determinants of firms' export performance in a world of heterogeneous firms focusing on the relationship between corporate taxes and exports at firm level<sup>2</sup>. In our opinion, heterogeneity in firm-specific costs (taking into account corporate taxation) seems interesting as heterogeneity in productivity or other factors.

We start out from the observation that firms' export shares (export to sales ratio) vary greatly among enterprises and tend to be systematically related to the firms characteristics and modeling exporting activity at the firm level throws up a range of possible channels through which exporting might be linked to firm characteristics. In our work, we relate differences in export shares to firm level differences in corporate taxation incidence and we focus on firm responses to corporate taxation changes. Accordingly, when governments change corporate tax rates, by virtue of firms' heterogeneity in the composition of their capital stock, investments financing and involvement in foreign markets, they induce heterogeneous effects across firms.

The actual incidence of corporate tax is one of the most controversial issues in tax policy analysis since the seminal paper of Harberger (1962). The issue of who effectively bears the burden of the corporate income tax has not been settled so far, whether by theory or empirical work (for a review of tax incidence in general, see Fullerton and Metcalf, 2002). Our analysis is related to the Gravelle and Smetter (2006) paper that reconsiders the incidence of capital taxes in an open economy and interestingly finds that most of the incidence is exported.

The empirical analysis presented in this paper uses micro data for a representative sample of Italian manufacturing firms, drawn from a reliable dataset, and examine to what extent corporate taxation affects firms' export behavior. Specifically, we use an integrated dataset that combines the *Indagine sulle Imprese*

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<sup>1</sup> See also Bernard et al. (2007), and Mayer and Ottaviano (2007) for comprehensive surveys of the empirical literature.

<sup>2</sup> On the importance of firm heterogeneity for profit taxation see Davies and Eckel, 2007, 2010; Egger and Loretz, 2020.

*Manifatturiere* collected every three years by the Unicredit Bank with company accounts provided by Cerved. Data refer to the period 2004-2006.

Computation of the average and marginal corporate tax rates builds on the methodology recently developed by Egger et al. (2009) which allows calculation of firm-specific effective corporate tax rates.

The relation between corporate taxation and firms' export behaviour remains largely unexplored, particularly at the micro level. Indeed, most studies are carried out at the macroeconomic level. For example, Keen and Syed (2006) consider the ways in which the tax structure might affect exports. The authors use panel data for OECD countries from 1967 to 2003 to examine the effects of corporate taxes on export performance and find that increases in corporate taxation—whether measured by revenues or the statutory rate—are associated with sharp short-run increases in net exports.

Two dimensions of firm level export performance have been focused upon: export propensity and export intensity. The former is defined as whether or not a firm is an exporter. The latter is measured as the ratio of export sales to the firm total sales. Among the two dimensions, export propensity features more prominently in the literature (see Hiep and Nishijima, 2009 for a review). The reason behind this is that researchers might consider the decision to export or not to be made simultaneously with the decision of how much to export. However, recent papers such as Helpman et al. (2008) and Lawless and Whelan (2008) find that although the two decisions are interdependent, they are different and the impact magnitudes of each factor on the two decisions are heterogeneous. This supports our choice to undertaking separate investigations to identify the determinants of exports.

The organization of the paper is as follows. The next section lays out synthetically the recent reforms of the Italian corporate tax system. Section 3 set up the basic framework to compute the effective tax rates. Section 4 states the theoretical background of the relationships between corporate taxation and exports. Section 5 describes data and methodology. Section 6 discusses the estimates results. The last section concludes.

## **2. The Italian corporate tax system and its recent reforms: an overview**

From its inception in the early 1970s, the Italian business income tax regime changed only marginally for over twenty years<sup>3</sup>. Indeed, until the mid-1990s, while other countries adopted reforms of the base-broadening/statutory rate cut type (Messere et al., 2003), Italy moved in the opposite direction, actually increasing the corporate tax rate. Starting in 1997 then Italy enacted two main reforms with the declared objective to reduce corporate taxation in order to foster firms' competitiveness, as well as to simplify the

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<sup>3</sup> This section draws on Oropallo and Parisi (2007).

system.

The first reform (1997) was mainly based on the introduction of the so-called Dual Income Tax (DIT) system, basically an Allowance for Corporate Equity (ACE)<sup>4</sup>, and of a new tax (IRAP)<sup>5</sup> as a replacement for pre-existing taxes (ILOR, a tax on companies' net assets) and health insurance contributions paid by firms.

The DIT system worked as a dual-rate schedule in which overall profits are divided into two components. The first approximates normal profits, i.e. the opportunity cost of new financing with equity capital compared with other forms of capital investments, and was taxed at the preferential rate of 19%. The second component of overall profits is computed residually from total profits after normal profits and represents business extra-profits. It was taxed at the prevailing statutory rate of 37% up to 2000, cut to 36% in 2001<sup>6</sup>. As a result of the operation of the DIT scheme, the "effective" statutory rate ranges between 19% and 36%, depending on the amount of profits qualifying for the allowance.

Therefore, given the features of the DIT allowance, the primary policy objective was a selective reduction in the burden of taxation, to reduce the tax distortion between equity and debt financing.

The second reform came into effect in 2004 and actually responded to a different policy design. Indeed, the general declared aim of the policy maker was to simplify the tax treatment of firms through standardisation of capital income taxation, the abolition of the dividend tax credit and group taxation, as well as to foster firms' competitiveness. Concerning the neutrality issue, the idea behind the reform is that the tax system should not interfere with firms' financing decisions. Consequently, the incentives for equity capital provided by the DIT allowance are eliminated.

The features of corporate income tax system introduced in 2004 are: i) the abolition of the dual-rate system and the introduction of a single rate of 33%; ii) the introduction of a participation-exemption regime and the abolition of the dividend tax credit; iv) the introduction of thin capitalisation rules; iv) the introduction of an optional consolidated tax declaration for groups that can be extended also to foreign

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<sup>4</sup> An ACE system has a number of attractive properties. The first is that it meets neutrality between debt and equity financing if tax parameters are chosen correctly. The second feature is that as the tax is not levied on the marginal investment, this system is neutral to firm investment decisions. Another property is that the system offsets the distortion originated by the difference between depreciation for tax purposes and economic depreciation (Boadway and Bruce, 1984), as the advantage generated by tax depreciation is fully compensated by the reduction of (future) allowances. In this sense an ACE is again neutral over company investment decisions.

<sup>5</sup> This is a regional tax paid by corporations and unincorporated firms on their value added net of depreciation and amortisations, i.e. with no deduction of interest expense and labour costs from the tax base. The statutory tax rate is 4.25%, although since 2000 regions may vary the rate within specific limits.

<sup>6</sup> The DIT allowance was subject to several changes in the period in which it was in operation, mainly aiming at accelerating the application of this allowance while at the same time preserving revenue losses given the public finance obligations Italy had to meet within the European Monetary Union process. Also it must be noted that while this allowance was definitely repealed in 2004, in July 2001, when a new government took office, some changes were made to the mechanism in order to curb its effects. These changes anticipated the intention of the (new) policy maker to abolish the dual-rate allowance. On these aspects see Oropallo and Parisi (2007).

subsidiaries.

Therefore the overall tax rate sums the corporate tax (33%) and the IRAP tax rate.

The present corporate tax system is based upon the one introduced with the 2004 reform. Here it must be noted that some minor changes were introduced in 2008. The most important one is the repeal of thin capitalisation rules and the introduction of a new limit on interest costs deductibility linked to the company operating income.

### 3. Computation of effective corporate tax rates

The methodology to compute corporate effective average tax rates (EATR) is based upon the methodology recently proposed by Egger et al. (2009) to calculate firm-specific effective tax rates. In turn, this bases upon the approach originally developed by Devereux and Griffith (1998) to calculating forward-looking effective tax rates, and widely used in the literature. The idea behind this approach is to compute the tax burden falling on a hypothetical investment project incorporated into a neoclassical investment model, by taking into account the main determinants of the corporate tax system (statutory tax rates, tax allowances, specific investment tax credits) and of personal taxation. Such rates are also defined as forward-looking effective tax rates and have the advantage of being independent of tax planning activities of the company. Therefore, they are exogenous from an empirical perspective.

In this section we describe the basic model we used to derive the effective tax rates for Italy, and refer to the original paper of Egger et al. (2009) for technical descriptions of the model and the various equations. EATRs measure the average tax burden on an investment giving a pre-defined rate of profitability and are calculated as the difference between the pre-tax net present value of investment ( $R^*$ ) and its after-tax net present value ( $R$ ) over the pre-tax rate of return on capital, defined by the ratio between the rate of profitability  $p$  and  $(1+r)$  where  $r$  is the market interest rate.

Formally we have that:

$$[1] \quad \text{EATR} = (R^* - R)/p/(1+r)$$

where  $R^* = (p-r)/(1+r)$ .

The expression of  $R^*$  depends on the various items of the corporate tax system that can be modelled, as well as on the source of financing, that is debt, new equity issues, retained earnings (see Egger et al., 2009).

This approach also allows to compute effective marginal tax rates (MTRs), measuring the tax burden on an investment giving no-extra profits, that is an after-tax return which equals the return on an alternative assets. While EATRs usually inform on the effects of the tax system on company binary choices, EMTRs study the impact of the tax system on company investment decisions (at the margin) and its funding sources. We will discuss this point further in section 5.

Formally:

$$[2] \quad \text{EMTR} = (p' - r')/p'$$

where  $p'$  is the cost of capital, that is the before-tax rate of return of the investment. For the equation of the cost of capital, depending again on the company financing sources, see again Egger et al. (2009). Because we abstract from shareholders' taxation<sup>7</sup>,  $r'=r$ .

Below we report the parameters used in the calculation of EATRs and EMTRs, actually based on the relevant literature:

1. profitability rate:  $p=0.20$ ;
2. interest rate:  $r=0.05$ ;
3. inflation rate:  $\pi = 0.025$ ;
4. rate of economic depreciation for machinery:  $\delta^m=0.01225$ ;
5. rate of economic depreciation for building:  $\delta^b=0.0361$ ;
6. rate of economic depreciation for inventories:  $\delta^{inv}=0$ ;
7. rate of economic depreciation for intangible assets:  $\delta^I=0.15$ .

Computation of firm-specific tax rates comes from the use of weights reflecting the actual (based on information available in the dataset) company assets structure and its financial policy.

The first are used in the calculation of the net present value of economic depreciation rates<sup>8</sup> (see equation 11 in Egger et al., 2009). The second are used when weighting the combinations of financing opportunities to obtain overall measures of EMTRs and EATRs. Specifically, we assume companies have two choices, equity capital and debt. Choices are weighted on the basis of the actual debt-equity ratio computed for

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<sup>7</sup> This is in line with the literature (see Egger et al., 2009 and Devereux and Griffith, 1998). Indeed, considering that a relevant part of companies is owned by other companies and that this choice cannot be modelled, personal taxation may not be so relevant and could lead to biased estimates of effective tax rates.

<sup>8</sup> Specifically, we calculate the share of tangible fixed assets, intangible fixed assets, stock of current assets over total assets, for each firm.

each firm on the basis of accounts data available in the dataset<sup>9</sup> and therefore reflecting the companies' actual financial policy.

Tables 1, 2 display the effective marginal and average tax rates for the years 2003, 2004, 2005, by activity sector (using the Pavitt classification available in the dataset).

**Tab. 1 – EATRs by activity sector (Pavitt classification); years 2003, 2004, 2005**

	2003	2004	2005
Traditional sectors	35.18	34.87	34.97
Scale sectors	35.44	34.84	34.94
Special sectors	36.23	35.86	35.90
High-tech sectors	35.59	35.15	35.23
<b>Mean</b>	35.53	35.15	35.23

Source: authors' calculations

**Tab. 2 – EMTRs by activity sector (Pavitt classification); years 2003, 2004, 2005**

	2003	2004	2005
Traditional sectors	30.40	29.75	29.90
Scale sectors	29.65	28.96	29.10
Special sectors	32.25	32.42	32.31
High-tech sectors	31.43	31.12	31.02
<b>Mean</b>	30.82	30.42	30.48

Source: authors' calculations

EMTRs are usually lower than EATRs, as they can also be negative. The results show that EATRs decrease in 2004, probably depending on the reduction of the statutory corporate tax rate enacted in 2004, but increase, though of a very small amount, in 2005. Also the EMTRs decrease in 2004 but slightly increase in 2005.

#### 4. Data and methodology

In the empirical analysis we use an integrated dataset combining micro-data from the 10th survey (2004-2006) *Indagine sulle Imprese Manifatturiere* and balance sheets data. The survey is administered by the

<sup>9</sup> The debt-equity ratio is defined as the ratio between current and non-current liabilities and company total assets. From the analysis we exclude firms for which the debt-equity ratio is negative or greater than 1.



Unicredit Bank and is based on a questionnaire sent to a sample of firms of the manufacturing sector every three year<sup>10</sup>. The sample covers 5,134 firms, of which 4,936 corporations and 198 unincorporated enterprises<sup>11</sup>, and is stratified by size class, geographic area and industry to be representative of the population of Italian manufacturing firms with more than 10 employees (39,868 enterprises). Balance sheets data are collected by Cerved and are exhaustive for the corporate sector.

The final dataset contains information on the firm's features (size, employment structure, legal status, participation in groups), and the firm's activity (investments, internationalization, finance). The company accounts contain the information necessary to calculate the firm-specific corporate (marginal and average) tax rates (see section 3).

Tables 3, 4, 5 provide some summary statistics on the companies present in the dataset, respectively regarding the Pavitt activity sector breakdown, the firm size as measured by the number of employees, the number of exporting and non-exporting companies.

**Table 3 – Number of companies present in the dataset by Pavitt activity sector (year 2006)**

Sector	Number	%
Traditional sectors	2,451	49.7
Scale sectors	935	18.9
Special sectors	1,325	26.8
High-tech sectors	225	4.6
<b>Total</b>	<b>4,936</b>	<b>100.0</b>

Source: Indagine sulle Imprese Manifatturiere, Unicredit

**Table 4 – Number of employees of the companies present in the dataset (year 2006)**

Size	Number	%
11-20	1,775	36.0
21-50	1,591	32.2
51-100	766	15.5
101-250	458	9.3
251-500	170	3.4
500-1000	80	1.6
More than 1000	96	1.9
<b>Total</b>	<b>4,936</b>	<b>100,0</b>

<sup>10</sup> Data from the this survey have been extensively used by other authors to study different aspects of the Italian economy (e.g., Benfratello and al., 2008; Caggese and Cunat, 2008). Most closely related to the present work are a number of papers concerned with internationalization of Italian firms (e.g., Castellani, 2002; Casaburi et al., 2007; Vannoni and Razzolini, 2008).

<sup>11</sup> We also include in this group firms not reporting their legal status, which amount to 51.

Source: Indagine sulle Imprese Manifatturiere, Unicredit

**Table 5 – Number of exporting/non-exporting firms (year 2006)**

	Number	%
Exporting	3,080	62,4
Non-exporting	1,826	37,6
<b>Total</b>	<b>4,936</b>	<b>100,0</b>

Source: Indagine sulle Imprese Manifatturiere, Unicredit

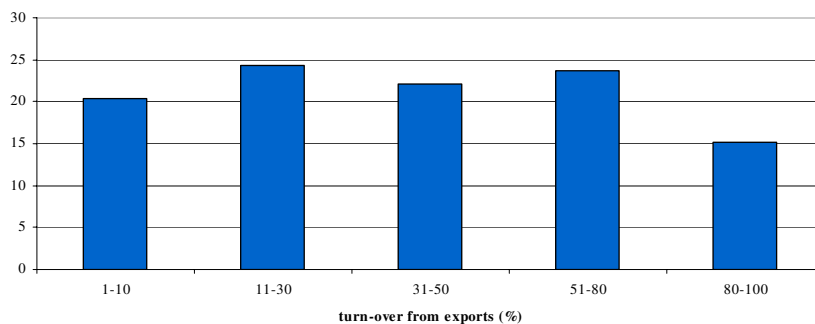
The majority of firms in the sample operate in traditional sectors (49.7%) and in special sectors (26.8%), while only 4.6% produce in high-tech sectors.

Turning to the firm size we can see that the greatest number of companies can be qualified as small-medium sized companies, employing up to 50 workers, in line with the well-known features of the Italian manufacturing sector.

Finally, over 60% of enterprises present in the dataset export.

Finally, Figure 1 illustrates the firm export intensity, measured by the incidence of turn-over from exports on the total, showing that this aggregate is quite relevant.

**Figure 1 – Turn-over from exports. Year 2006, % values.**



Source: Indagine sulle Imprese Manifatturiere, Unicredit

## **5. Corporate taxation and exports: the theoretical background**

When investigating on the relation between enterprise domestic taxation and export performance, one important consideration for the EMU is that since the introduction of the single currency the Member

States cannot rely on exchange rates adjustments as policy instrument<sup>12</sup>. Therefore, the basic point is whether lowering domestic taxation on firms (in the form of social security contributions, the value added tax, taxes on business income) should be considered as an internal exchange rate devaluation and can be used to improve trade balance (Alworth and Arachi, 2008). In this framework the corporate tax rate cutting reforms enacted by most OECD countries in recent years can be interpreted as measures aimed at fostering firms' competitiveness both on the domestic market as well as on international markets.

A few papers explore these theoretical predictions and test empirically the effects of corporate taxation on trade. In this direction, Keen and Syed (2006) set up a two-period model, where investment is undertaken in period 1 and yields output in the following period. Corporate taxation drives investments until its after-tax marginal productivity equals the gross interest rate. A source-based corporate tax reduces domestic investment and results in greater capital exports in the first period. As a consequence the country runs a trade surplus which reduces in the second period given higher income flowing from abroad due to the investment undertaken abroad in the first period<sup>13</sup>.

In this model the corporate tax is levied only on the marginal return to investment (and savings) but it does not affect the infra-marginal units (rents). However, corporate taxes in actual systems are designed to bear also on these units. Taxation of rents would have effects on the level of investment only if fixed factors are internationally mobile, that is an increase in the corporate tax will drive investment abroad.

Keen and Syed (2006) also test empirically the impact of corporate taxation on net exports using a panel covering OECD countries in the period from 1967 to 2003. In a static framework Keen and Syed (2006) find a significant and robust positive effect of corporate taxation (measured as the ratio of corporate tax revenue on GDP) on export performance. However this effect would fade in the long period (after ten years) where the overall impact of corporate taxation on net exports converges to zero. This is in line with increased income from abroad as a consequence of the initial reallocation of capital abroad, as discussed above.

Recently, Alworth and Arachi (2008) test the relation between some measure of the corporate tax rate (corporation tax revenue over GDP) and net exports in goods and services for a panel of OECD countries from 1970 to 2005. The authors find a positive relation and also show that the sensitivity of net exports to

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<sup>12</sup> Empirical investigation of the relationship between exchange rates and exports has a long tradition in the international trade literature (for a review see Clark et al., 2004). This has been maintained as the international trade literature has become more micro-focused following the publication of Bernard and Jensen (1995, 1999) and Melitz (2003). A number of studies have examined the effect of exchange rates on the export behavior of individual firms (Bernard and Jensen, 2004; Campa, 2004; Das et al., 2007).

<sup>13</sup> On the opposite, a residence-based tax would have no effect on domestic investments since it does not affect the return required by non-resident investors. Therefore source-based or residence-based taxes actually have very different effects on the pattern of net exports and the questions of whether considering actual systems as source-based or residence-based becomes central. The authors conclude that most corporate tax systems are close to source-based schemes.

the corporation tax has increased after the introduction of the Euro.

These results are somehow in line with those of earlier studies. For instance, Slemrod (2004) finds a positive relation between the corporation tax, again measured in terms of the ratio between tax revenue on GDP, and trade intensity.

In analysing the impact of the corporation tax on firm export decisions, the obvious basic assumption is that the tax represents a cost for the firm. In this respect a cut in the statutory corporate tax rate may be regarded as a cut in the firm tax related cost that may expand enterprise activity, and along this line also exports. This is consistent with the theory of internal devaluation.

However, in this simple framework, the effective incidence of the corporation tax plays a crucial role and must be taken carefully into considerations to examine the effects of taxes on firm's activity. The conclusion reached above relies on the implicit assumption that the corporate tax is effectively borne by the firm, which might not be the case. Furthermore, the degree of enterprise openness may affect the ability of the firm to shift the corporation tax burden.

The corporation tax incidence is one of most controversial issues in tax policy analysis. The standard theory was developed in 1962 by Harberger initially for a closed economy, then in the mid 70's extended to the open economy case<sup>14</sup> (see Harberger, 2008, and for a review Gravelle and Smetters, 2006, and Auerbach, 2005).

In line with the original analysis of Harberger (2008), Gravelle and Smetters (2006) consider a four sector (manufacturing-the traded corporate sector, agriculture, services and utilities- the non-traded corporate sector, trade and services) general equilibrium model of an open economy. While in the short-run the corporate tax burden falls mainly on capital, in the long-run (a lapse of time that allows for capital reallocations) the tax incidence depends on four factors: (a) the elasticity of substitution between the goods produced by the corporate sector and foreign goods; (b) the elasticity of substitution between domestic and foreign capital; (c) the factor elasticity of substitution; (d) the elasticity between the goods produced by the four sectors of the economy.

Gravelle and Smetters (2006) show that the tax burden falls mainly on capital and to a lesser extent on labour, though the shared burden depends on the values of the model parameters<sup>15</sup>.

One interesting and novel result of the incidence analysis developed by Gravelle and Smetters (2006) is that some of the burden can be "exported", that is falls on foreign production factors. Specifically, the

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<sup>14</sup> In tax incidence analysis the definition of closed or open economy scenario depends on the assumptions on the countries behaviour in setting their tax rates. Namely, if one assumes one country (or a small number of countries) changes its tax rate, while the others leave their tax rates unchanged, the appropriate model is the open economy one. On the opposite, if all countries (or a large number of countries) change their rates in tandem, they respond to the closed economy model.

<sup>15</sup> These results are in line with the recent literature on tax incidence (see also Auerbach, 2005), but not on the original conclusions of Harberger (2008) who argued that in the long-run capital does not bear the tax burden at the expense of labour.

exported burden increases with the elasticity of substitution between domestic and foreign capital and is greatest when product elasticity is low.

## **6. Estimation results.**

The arguments traced above suggest that exporters may have a greater capacity to shift the corporate tax burden on foreign factors and foreign consumers, compared to domestic firms which on the opposite bear much of the tax in terms of a reduced after-tax rate of return on invested capital.

To examine the effects of corporate taxation and industry characteristics on export performance, two different indicators of export performance are used, export propensity and export intensity.

However, before turning to the estimation results, one specific point deserves discussion. This concerns the choice of the appropriate tax indicator when analysing the effects of corporate taxation on export decisions (and, more generally, investments).

Export propensity of the firm can be interpreted as a discrete choice between serving only the domestic market or exporting to foreign market. This decision is also similar to the choice a firm faces when deciding whether or not to undertake R&D investments, or the choice of a multinational when deciding between a given number of mutually exclusive locations for its investment, as well discussed by Devereux and Griffith (1998).

In binary choices, given a net present value of the investment, the firm evaluates the impact of taxation on the post-tax present value for each choice (in our case, exporting or serving the domestic market), that is how taxation affects the infra-marginal units, i.e. the ones for which the return of the investment is greater than the marginal cost. So in these cases the most appropriate indicator is represented by the EATR, that as explained in section 3 measures the average tax burden on an investment giving a pre-defined rate of profitability.

Conditional on that choice, then the size of investment can be modelled as a marginal choice and in this case the relevant indicator is the EMTR. Indeed, this measures how taxation affects the marginal unit, for which the return equals the marginal cost.

### **6.1 Export Propensity**

The theoretical decision to export can be expressed as a binary choice model where the dependent variable ( $EXP_{it}$ ) equals 1 if firm's exports are positive in that year, 0 otherwise:

$$[3] \quad EXP_{it} = \begin{cases} 1 & \text{if } EXP_{it}^* > 0 \\ 0 & \text{if otherwise} \end{cases}$$

We estimate the probability of exporting as a function of the following variables: the EATR in 2004, the log of net capital (resulting from the balance sheet), the number of skilled workers on the total number of employees, innovation, i.e. if the firm has undertaken innovative investments (either in terms of product, process, organisational innovation) in the period 2004-2006, the geographical area, the Pavitt activity sectors, the firm's age, the log of the firm size (expressed in terms of the number of employees).

Table 6 displays the Probit regression estimates.

**Tab. 6 – Export decisions: Probit estimates; year 2006**

Export_06	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
EATR (2004)	1.6140	0.5388	3.0000	0.0030	0.5580	2.6700
Log capital	0.0612	0.0152	4.0200	0.0000	0.0314	0.0910
Innovation	0.1967	0.0420	4.6800	0.0000	0.1143	0.2791
Skill_labour	0.0018	0.0006	3.2900	0.0010	0.0007	0.0029
Geographical area	-0.2449	0.0460	-5.3200	0.0000	-0.3351	-0.1546
Pavitt activity sector	0.0968	0.0215	4.5000	0.0000	0.0546	0.1389
Age	0.0019	0.0010	2.0200	0.0440	0.0001	0.0038
Log size	0.2700	0.0282	9.5800	0.0000	0.2148	0.3253
_cons	-2.1261	0.2822	-7.5300	0.0000	-2.6792	-1.5729

Source: Authors' estimates

Iteration 0: log pseudolikelihood = -24339.986  
 Iteration 1: log pseudolikelihood = -22791.496  
 Iteration 2: log pseudolikelihood = -22787.563  
 Iteration 3: log pseudolikelihood = -22787.563

Number of obs = 4609  
 Wald chi2(8) = 365.47  
 Prob > chi2 = 0.0000  
 Log pseudolikelihood = -22787.563                      Pseudo R2 = 0.0638

The probability of engaging in exports is positively affected by the EATR and the coefficient is statistically significant and quantitatively relevant (1.61). This result might seem unexpected as the basic economic intuition might suggest that taxation reduces firm's activity, and therefore also exports. However, in line with the results of the tax incidence theory, a higher EATR induces firms to "re-locate" their investments and plays an important role in determining firms' internationalization. As already

discussed, the EATR, in our case, refers to discrete “location choice” (domestic or/and export participation) or the extensive margin of exports.

The argument that in an open economy the corporate tax can be exported holds in the long run where capital reallocations are possible. The case we are considering here actually may qualify as an intermediate period rather than a long term. However, it is reasonable to assume that even in the intermediate run internationalized firms have greater capacity than domestic firms to face market constraints, and therefore to shift, maybe to a lower extent than in the long run, the tax related cost.

In addition, one potential explanation for this result could be related to the theories of business management that reveal a different channel through which firms’ individual characteristics actions and environment affect export performance. Indeed, exporting activity can be conceptualized as a strategic response by management to the interplay of firms’ internal and external forces. Besides affecting export performance of firms directly, the internal and external factors also indirectly influence export performance by affecting the export marketing strategy of firms. Enterprises trying to shift the tax burden, try to earn larger market shares and profits in domestic and foreign markets. When domestic competition gets “tougher”, domestic rivalry pushes firms to improve efficiency as well as to find new markets, including overseas ones: perceived competition enhances firms’ export involvement (Cloughety and Zang, 2008)<sup>16</sup>.

The effects of the remaining variables is in line with the already well-established literature on the determinants of export activity. The coefficients are significant and they are all positive, except for the geographical area suggesting that Southern firms have lower propensity to export.

The analysis of the marginal effects (table 7), strengthens the role of corporate taxation in influencing export propensity. The value of the estimated parameter is sizeably high (0.62) compared with the coefficients of the other variables. This means that a marginal increase in the average corporate tax rate leads to an increase in the probability of exporting of 0.62 points.

**Tab. 7 - Export decisions: Probit estimates; year 2006. Marginal effects**

$$y = \text{Pr}(\text{export}_{06}) \text{ (predict)}$$

$$= .60827022$$

Variable	dy/dx	Std. Err.	Z	P>z	[ 95% Confidence Interval ]
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<sup>16</sup> We estimate the same model expressed in eq. [1] using the EATR of 2005 and the main message remains the same: corporate taxation and export choices are positively associated. Indeed, the coefficient is positive (1.98) and statistically significant.

EATR (2004)	0.6192962	0.20667	3	0.003	0.21423	1.02437	0.351803
Log capital	0.0234769	0.00584	4.02	0	0.01204	0.034916	13.7192
Innovation	0.0758066	0.01624	4.67	0	0.04398	0.107631	0.610933
Skill_labour	0.0007036	0.00021	3.29	0.001	0.00028	0.001123	31.0811
Geographical area	-0.093949	0.01767	-5.32	0	-0.12858	-0.05932	1.27286
Pavitt activity sector	0.0371337	0.00826	4.5	0	0.02095	0.053317	1.83004
Age	0.0007356	0.00036	2.02	0.044	2.1E-05	0.00145	26.4501
Log size	0.1036106	0.01083	9.56	0	0.08238	0.124842	3.35013

Source: Authors' estimates

## 6.2 Export Intensity

To go deeper into the relation between corporate taxation and firm's export activity, we extend the analysis by considering export intensity as dependent variable in the regression model.

To estimate how firms' export intensity is characterized by various factors we should take into account the specific nature of our dependent variable and the heterogeneous nature of firm behavior. By construction, export intensity is bounded between 0 and 1. Furthermore, for non-trivial proportion of sample the variable takes the value of 0. For this reason we use the Tobit maximum likelihood methodology to control for censoring problems. The Tobit model is referred to as the corner solution response where the dependent variable is zero for a nontrivial fraction of the population but is roughly continuously distributed over positive values (Wooldridge, 2006).

The Tobit regression is left-censored as it excludes non-exporting firms:

$$EXP_{it} = \begin{cases} EXP_{it}^* & \text{if } EXP_{it}^* > 0 \\ 0 & \text{if } EXP_{it}^* \leq 0 \end{cases}$$

Table 8 displays the results of the Tobit model. In this case the dependent variable is represented by the export intensity, measured by the ratio between export turn-over to overall turn-over. Consistently with what discussed at the beginning of this section, in this case the relevant tax indicator is the EMTR. Indeed, the EMTR refers to the intensive margin and it is relevant making existing firms grow larger and increase export sales.

**Tab. 8 – Export decisions: Tobit estimates; year 2006.**

Export intensity	Coeff.	Std. Error	t	P>t	[95% Conf. Interval]
EMTR (2004)	0.1132	0.0468	2.4200	0.0160	0.0214 0.2049



Log capital	0.0189	0.0056	3.3600	0.0010	0.0079	0.0299
Innovation	0.0825	0.0155	5.3200	0.0000	0.0521	0.1129
Skill_labour	0.0005	0.0002	2.3200	0.0200	0.0001	0.0008
Geographical area	-0.0803	0.0174	-4.6100	0.0000	-0.1144	-0.0461
Pavitt activity sector	0.0442	0.0075	5.9300	0.0000	0.0296	0.0589
Age	0.0002	0.0003	0.6400	0.5230	-0.0004	0.0008
Log size	0.0927	0.0096	9.6600	0.0000	0.0739	0.1115
Constant	-0.5336	0.0683	-7.8200	0.0000	-0.6675	-0.3998
<hr/>						
/sigma	0.4273	0.0058			0.4159	0.4387

Source: Authors' estimates

Number of obs = 4583

F(8.4575) = 56.84

Prob>F = 0.0000

Log pseudolikelihood = -23187.933; Pseudo R2 = 0.0647

Obs. summary: 1806 left-censored observations at export\_intensity <=0  
2820 uncensored observations  
0 right-censored observations

Taxation at the margin has a positive impact on export intensity. A 1% increase in the tax rate increases the share of exports on turnover by 11%. The estimated coefficients are statistically significant at the 5% level. We note that the effect of capital, innovation, skilled labour, geographical area, activity sector, size remain in line with the Probit estimates. However, the variable age is not significant and this is not surprising as firms already present in foreign markets have reached the threshold level of competitiveness<sup>17</sup>.

As for export propensity estimates, it is noteworthy that corporate taxation has the higher weight compared to the other variables considered in the estimation. The estimated effect seems to go in the opposite direction one might expect, with increases in the marginal tax being associated with increased export sales. Crucially, we argue, that our empirical results can be explained in the context of corporate tax incidence literature and tax burden shifting strategy of firms.

Other potential explanation is the following. There are adjustment costs in exporting at the plant level, such as sunk costs of entry and this induce firms to stay even in the case of reduced profits because of higher taxation. Firms' current foreign participation is influenced by past experience, thus reflecting the existence of sunk costs when involved in trade (Bernard and Jensen 1999, 2004) and the hazard of exit or reduction of participation is declining in the number of years a firm participates in the foreign market. Furthermore, a well-established stylized fact in the empirical literature of international trade is that trade

<sup>17</sup> Years of accumulated experience may capture "learning by doing" effects, but the opposite is expected if younger firms may behave more pro-active, flexible and aggressively. Therefore, the expected sign of the age coefficient is ambiguous and a U-shaped relationship may also be possible.

flows exhibit hysteresis and quantitatively, firms that change their participation status are much smaller in average than incumbents. On the other hand, an increase in the tax burden usually induce firms to shift the burden on consumers' prices but imperfect product substitution in traded goods can be very effective in limiting reduction of sales. In the literature typically is assumed a very low elasticity of substitution between home goods and foreign goods (in the range 0.5 to 1.5) in order to explain co-movements of relative prices and relative quantities.

## **7. Conclusions.**

In this paper we have analysed the response of export participation and export sales at firm level to corporate taxation. For this purpose we estimated a Probit and a Tobit model.

Differently from what one might expect, the probability of engaging in exports is positively affected by the effective average tax rate and higher export sales are associated with increases in the marginal tax rate. The empirical strategy builds on recent findings of the corporate tax incidence literature. Indeed, the results are consistent with the strategy of internationalized firms suggesting greater ability to shift their tax burden on international markets.

While further analysis is clearly merited, we think that our paper is a contribution to the understanding of the determinants of export strategies at firm level.

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