Firm entry dynamics and the taxation of corporate profits: Evidence from firm-level data

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Abstract

We assemble a novel firm-level database with entry data of several million European companies between 1997 and 2004. We compute entry rates and effective corporate tax rates with different methodologies. Exploiting the panel nature of our data, we use 'within group' transformations to study the effect of corporate taxation policies on incorporation and entry. We also draw on the political economy literature and account for the endogeneity of taxation and business regulation policies. We find an economically appreciable and statistically significant negative effect of corporate taxation on entry rates. Interestingly, the effect is non-linear. Our results are robust to alternative measures of effective taxation, to the introduction of the personal taxation of dividends and coupons, and to the use of alternative and additional explanatory variables.

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1 Introduction

The creation of new companies by entrepreneurs who seek to profit by exploiting business opportunities is a fundamental force for economic growth. This process, first identified by Schumpeter (1911, 1942) and formalized by Aghion and Howitt (1992), has been shown to spur economic growth since Hause and du Rietz (1984).

Economic policies aimed at fostering the entry of new companies are high on the agenda of many governments for their potentially positive effect on innovation, competition, and growth (see Aghion and Howitt (2006)). Several recent studies have looked at this issue from a variety of angles. In particular, the increasing availability of firm-level data has been used to assess the impact of economic policy reforms on entry (e.g., Aghion et al. (2006), Alesina et al. (2005), Betrand and Kramarz (2002), Bertrand, Schoar, and Thesmar (2007), Griffith et al. (2006), Klapper, Laeven, and Rajan (2006), Giannetti and Ongena (2006)). This literature focuses on the effects of labor, credit, and product market regulations and their impact on entry and on the characteristics of entrants and incumbents. We fill a gap by addressing the role of a policy instrument tha has received surprisingly little attention so far: taxation.

Taxation, which is likely to affect entry decisions (Appelbaum and Katz (1996)) has been shown to affect the incorporation decision by a number of studies based on US data (e.g., Mackie-Mason, and Roger Gordon (1997)). More recently, Djankov et al. (2008) are the first to analyze the effect of taxation on entry in a cross-section, which covers 85 countries in 2004. They use survey-based information to build the tax burden of a 'typical' company with similar characteristics across all countries. They find a negative effect of corporate tax rates on entry, investments, and FDI.

Taxation is also one of the policy variables which are easier to modify. A literature has dealt with the task of correctly measuring the effective corporate tax rate, and its influence on the incorporation decision (see Devereaux, Griffith, and Klemm (2002)). The focus of these studies has been the decision to incorporate in a given country, as a way to study the relevance of tax policy competition between countries (see Devereux (2007) for a survey).

We also build on a recent strand of literature which employs cross-country data to study the effect of country characteristics on entry, on the incorporation decision, and on the characteristics of entrants (Beck, Demirgüç-Kunt, and Maksimovic (2006), Demirgüç-Kunt, Love, and Maksimovic (2006), Desai, Gompers, and Lerner (2006)). Closely related to our paper is the study by Klapper, Laeven, and Rajan (2006), who apply to similar, but cross-sectional data, the 'difference in differences' methodology introduced by Rajan and Zingales (1998). They find that higher entry costs result in lower entry, especially in industries which naturally experience higher entry. Ciccone and Papaioannou (2007) adopt a somewhat similar approach using data for the 1980s in European countries, and find similar results.

Our paper advances this literature both methodologically and substantially. Beyond introducing taxation as a possible determinant of the incorporation and entry decision, we contribute to a new methodological perspective, by moving from cross-sectional to panel data. We assemble a novel firm-level database with entry data of several million European companies between 1997 and 2004. The panel structure of the data allows

us to include country-industry fixed effects through the use of 'within group' estimation techniques. Since we are also able to build country-industry entry rates, we can bring the analysis to a more disaggregate level than most previous studies while avoiding the well-known weaknesses of purely cross-country effects. Moreover, we look beyond taxation and include a country-specific, time-varying variable which summarizes the quality of the political attitudes towards the business environment, namely the ranking given to a country's level of economic freedom.

We then go one step further and consider that taxation is unlikely to be an exogenous policy instrument, but that it rather reacts to current business conditions. We account for this endogeneity by using instrumental variables borrowed by the political economy literature (see Daveri and Tabellini (2000)). To the best of our knowledge, our paper is the first to take into account the endogeneity of tax policies in this context.

We build our analysis on a novel dataset which covers 17 (West) European countries in the period between 1997 and 2004. The dataset is assembled from the Amadeus database published by Bureau van Dijk, first studied by Klapper, Laeven, and Rajan (2006), which contains data on over 9 million European companies. Europe offers a particularly interesting testing ground, both for the quality of data an for the diversity of policies across countries. In particular, from the taxation perspective, several European countries reduced statutory tax rates during the last decade, while at the same time also changing the effective tax base, creating a variety of situations which we try to exploit econometrically. We build effective taxation measures which take into account the overall effect of taxation on those who provide a company with outside finance, be it through debt or through equity. Moreover, unlike most previous studies, we account for the effects of corporate and personal taxation at the local level, alternative capital structures of entering firms, and alternative measures of the tax burden.

What is the verdict on the effect of corporate taxation on entry? On the whole, there is strong evidence, which is robust across a variety of specifications, that corporate taxation has indeed a statistically significant effect. This effect is robust to alternative definitions of taxation and to the inclusion of a wide set of explanatory variables. Interestingly, we also find evidence supporting a non-linear relation which suggests that the effect is at work only below a given initial threshold tax level. We also find that the effect is economically non-negligible. In our preferred specification, a reduction of the corporate tax rate from the median (30.07%) to the first quartile (27.60%) implies a 0.325 percentage point increase in the entry rate. A more substantial reduction from the median to the fifth percentile (20.07%)—that is a ten percentage point reduction in taxation—implies as much as a 2.64 percentage point increase in the entry rate.

The rest of the paper is organized as follows: Section 2 describes the sources of data. Section 3 discusses the methodology for computing entry rates. Section 4 discusses the assumption behind the computation of different measures of effective tax rates. Section 5 presents our results and is followed by a brief conclusion.

2 Data Sources

2.1 Entry data

Our first data source is the Amadeus database published by Bureau van Dijk Electronic Publishing (BvD). The database is updated monthly and our analysis is based on the December issues of all years from 2000 to 2006. Amadeus collects company accounts from 38 Western and Eastern European countries. It covers financial information (balance sheet and profit and loss account), industry activity codes, legal form, legal status and date of incorporation for almost 9 million firms, mainly collected from each country's Company Registrar. A detailed description of the Amadeus database can be found in Klapper, Laeven, and Rajan (2006). We use information from Amadeus to construct our dependent variable: entry rates at country and industry level. Our dataset includes information starting in 2000 because in that year coverage of European companies by Amadeus increased substantially, so that any company required to file its accounts (with the exception of banks and insurance companies) in principle should enter the database.[1]

2.2 Taxation data

Our main independent variable is a set of tax rates at country level which we collect from the *Worldwide Corporate Tax Guide* and *The Global Executive* by Ernst&Young, a leading tax consulting firm. The yearly publications are compiled by local offices of Ernst&Young in over 140 countries following common criteria. This ensures high professional standards and consistency both over time and across countries.

To build our taxation measures, we need to detail a series of elements characterizing each national tax system in each year. From the *Worldwide Corporate Tax Guide*, we gather information on statutory corporate tax rates, corporate tax rates on dividend tax rates and on statutory depreciation rates. These include tax rates at the local level.

From *The Global Executive* tax guide we collect data on personal taxation, also for each year and country. In particular, we consider the personal tax rate on interest income, the personal tax rate on dividend income, the rate of tax credit available on dividends, the personal capital gains tax rate. The personal tax rate on interest income is the final (i.e., after witholdings) tax rate on interest income from savings (e.g. bank accounts and deposits) and investments (e.g. bonds and securities). When rates differ between savings and investments, we take the (marginal) tax rate on interest income from bonds and securities.

The personal tax rate on dividends is the final maximum tax rate for the qualified shareholder[2], while the rate of tax credit available on dividends is expressed as a proportion

[1] Before 1999 Bureau van Dijk published what is now the "Top 250,000" module, which includes only large companies. However, we start collecting data with the 2000 edition since only with that year the effective coverage of the more comprehensive dataset edition really increased substantially.

[2] The definition of 'qualified' or 'substantial' participation differs across the jurisdictions and over time. In 2003, the last year of our panel, a qualified shareholder owns more than 1% of the share capital of the corporation in Germany, while she is required to sell more than 5% of the issued shares of a quoted company in Italy.

of the gross dividend.[3] Finally, the personal capital gains tax rate is the tax rate on capital gains from the disposal of shares by the top rate shareholder with a qualified participation in the corporation.

2.3 Business environment data

The second set of independent variables comes from the Index of Economic Freedom, published yearly by the Heritage Foundation (www.heritage.org) and the Wall Street Journal. The Index spans nine specific freedom factors: business freedom, trade freedom, fiscal freedom, freedom from governments, monetary freedom, financial freedom, investment freedom, property rights and freedom from corruption. Each factor is evaluated using both national and international sources (e.g. World Bank publications, World Trade Organization data, OECD databases, national official publications, etc.) augmented with other synthetic indicators (e.g. Transparency International's corruption index, the Economist Intelligence Unit reports, etc.), and with qualitative opinions of an academic advisory board.

The three indexes we use in this paper are the fiscal freedom index (FISCAL–FREEDOM), the freedom from the government index (GOVERNMENT–RESTRAINT) and the overall index of economic freedom (ECONOMIC–FREEDOM) which is the total score obtained by averaging the nine specific factors (see Beach and Kane (2007) for methodological details).

FISCAL–FREEDOM is a proxy for tax revenues and it is composed of three quantitative components, equally weighted: the top personal income tax rate, the top corporate income tax rate, and the tax revenues as a percentage of GDP. GOVERNMENT–RESTRAINT is a measure of public expenditure and is based on two quantitative components: government expenditure as a percentage of GDP and the revenues generated by state owned firms as a percentage of total government revenues. ECONOMIC–FREEDOM averages the nine components mentioned above, all of which span a 0-100 scoring scale, where the economic freedom level increases as we move from 0 to 100.

We also employ an alternative measure of fiscal burden (PERCEPTION–TAX) obtained from the World Competitiveness Yearbook published each year by the Institute of Management Development (IMD), a Swiss business school. PERCEPTION–TAX is a survey-based measures (on a 0 to 10 scale) of whether corporate taxes are perceived by business leaders to discourage entrepreneurial activity. As the index increases from 0 to 10, the tax system is assessed as less oppressive.

In our robustness checks we introduce a set of indicators which are meant to proxy for the efficiency of the regulatory framework and the openness of the business environment for each country. These indexes, that come from the World Competitiveness Yearbook published by Institute of Management Development, are: ANTITRUST–REGULATION, BUREAUCRACY, LABOUR–REGULATION, CORRUPTION, ACCESS–CAPITAL and ACCESS-BY-FOREIGN. They all are survey-based indicators that range between 0 and 10.

ANTITRUST–REGULATION; BUREAUCRACY and LABOUR–REGULATION are indexes whih score the efficiency of the antitrust regulation, the administrative system in

[3] The latter is available only in those countries that adopt an imputation system, where a share of corporate income taxes paid on distributed profits can be offset against personal income tax liabilities.

general and labour regulation respectively and they judge the ability of these forms of regulation to facilitate business activities. A higher value of each index corresponds to a 'better' (more pro-competition, less regulated) system.

CORRUPTION in an indes which evaluates whether bribing or corruption prevail in the public administration. A higher score denotes absence of improper practices.

ACCESS–CAPITAL and ACCESS-BY-FOREIGN relate to the capital market. ACCESS–CAPITAL ranks countries according to the easiness to access capital (local and foreign) by domestic investors, while ACCESS-BY-FOREIGN assesses the freedom of foreign investor to acquire control in domestic companies. More freedom is suggested by a larger index value.

3 Computing entry rates

We build our sample of companies with two goals: we want to include all firms with reliable accounting data, while at the same time we require a homogeneous comparable set of firms across countries and across time. Table 1 summarizes the steps we follow in selecting the firms that we include in the dataset, which closely follow the strategy of Klapper, Laeven, and Rajan (2006).

First we select countries, focusing our analysis on the following Western European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom (all of which are members of the European Union), Norway and Switzerland.[4]

Second, we include all incorporated and limited liability firms, but exclude partnerships, sole proprietorships, cooperatives and any other legal form. The reason for this choice is that limited liability firms and corporations typically have to file their accounts, so that their coverage in Amadeus is both wider and more regular than other legal forms. Moreover, different rules apply to companies with other legal forms, and in particular the format of their accounts is often not standardized. Moreover, small firms—even if when they have with limited liability—are sometimes required to file only abridged accounts (as in Belgium, France, Netherlands, Spain, and the UK) or are even exempt from any obligations (as in Austria or Finland). Our methodology accounts for this source of heterogeneity through the use of country-industry fixed effects.

Third, we include all firms active in manufacturing and in services specifically addressed to enterprises. We therefore exclude companies in agriculture, fishing, mining, financial intermediation, public administration, education, health and social work, households activities, and extra territorial organizations.[5]

Fourth, we drop all consolidated statements for firms that also report an unconsolidated statement. In Amadeus each observation corresponds to a company account. Two different accounts, the consolidated and the unconsolidated statements, can be associated to the same firm. To avoid double counting we drop all consolidated company accounts if an unconsolidated account for the same company is available.

[4] We do not consider Malta and Cyprus, which recently accessed the EU, because of their small size.

[5] The coverage of the excluded industries is likely to be uneven across countries, as some industries are highly country-specific (such as mining or fishing) or heterogeneously regulated (such as public administration, health and social work).

With these data we compute entry rates. In order to build comparable entry rates across countries and industries over time we need to control both for the BvD criteria for inclusion and deletion of firms from the Amadeus database and for differences in accounts filing obligations (including the timing requirements for filing) across countries.

BvD includes all companies which are required to file their accounts; it also keeps a company for four years after its last filing, and deletes the company (with its history) from the database afterwards. It also deletes companies which stop filing because they go bankrupt or are acquired.[6] We therefore expect that a company entering the Amadeus database in 2000 will remain in the database at least until 2004, while it will be deleted starting from 2005 if no more accounts are filed after 2000. The fact that firms are continuously included and deleted from Amadeus then justifies our choice of gathering data from more than one Amadeus issue. Because of delays in firms filing their reports, and because of the time these are entered in the database, we expect that a new company should appear in the database only two to three years after its foundation.[7] Therefore, we choose to compute entry rates from each Amadeus edition with respect to year $t-3$ or $t-2$, where t is the issue year of the database.

Our sample has a panel data structure. From each of the Amadeus December issues (from 2000 to 2006) we count the number of firms whose date of incorporation is $t-3$, and the number of firms whose date of incorporation precedes year $t-3$ that are still active in year $t-3$ (at similarly for $t-2$). Following Klapper, Laeven, and Rajan (2006), a company is considered to be active in a year if it reports at least some key accounting data for that year (total assets, sales, profits, and number or cost of employees). Our entry rate is given by the ratio of these two numbers:

$$ENTRY_t = \frac{\textit{Number of firms born at time } t}{\textit{Number of firms born before, but still active at time } t} \quad t = 1997, \ldots, 2003$$

where entry rates for 1997 are computed from the 2000 database issue, entry rates for 1998 from the 2001 issue, and so on. Using this strategy, we aim at minimizing survival bias: computing entry rates from more recent Amadeus issues (i.e., with less than three years of lag) brings the risk of over-estimating entry as long as a larger fraction of old firms has been excluded because it stopped filing. At the same time, entry rates computed closer to time t may be under-estimated because of the delays in reporting.

Entry rates are computed by country (ENTRY–COUNTRY) and also by industry/country (ENTRY–COUNTRY–INDUSTRY) and we present our empirical results for the second measure only.

Our entry measure should be interpreted as a measure of the incorporation decision,

[6] A company may stop filing for several reasons, including the fact that it does not meet any more the filing requirements of its country.

[7] Countries differ in the period a company can take to file its accounts after its year end. Moreover, where fines are low and/or controls infrequent, firms often do not report their accounts at all (e.g. Germany or Portugal). There can also be delays between the moment a company files its accounts and their recording in the Amadeus database. Moreover, BvD assembles data from local information providers that gather information from public sources (chambers of commerce, local public registers, courts, etc.) and also from direct interviews to the companies and the local press. This data gathering process may be time consuming, increasing data quality but causing delays in the appearance of account information in the database.

since it is based on the year of foundation of corporations and limited liability companies. It thus differs from entrepreneurial entry rates or entry into self-employment , usually based on census data, where the number of new entrepreneurs is the relevant variable.[8] The measure we use thus represents entry rate of successful companies. A newly created company needs to meet the Amadeus inclusion criteria to be included in our dataset and, even if these requirements differ across countries and over time, in general they entail a minimum size requirement (in terms of turnover, number of employees or assets). Our entry rate therefore measures entry by those new companies that may actually have a larger impact on the size and growth of the national economies.

Moreover, the fact that the denominator includes only active companies provides us with a sort of net entry rate. A net entry rate is given by the ratio of the difference between entry and exit to the total number of firms.

4 Computing effective tax rates

Obtaining a meaningful measure of actual corporate taxation is a non trivial task. The simplest, most obvious measure of taxation is the statutory tax rate. However this is not a satisfactory measure because a company's decision to incorporate depends also on the tax base (i.e. its taxable corporate income). A high corporate income tax rate with a thin tax base can in fact be more attractive than a lower tax rate with a much larger tax base (see Devereux, Griffith, and Klemme (2002) for a discussion).

An alternative set of tax measures is based on average tax rates, computed as the ratio of tax payments to taxable income. However, such 'implicit' tax rates are backward looking in nature as they reflect the effect of taxation on the past corporate history of profits and investment decisions.

A third approach is the so called 'Tax Analyser model' (see Jacobs (2000) and European Commission (2001)), where the computation of the tax burden is based on a 'standard' firm. According to this approach, which is used by Djankov et al. (2008), a hypothetical firm is identified and characterized by a set of features with respect to its initial capital stock, its industry, its mix of assets and liabilities, its size and its expected development over a given number of years. The firm's pre-tax profits are derived starting from the assumed hypothesis, while post-tax profits and tax liabilities are computed applying the tax legislation to the computed pre-tax profits. This methodology has the advantage of making comparisons across countries quite straightforward, as long as the same hypothetical firm is operated under different national tax rules. It also allows for the contemplation of a larger set of taxes and contributions, e.g. taxes on labor, property, energy, etc. The main drawback is that these measures lack generality because they heavily rely on the hypothetical firm's characteristics.

Some authors have suggested the use of 'effective' tax measures, that are aimed at overcoming the main limitations of statutory or average corporate income tax rates. King and Fullerton (1984) were the first to propose an effective marginal tax rate measure (EMTR), while Devereux and Griffith (1998a) proposed the effective average tax rate (EATR), which

[8] Recent papers that study the relationship between entrepreneurial entry and taxation are: Gentry and Hubbard (2000), Parker and Robson (2004) and Georgellis and Wall (2006)

they subsequently extended (see European Commission (2001)). These measures have the advantage of being theoretically grounded—they are based on a neoclassical theoretical model with forward looking agents—and they are relevant in corporate decisions.

The computation of the effective average tax rate is based on the definition of a hypothetical investment project (e.g. a one unit increase in the capital stock), characterized by a set of assumptions about the industry where the investment is realized, the type of assets purchased, the way it is financed and the type of investor. Taxes affect the rate of return of the investment. The pre-tax rate of return is given by the net present value of the stream of net income generated by the investment project. Let R^* be the pre-tax economic value associated to the project. The after-tax rate of return is influenced by "the system of corporate taxation, the interaction of taxation and inflation, the tax treatment of depreciation and inventories, the treatment of different legal forms of income, and a number of other elements linked to the definition of the tax base" (European Commission (2001)). Define as R the after-tax economic value associated to the same project, the effective average tax rate is then given by the proportional fall in the profitability rate that follows the application of taxation to the income stream generated by the investment:

$$TAX - EATR = \frac{R^* - R}{R^*}$$

Like tax measures based on the "Tax Analyser model", also the size and distribution of the effective average tax rates strongly depend on the simplifying assumptions imposed for its computation, but it has the advantage of capturing the main features of the national tax systems while ensuring more generality in the evaluation of the corporate tax burden and less demanding computations.

Many authors have adopted the effective average tax rates as the relevant measure of tax burden at corporate level when the companies' decision among two or more mutually exclusive investment projects is under investigation. Devereux and Griffith (1998a) study the effect of taxes on the location decisions of U.S. multinational companies, while Yoo (2003), Bellak and Leibrecht (2005), Bénassy-Quéré, Fontagné and Lahrèche-Révil (2005), Buettner and Ruf (2007) analyse the link between corporate income tax rates and foreign direct investments in European countries.

We therefore choose to adopt as our measure the effective average tax rate as this is the measure of taxation that better captures the impact of corporate taxation on firms' incentives to make the discrete decision to incorporate. For the computation of TAX–EATR we follow the methodology of Devereux and Griffith (1998b) and Appendix A presents all the formulas.

To compute this measure, a number of assumptions about the features of the project and the type of taxation are required. Hypothesis about the investment project affect both the before and after tax rates of return, while assumptions about the tax system affect the after tax income stream of the project.

4.1 Assumptions on the investment project

The investment we consider is a domestic investment in plant and machinery by a resident company. A similar approach is found in Devereux and Griffith (1998b) and Devereux,

Griffith and Klemm (2002). Our empirical results are unchanged when the investment encompasses both plant and machinery and industrial buildings.

The project is characterized by a given rate of return and a cost, given by the cost of capital. The rate of return of the investment is assumed to be industry-specific. Our hypothesis is that the gross income associated to the project undertaken in a particular European industry is equal to the profitability rate in the corresponding U.S. industry, computed as the following ratio: (Total Value Added - Total Labor Cost)/Total Value Added.[9] A similar approach is followed by Devereux and Griffith (1998a) who estimate an average industry profitability rate based on country data. We choose to introduce U.S. profitability instead of country-specific profitability rates, as we believe U.S. represents a low barrier environment, where profitability is less affected by restrictions to competition and entry. This idea is similar in spirit to the methodology by Rajan and Zingales (1998), which we apply to a different setting, where panel data are available.

Devereux and Griffith (2003) study the properties of the effective average tax rate when profitability changes. All else equal, the effective average tax rate approaches the statutory tax rate as profitability increases, and they coincide for profitability rates close to 100%. When the investment is very profitable, the stream of income of the project largely exceeds the costs and tax allowances on the cost of the investment (see the next subsection) become less important. As a consequence the only relevant tax measure is the statutory corporate tax rate. In our data, industries with very high profitability rates in the U.S. experience effective average tax rates[10], approaching the statutory corporate tax rates, that are larger than the effective tax rates computed for sectors with low profitability, all else equal and in the absence of personal taxes.

The cost of the investment is given by the cost of capital and we thus need a set of assumptions about the sources of finance. We alternatively assume that the investment is fully financed by retained earnings, or by debt, or by newly issued equity. The pre-tax rate of return of the investment is independent of the source of finance (see Devereux and Griffith (1998b)), however the post-tax net economic rent is affected by the type of capital financing the project.

The main effect of allowing for debt-financed investments is the possibility to deduct passive interest payments, creating a 'debt tax shield' which reduces the amount taxable profits. Therefore, the inclusion of debts leads to lower effective tax rates, all else equal.

In the absence of personal taxes, financing the investment by retained earnings or by issuing new equity has an identical effect on the cost of investment. When personal taxation at the shareholder level is considered, the effective tax rate is larger when the source of financing is new equity if dividends are taxed more than capital gains, all else equal. On the contrary, the effective tax rate is larger for investments financed by retained earning if capital gains are taxed more than dividends.

The inflation rate we use is the actual inflation rates, obtained from Eurostat. The inflation rate changes over time and across countries, but not across industries. Following the literature, we assume a common inflation rate for output and capital. The real interest

[9] Data come from the OECD Stan Database, Appendix A.

[10] Examples of industries with high profitability rates are public utilities —electricity, gas and water supply—(76% on average), real estate (90%) and the renting of machinery and equipment (77%). Industries with low profitability rates are textiles (26%), and medical, precision and optical instruments (13%).

rate is then obtained as $(1+r) = (1+i)/(1+\pi)$, where r is the real interest rate, π is the inflation rate and i the nominal interest rate. The nominal interest rate, common to all countries, is the Euro bond one-year interest rate, obtained from the European Central Bank.

Inflation rates and interest rates mainly affect the cost of the investment. In particular inflation is expected to impact tax allowances on the assets (see next subsection). Tax allowances are linked to depreciation rates that have to applied to the historical cost of the asset, which cannot be adjusted for inflation. As inflation raises, nominal interest rates increase and the net present value of tax allowances decrease, all else equal. Lower tax allowances mean higher after-tax cost for the investment and a higher effective tax rate, all else equal.

4.2 Assumptions about the tax systems

We separately present results for effective tax rates that include only corporate taxation (TAX–EATR, TAX–EATR–LOCAL and TAX–EATR-DEBT) and that take into account both corporate and personal taxation (TAX–EATR-PERS-RE, TAX–EATR-PERS-DE and TAX–EATR-PERS-NE).

The exclusion of personal taxation can be justified on a number of grounds. In the absence of personal taxation, we are able to concentrate on the effect of corporate tax rates on the effective tax rates and on our measure of entry. Moreover some assumptions about shareholders' nationality, income, etc.. The choice of the "correct" shareholder is often arbitrary. Finally, from a theoretical point of view, the assumption of international perfect capital mobility should make the investment behaviour of firms independent of personal taxes.

The tax rates that enter our effective tax measure are the statutory corporate tax rate, depreciation rates for assets, personal taxation of dividends and capital gains, the rate of tax credit available on dividends, the tax rate on interest income.

Statutory corporate tax rates are positively correlated to the effective average tax rates: an increase in the corporate tax rate, lowering the after tax rate of return to the investment, raises the effective tax rates, all else equal. However the change in the effective tax rate is less than proportional, because of the presence of tax allowances that increase when the corporate tax rate raises.

Tax allowances lower the cost of the investment and their magnitude depends on the national legislation on assets depreciation. Higher tax allowances lower the firm tax liabilities and the effective tax rates.

The personal tax rate on interest income negatively affects shareholders' discount rate while shareholder personal taxation on dividends and capital gains and the tax credit on dividends have an ambiguous effect. In fact they influence both the rate of return and the cost of the investment.

5 Empirical results

5.1 Descriptive evidence

In this section we describe the data used in our empirical applications. In particular, Table 2 provides a comprehensive description of all variables, while Tables 3 and 4 report two sets of descriptive statistics. In addition, Figures 1 and 2 describe the evolution over time of the main variables of interest. Four empirical features are worth mentioning at this stage.

Firstly, a simple comparison between the distributions of our main measure of effective tax rates (TAX–EATR, TAX–EATR–LOCAL and TAX–EATR–DEBT) and the distributions of the rates which include personal taxation (TAX–EATR–PERS–RE, TAX–EATR–PERS-DE and TAX–EATR–PERS–NE) shows that the inclusion of personal taxation increases not only the mean—as obviously expected—but also the variance (see Table 3). To what extent this is a genuine feature of taxation in European countries or instead an undesired effect of the difficulties in obtaining time-country consistent series on personal taxation is difficult to say. We will take this potential problem into account in our empirical analysis by checking the robustness of our findings to alternative measures of taxation.

Secondly, the mean yearly entry rates at the aggregate level (8.16% for the ENTRY–COUNTRY variable, and 6.97% for the ENTRY–COUNTRY–INDUSTRY variable, see Table 3) hide a significant between-country variation. The UK, Denmark and Belgium show consistently high entry rates, while Italy, Luxembourg and Ireland show consistently low entry rates. Rather comfortingly, our ranking of countries is very similar to the one reported in Klapper, Laeven, and Rajan (2006). Still, one has to acknowledge the possibility that these differences do not reflect underlying differences in industry dynamics but differences in data collection practises across countries.[11] For this reason it is crucial to have panel data which will allow us to exploit the longitudinal dimension to control for industry–country systematic differences in data collection.

Thirdly, as it is apparent from Table 4, there is a negative correlation at the country level between corporate taxation (TAX–EATR) and more general measures of country attitude towards entrepreneurship as proxied by the ECONOMIC–FREEDOM variable. For instance, Ireland has the lowest corporate tax rate and the highest score for the ECONOMIC–FREEDOM index. At the opposite, most Latin countries (France, Italy, Portugal, and Spain) have high corporate tax rates and at the same denote a not-too-friendly attitude towards entrepreneurship. This suggests that the identification of the direct effect of corporate taxation on entry requires to control for other economic relevant factors which are likely to move together with taxation both cross-sectionally and longitudinally.

Finally, since our identification strategy will lead us to exploit only within-country variation we also provide some *prima facie* evidence on the evolution of the empirical distributions of our main variables of interest over time. Overall, entry rates (see Figure 1.a and 1.b) show a moderately pro-cyclical pattern not only at the mean but also at

[11] For instance, the observed low entry rates for Italy and Ireland might, at least partly, depend on an incomplete coverage for the 'date of incorporation' or for the 'industry' dummy variable, respectively.

most, if not all, quartiles. Effective tax rates are characterized instead by a pronounced downward trend at the mean which is only partially reproduced at the quartiles (see Figure 2.a). On the contrary, the economic freedom index shows a clear upward trend both at the mean and at the quartiles (see Figure 2.b). Again, this points out to the potential identification problems associated to the omission of country-specific time-varying controls.

5.2 Estimation Strategy

The aim of this section is to discuss the empirical strategy that we follow to estimate the relationship between entry rates, on the one hand, and corporate taxation and other potentially relevant country characteristics, on the other hand. Let y_{ict} be the entry rate at time t referred to industry i located in country c. Ideally, we would like to estimate the following equation:

$$y_{ict} = \alpha_t + \mathbf{g}(Tax_{ict})'\boldsymbol{\gamma} + \mathbf{x}_{ct}^{'}\boldsymbol{\beta} + \eta_{ic} + \varepsilon_{ict} \tag{1}$$

The main variable of interest is Tax_{ict} ,which represents the effective tax rate (TAX–EATR) and varies across time, industries and countries. In equation (1) we allow the effective tax measure to enter non-linearly with alternative polinomial specifications, which we discuss in the next Section. The variable α_t is a time effect that we model by introducing year dummies. The vector $\mathbf{x}_{ct}$ includes a set of observable regressors which vary across countries and over time, but not across industries. These variables represent additional country-specific time-varying factors potentially affecting entry rates and, in some specifications, this vector will also include alternative, or complementary, measures proxying for corporate taxation.

The remaining variables in equation (1) are unobservable error components. In particular the term η_{ic} represents an industry-country specific effect capturing the set of characteristics which are relevant to the entry decision but cannot be included among the regressors because they are not observed. These include, but are not limited to, structural as well as behavioral industry specific characteristics such as entry barriers, regulatory practices and the degree of competition.

The main econometric challenge is to consistently estimate $\boldsymbol{\gamma}$ and $\boldsymbol{\beta}$ under reasonable identification assumptions. Problems here can arise for two different reasons. First, some of our explanatory variables are potentially correlated with unobservable (or unobserved) time-invariant, industry-country level omitted variables. To overcome this first source of endogeneity it is standard practice to use appropriate transformations (e.g. 'within group' or 'first difference') which remove unobserved heterogeneity, η_{ic}, from the original model.

The second problem is that the identification of structural effects through regression coefficients in deviations from industry-country specific means (i.e. the within-group transformation) requires the lack of correlation between the regressors and the idiosyncratic error term at all leads and lags. This strict exogeneity assumption rules out the possibility that current values of some of the explanatory variables are correlated with present and past idiosyncratic errors. This is unlikely to be the case here since policy makers might potentially respond to shocks which are negative correlated to entry rates by lowering corporate taxation.

The standard solution to this second source of endogeneity is to find convincing external instruments. In this paper, we borrow from the recent political economy literature and

we use complementary measures proxying both for the political orientation of the elected government (left, centre, right) and for other institutional characteristics. The required identification assumption is that politics does not affect entry rates directly but only through corporate taxation.

5.3 Econometric results

We address the effectiveness of corporate taxation on entry rates by estimating several versions of equation (1). Our baseline specification includes as explanatory variables (a quadratic expression in) TAX–EATR and ECONOMIC–FREEDOM. TAX–EATR is the relevant tax rate to be applied to discrete investment projects and it is expected to have a negative effect on entry rates.[12] ECONOMIC–FREEDOM, the economic freedom score, proxies for the time-varying country-specific attitude towards entrepreneurship. This variable is expected to enter our equations with a positive sign. Within-group estimation results are reported in the first column of Table 5. Our findings can be summarized as follow. Firstly, the coefficients on corporate taxation (TAX–EATR and TAX–EATR2) are found to be respectively negatively and positively signed. They are also both significant at conventional statistical levels. Secondly, as expected, the economic freedom index is found to be positive and significant.

We find that a reduction of the tax rate from the median (30.07%) to the first quartile (27.60%) implies a 0.212 percentage point increase in the entry rate. This effect is significant at conventional statistical levels. On the other hand, a reduction from the third quartile (33.46%) to the median is found to have the wrong sign but with no statistically significant effect. Taken at its face value, this implies that the marginal effect on entry rates is a negative function of the initial tax rate.

Before drawing strong conclusions, however, we need to address the main limitation of our estimation approach, namely the strong exogeneity assumption for TAX–EATR, TAX–EATR2 and, possibly, ECONOMIC–FREEDOM. For this reason we report in columns 2 and 3 of Table 5 additional estimates based on alternative - and possibly more plausible - orthogonality assumptions. Building on recent political economy literature, we used as instruments four "political economy" variables: LEFT–GOV, RIGHT–GOV, CHECKS, and HERFIND. These variables are defined in Table 2 and described in Appendix B. The two columns differ since in column 2 we treat ECONOMIC–FREEDOM as strictly exogenous whereas in column 3 also this variable is allowed to be freely correlated with the idiosyncratic component of the error terms. In both specifications Hansen's J statistic does not reject the validity of our set of instruments. The coefficients reported in column 2 are very similar in magnitude to those reported in column 1 albeit—as expected—less precisely estimated. Nevertheless, both the linear and the quadratic terms are still significant at the 5% statistical level. Less conclusive findings are found once ECONOMIC–FREEDOM is also treated as endogenous. On the one hand, if one looks at punctual estimates the overall pattern is unaltered. On the other hand, both coefficients on TAX-EATR are closer to zero in absolute value and much less precisely estimated. Note however that the

[12] High order terms are not significant at conventional statistical levels in all reported equations. Also, the null hypothesis that the parameter on the second order term is equal to zero is strongly rejected.

endogeneity test for ECONOMIC–FREEDOM does not allow to reject the null when the 5% statistical level is used as threshold.

We also find that the effect is economically non-negligible. In our preferred specification (column 2), a reduction of the corporate tax rate from the median (30.07%) to the first quartile (27.60%) implies a 0.325 percentage point increase in the entry rate. A more substantial reduction from the median to the fifth percentile (20.07%) implies as much as a 2.64 percentage point increase. This effect is larger than that found by Djankov et. al (2008). In fact they find that a decrease of ten percentage points in taxation brings to an 1.4 percentage point increase in the entry rate.

5.4 Robustness checks

In this section we assess the robustness of our base case results with respect to three main issues: a) alternative assumptions in the computation of the effective tax rates (Tables 6 and 7); b) alternative taxation measures (Table 8); c) inclusion of additional explanatory variables (Table 9).

As it is apparent from the discussion in Section 4 and Appendix B, several assumptions have to be made in order to derive an appropriate measure of the effective corporate tax rate. On the one hand, one has to solve the trade-off between theoretical soundness and data availability/reliability. On the other hand, choices have to be made on how the project is financed (retained earnings, new debt, or new share issue). In particular, our original measure TAX-EATR does not include local or municipal taxes, surtaxes and supplementary charges. From a theoretical perspective, there is no reason why these tax components should not be included. On the other hand, there is a legitimate concern that their inclusion might enhance measurement error problems since building appropriate time-consistent series for these components of corporate taxation is a very difficult task. Furthermore, the fact that firms are observed at the national level makes the choice of the 'appropriate' local taxation level rather arbitrary. Estimates presented in the first three columns of Table 6 address this issue by replacing TAX–EATR with an alternative tax measure (TAX–EATR–LOCAL) which includes these additional tax components. In spite of our concerns, it can be easily seen that reported results turn out to be very similar to those already discussed in the previous section. Columns 4 to 6 of Table 6 make instead a first step in addressing the financing issue. Since TAX–EATR is computed under the assumption that the project if fully financed with retained earnings we have computed an additional measure, TAX–EATR–DEBT where it is assumed that the project if fully financed by new debt.[13] The results show that punctual estimates tend to be lower compared to the base line case; this is particularly so in column 4 where WG estimation is used. Furthermore, the IV coefficients reported in columns 5 and 6 are very imprecisely estimated.

Another potential drawback of our original specification is that we overlook personal taxation in the computation of the effective tax rate. This is not uncommon in this literature and it can be justified by noticing that in many countries the system of personal taxation is so complex that one can well imagine a large variety of personal tax positions. This,

[13] Note that in the absence of personal taxes financing through retained earnings or through the issue of new share yields the same expression for the effective tax rate.

in turn, makes the identification of the 'representative' investor quite arbitrary. Having said so, we have computed three additional tax measures: TAX–EATR–RE, TAX–EATR–DE and TAX–EATR–NE. They all take into account personal taxation (see appendix A for details) but differ in the assumptions on how the project is financed. Results are summarized in Table 7. Columns 1 to 3 refer to the 'retained earnings' scenario, columns 4 to 6 to the 'new debt' scenario and columns 7 to 9 to the 'new shares issue' scenario. A clear and systematic pattern emerges across specification. Within-group estimates of the coefficients on the tax variable turn out to be insignificant, both statistically and economically. However, when we instrument our regressors, the estimated coefficients come closer to those reported in Table 5. In addition, they are all statistically significant and very similar across specifications. The fact the within-group estimator works so poorly is not surprising as it probably reflects measurement error problems associated to the introduction of the personal taxation elements in the formulas for corporate taxation. The fact the IV results are not affected by the type of financing—once personal taxation is taken into account—is very reassuring given the concerns raised by the large standard errors found in the specification with debt but without personal taxation (Table 6, columns 4 to 6).

It might also be argued that potential entrants do not take their entry decision on the basis of the effective tax rate but are driven by more qualitative factors which reflect the entrepreneurial perception of governemnt behavior towards corporate taxation. To address this issue, and additional robustness checks, we replace TAX–EATR with alternative—more qualitative—proxies of the tax burden: FISCAL–FREEDOM and GOVERNMENT–RESTRAINT which respectively capture the overall government attitude towards taxation and public spending, and PERCEPTION–TAX, a survey-based variable which tries to measure the perceived attitude of national fiscal policies toward entrepreneurship. As in all our regressions, time dummies are included in all specifications. Results are presented in Table 8. When equations are estimated by WG, results conform to expections. In fact, FISCAL–FREEDOM has a positive and GOVERNMENT–RESTRAINTS has a negative effect on entry rates. Furthermore, both coefficients are statistically different from zero (column 1). We get a very similar picture when we introduce the measure of fiscal burden obtained from the World Competitiveness Yearbook (PERCEPTION–TAX), as the coefficient of PERCEPTION–TAX is positive and significant (column 4).[14] On the other hand the IV results are rather disappointing. In columns 2 and 3 the Hansen's J statistic rejects the validity of our set of instruments. Furthermore, in columns 5 and 6, the coefficient on PERCEPTION–TAX has the wrong sign and it is significant. One potential explanation for this finding is that our instruments are only weakly correlated to PERCEPTION–TAX, but clearly this issue deserves further investigation.

Finally, in Table 9 we introduce additional time-varying covariates which have been found in the literature to affect entry rates. Klapper, Laeven and Rajan (2007) include the ratio of industry sales to total sales in order to capture a potential convergence effect that might operate at the industry level where larger industries are expected to display lower entry rates. With this purpose in mind, we compute the INDUSTRY–SHARE variable and we include it in an augmented version of our base line specifications (columns 1 to

[14] In all specifications reported in Table 8 the quadratic form is rejected against the linear form for all our variables of interest.

3). The coefficient for the industry share is negative, as expected; it is also significative in the IV regression corresponding to column 2, which instruments the effective tax rate but not the ECONOMIC-FREEDOM index. The effect become statistically insignificant when this variable is also instrumented. The effect of taxation on entry retains its magnitude and remains significant. Finally, in the last three columns of Table 9 we replace the ECONOMIC–FREEDOM variable with a set of variables which are meant to capture separately those country characteristics which are taken into account and aggretaed over when computing the ECONOMIC-FREEDOM index.[15] Most of these variables have the expected sign but only ANTITRUST–REGULATION is significant. This is hardly surprising, since we already control for time-invariant industry-country components and therefore for these variables we exploit in estimation only the small, and often correlated, within-country variability component. More importantly from our perspective, is that also in these final specifications the coefficients on TAX–EATR are similar in magnitude compared to our base line case and are statistically significant, lending additional credibility to our baseline estimates.

6 Conclusion

In this paper we pose ourselves a research question which is also relevant from a policy perspective, that is if and to what extent policy-makers can induce firm entry by lowering corporate taxation. To answer this question we have exploited a newly constructed data-base which allows us to improve significantly on the existing literature. In particular, the availability of a longitudinal dimension allows us to control for country-industry unobserved heterogeneity therefore avoiding the endemic omitted variables problem which affects previous purely cross-sectional studies. In addition, and equally important, we recognize in the paper that additional endogeneity problems can arise because of feedback effects. These might occur to the extent that policy-makers adjust corporate tax rates to industry-wide idiosyncratic negative entry shocks. To address this problem, we borrow from the recent political economy literature and introduce an innovative—and hopefully convincing—instrumenting strategy.

What is the final verdict on the effect of corporate taxation on entry? On the whole, there is strong evidence, which is robust across a variety of specifications, that corporate taxation has indeed a statistically significant effect. This effect is robust to alternative definitions of taxation and to the inclusion of a wide set of explanatory variables. Interestingly, we also find evidence supporting a non-linear relation which suggests that the effect is at work only below a given initial threshold tax level. We also find that the effect is economically non-negligible. In our preferred specification, a reduction of the corporate tax rate from the median (30.07%) to the first quartile (27.60%) implies a 0.325 percentage point increase in the entry rate. A more substantial reduction from the median to the

[15] Klapper, Laeven and Rajan (2007) show that higher entry regulation costs reduce entry rates. Ciccone and Papaioannou (2006) find evidence of a negative relationship between the number of procedures a start up has to comply and their measure of entry, Fisman and Sarria- Allende (2004) show that product market regulation can slow down entry, while Rajan and Zingales (1998) and Perotti and Volpin (2006) highlight the role of financial development and investor protection in incorporation decisions.

fifth percentile (20.07%)—that is a ten percentage point reduction in taxation—implies as much as a 2.64 percentage point increase in the entry rate.

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Table 1. Dataset Construction

This Table summarizes the various steps in the dataset construction.

	COUNTRIES	
	Included	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom
	Excluded	Malta
	LEGAL FORMS	
	Included	Corporations (e.g. AG, SA, NV, A/S, Plc, OYJ, AE, SpA, AB) Limited Liability Companies (e.g. GmbH, SPRL, BVBA, ApS, Ltd, OY, SARL, EPE, Srl, BV, A/S, LDA, SL)
	Excluded	Other legal forms (e.g. sole proprietorships, cooperatives, partnerships)
	INDUSTRIES (2-DIGIT NACE CODE LEVEL)	
	Included	
D	Manufacturing	(NACE codes: 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36)
E	Electricity, gas, water supply	(NACE codes: 40, 41)
F	Construction	(NACE code: 45)
G	Wholesale and retail trade	(NACE codes: 50, 51, 52)
H	Hotels and restaurants	(NACE code: 55)
I	Transport, storage and communication	(NACE codes: 60, 61, 62, 63, 64)
K	Real Estate, renting and business activities	(NACE codes: 70, 71, 72, 73, 74)
	Excluded	
A	Agriculture	(NACE codes: 01, 02)
B	Fishing	(NACE code: 05)
C	Mining	(NACE codes: 10, 11, 12, 13, 14)
J	Financial intermediation	(NACE codes: 65, 66, 67)
L	Public Administration	(NACE code: 75)
M	Education	(NACE code: 80)
N	Health and social work	(NACE code: 85)
O	Other community, social and personal service activities	(NACE codes: 90, 91, 92, 93)
P	Activities of households	(NACE codes: 95, 97)
Q	Extra territorial organizations and bodies	(NACE code: 99)
	CONSOLIDATION CODES (Amadeus assigned codes)	
	Included	
	C1	Consolidated statement without an unconsolidated companion
	U1	Unconsolidated statement without a consolidated companion
	U2	Unconsolidated statement with a consolidated companion
	LF	Limited financial data, probably unconsolidated
	NA	Not available
	Excluded	
	C2	Consolidated statement with an unconsolidated companion

Table 2. Variable definitions

This Table describes the variables used in the empirical application.

Variable	Source	Description
ENTRY–COUNTRY	Amadeus database published by Bureau van Dijk, December issues, years 2000–2006.	For each year t and country c, we identify (a) all firms in country c whose date of incorporation is $t-3$, and (b) all firms in country c whose date of incorporation precedes year $t-3$ which are still active in year t. A company is considered to be active in year t if it reports at least some accounting data for that year (total assets, turnover, total sales, operating profits, number of employees or cost of employees). The entry rate is computed as the ratio of (a) over (b).
ENTRY–COUNTRY–INDUSTRY	Amadeus database published by Bureau van Dijk, December issues, years 2000–2006.	For each year t, country c and industry i, we identify (a) all firms in country c and industry i whose date of incorporation is $t-3$, and (b) all firms in country c and industry i whose date of incorporation precedes year $t-3$ which are still active in year t. A company is considered to be active in year t if it reports at least some accounting data for that year (total assets, turnover, total sales, operating profits, number of employees or cost of employees). The entry rate is computed as the ratio of (a) over (b). We drop industries with less than 5 companies.

(continued)

Variable	Source	Description
TAX–EATR; TAX–EATR2	Authors' computation on data from "Worldwide Corporate Tax Guide" by Ernst & Young, Eurostat and OECD STAN Database.	Computations based on the methodology of Devereux and Griffith (1998b). The effective average tax rate is defined as the proportional fall in the profitability rate of a project that follows the application of taxation to the income stream generated by the project itself. If we define as R^* the pre - tax net present value of the stream of income generated by the investment and as R the post - tax net present value of the same flow of income, TAX–EATR= $(R^* - R)/R^*$. The main assumptions imposed for the computation of this measure are: (a) the statutory corporate tax rates do not include local or municipal taxes, surtaxes and supplementary charges and are obtained from the "Worldwide Corporate Tax Guide" by Ernst & Young; (b) an industry specific profitability rate equal to the industry profitability rate in the U.S (the U.S. profitability for each industry - year couple is obtained as (Total Value Added - Total Labor Cost)/Total Value Added, source OECD STAN Database); (c) the investment is financed by retained earnings; (d) absence of personal taxes on interest income, dividends and capital gains; (e) the inflation rate is the actual country specific inflation rate as measured by Eurostat; (f) the economic depreciation rate is set equal to 12.5%; (g) the nominal interest rate is the short term (one year) EURO bonds rate; (h) the fiscal depreciation rates are those for plant and machinery as reported by the "Worldwide Corporate Tax Guide" by Ernst & Young. TAX–EATR2 is the squared effective average tax rate.

(continued)

Variable	Source	Description
TAX–EATR–LOCAL; TAX–EATR–LOCAL2	Authors' computation on data from "Worldwide Corporate Tax Guide" by Ernst & Young, Eurostat and OECD STAN Database.	Computations based on the methodology of Devereux and Griffith (1998b). The main assumptions imposed for the computation of this measure are: (a) the statutory corporate tax rates include local or municipal taxes, surtaxes and supplementary charges and are obtained from the "Worldwide Corporate Tax Guide" by Ernst & Young; (b) an industry specific profitability rate equal to the industry profitability rate in the U.S. The U.S. profitability for each industry - year couple is obtained as (Total Value Added - Total Labor Cost)/Total Value Added, source OECD STAN Database; (c) the investment is financed by retained earnings; (d) absence of personal taxes on interest income, dividends and capital gains; (e) the inflation rate is the actual country specific inflation rate as measured by Eurostat; (f) the economic depreciation rate is set equal to 12.5%; (g) the nominal interest rate is the short term (one year) EURO bonds rate; (h) the fiscal depreciation rates are those for plant and machinery as reported by the "Worldwide Corporate Tax Guide" by Ernst & Young. TAX–EATR–LOCAL2 is the squared effective average tax rate.

(continued)

Variable	Source	Description
TAX–EATR–DEBT; TAX–EATR–DEBT2	Authors' computation on data from "Worldwide Corporate Tax Guide" by Ernst & Young, Eurostat and OECD STAN Database.	Computations based on the methodology of Devereux and Griffith (1998b). The main assumptions imposed for the computation of this measure are: (a) the statutory corporate tax rates do not include local or municipal taxes, surtaxes and supplementary charges and are obtained from the "Worldwide Corporate Tax Guide" by Ernst & Young; (b) an industry specific profitability rate equal to the industry profitability rate in the U.S. The U.S. profitability for each industry - year couple is obtained as (Total Value Added - Total Labor Cost)/Total Value Added, source OECD STAN Database; (c) the investment is fully financed by debt; (d) absence of personal taxes on interest income, dividends and capital gains; (e) the inflation rate is the actual country specific inflation rate as measured by Eurostat; (f) the economic depreciation rate is set equal to 12.5%; (g) the nominal interest rate is the short term (one year) EURO bonds rate; (h) the fiscal depreciation rates are those for plant and machinery as reported by the "Worldwide Corporate Tax Guide" by Ernst & Young. TAX–EATR–DEBT2 is the squared effective average tax rate.

(continued)

Variable	Source	Description
TAX–EATR-PERS-xx; TAX–EATR-PERS-xx2	Authors' computation on data from "Worldwide Corporate Tax Guide" and "The Global Executive" tax guide by Ernst & Young, Eurostat and OECD STAN Database.	Computations based on the methodology of Devereux and Griffith (1998b). The main assumptions imposed for the computation of this measure are: (a) the statutory corporate tax rates do not include local or municipal taxes, surtaxes and supplementary charges and are obtained from the "Worldwide Corporate Tax Guide" by Ernst & Young; (b) an industry specific profitability rate equal to the industry profitability rate in the U.S. The U.S. profitability for each industry - year couple is obtained as (Total Value Added - Total Labor Cost)/Total Value Added, source OECD STAN Database; (c) the investment is financed by retained earnings in the case of TAX–EATR-PERS-RE, by debt in the case of TAX–EATR-PERS-DE and by issuing new equity in the case of TAX–EATR-PERS-NE; (d) personal taxes on interest income, dividends and capital gains are included; (e) the inflation rate is the actual country specific inflation rate as measured by Eurostat; (f) the economic depreciation rate is set equal to 12.5%; (g) the nominal interest rate is the short term (one year) EURO bonds rate; (h) the fiscal depreciation rates are those for plant and machinery as reported by the "Worldwide Corporate Tax Guide" by Ernst & Young. TAX–EATR-PERS-xx2 is the squared effective average tax rate.
FISCAL–FREEDOM	Economic freedom, published by Heritage Foundation and Wall Street Journal (www.heritage.org/Index/), various years.	It is a measure of the fiscal burden on companies. It ranges from 0 (maximum fiscal burden) to 100 (minimum fiscal burden). The index is computed using institutional national and international data, other economic synthetic indicators, and views by a panel of academic advisors.

(continued)

Variable	Source	Description
GOVERNMENT–RESTRAINT	Economic freedom published by Heritage Foundation and Wall Street Journal (www.heritage.org/Index/), various years.	It is a measure of government intervention in the economy. It ranges from 0 (maximum government spending) to 100 (minimum government spending). The index is computed using data on public expenditure and state ownership of enterprises, other economic synthetic indicators, and views by a panel of academic advisors.
PERCEPTION–TAX	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Do corporate taxes discourage entrepreneurial activity? It ranges from 0 (yes, the tax system discourages entrepreneurial activity) to 10 (no, the tax system does not discourage entrepreneurial activity)
ECONOMIC–FREEDOM	Economic Freedom Index, published by Heritage foundation and Wall Street Journal (www.heritage.org/Index/), various years.	It is the simple average of the 9 index scores built by the Heritage Foundation: regulation, freedom of trade, fiscal freedom, freedom from government, monetary policy , foreign investment, financial sector freedom, property rights and corruption. The index ranges from 0 (minimum economic freedom) to 100 (maximum economic freedom). The single scores are based on institutional national and international data, other economic synthetic indicators, views by a panel of academic advisors.
ANTITRUST–REGULATION	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Are antitrust laws efficient in preventing unfair competition? It ranges from 0 (no, antitrust laws do not prevent unfair competition) to 10 (yes, antitrust laws prevent unfair competition)

(continued)

Variable	Source	Description
BUREAUCRACY	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Does bureaucracy hinder business development? It ranges from 0 (yes, bureaucracy hinders business development) to 10 (no, bureaucracy does not hinder business development)
CORRUPTION	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Do improper practices such as bribing or corruption prevail in the public sphere? It ranges from 0 (yes, bribing or corruption prevail in the public sphere) to 10 (no, bribing or corruption do not prevail in the public sphere)
LABOUR–REGULATION	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Do labor regulations (hiring/firing practices, minimum wages, etc.) hinder business activities? It ranges from 0 (yes, labor regulations hinder business activities) to 10 (no, labor regulations do not hinder business activities)
ACCESS–CAPITAL	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Are capital markets (foreign and domestic) easily accessible? It ranges from 0 (no, capital market are not accessible) to 10 (yes, capital market are accessible)
ACCESS–BY–FOREIGN	World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years.	Survey based index measure which answers the question: Are foreign investors free to acquire control in domestic companies? It ranges from 0 (no, foreign investors are not free) to 10 (yes, foreign investors are free)

(continued)

Variable	Source	Description
INDUSTRY–SHARE	Amadeus database published by Bureau van Dijk, December issues, years 2000–2006.	It equals the ratio of total industry turnover to the total country turnover.
CHECKS	Database of Political Institutions, World Bank; details in Thorsten et al. (2001) and Keefer and Stasavage (2003); data available from http:// go. worldbank .org/ 2EAGGLRZ40	The checks and balances index counts the number of veto players present in a political system. "For presidential systems, the variable CHECKS counts the number of veto players, counting the executive and legislative chamber(s) separately only if they are controlled by different parties. For parliamentary systems, CHECKS counts the number of parties in the government coalition, based on the assumption that individual coalition members will enjoy veto power over policy. The index is modified to take into account the effect that certain electoral rules (closed list versus open list) have on the cohesiveness of governing coalitions" (Keefer and Stasavage (2003))
HERFINDAHL	Database of Political Institutions, World Bank; details in Thorsten et al. (2001); data available from http:// go. worldbank .org/ 2EAGGLRZ40	The Herfindahl index for the political parties is computed as the sum of the squared seat shares of all parties in the parliament.
LEFT–GOV ; RIGHT – GOV ; CENTER–GOV	Database of Political Institutions; World Bank, details in Thorsten et al. (2001); data available from http:// go. worldbank .org/ 2EAGGLRZ40	The variables LEFT–GOV, RIGHT–GOV and CENTER–GOV are dummy variables that equal one if the chief executive party is left - wing, right - wing or centrist respectively and zero otherwise.

Table 3. Descriptive statistics

This Table reports summary statistics for the sample of 17 EU countries observed over the 1997–2003 time period. PERCEPTION–TAX is missing for 1997 while INDUSTRY–SHARE is missing for 8 observations. When a variable does not vary over industries, the descriptive statistics are reported with respect to the country - time dimensions only (117 observations, an unbalanced panel since 1997 entry data for Ireland and UK do not comply with our data set construction rules, see tables 1 and 2).

Variable Names	Mean	Std. Dev.	25th perc.	Median	75th perc.	N. obs.
ENTRY–COUNTRY	8.16	5.18	5.31	8.06	10.07	117
ENTRY–COUNTRY–INDUSTRY	6.97	6.89	3.12	5.51	8.85	4,293
TAX–EATR	30.21	4.87	27.60	30.07	33.46	4,293
TAX–EATR–LOCAL	31.72	6.18	28.28	31.33	34.78	4,293
TAX–EATR-DEBT	26.53	5.91	23.74	26.83	30.32	4,293
TAX–EATR-PERS-RE	39.23	15.19	25.14	44.54	49.75	4,293
TAX–EATR-PERS-DE	36.98	16.67	20.58	43.41	48.67	4,293
TAX–EATR-PERS-NE	40.24	17.23	24.56	47.02	51.88	4,293
FISCAL–FREEDOM	65.52	8.78	58.50	64.40	71.50	117
GOVERNMENT–RESTRAINT	42.84	13.71	31.90	42.60	51.00	117
PERCEPTION–TAX	5.46	1.38	4.19	5.64	6.50	102
ECONOMIC–FREEDOM	69.48	5.77	65.70	68.70	73.90	117
ANTITRUST–REGULATION	6.41	0.86	5.78	6.46	7.00	117
BUREAUCRACY	4.00	1.54	2.74	3.96	5.40	117
CORRUPTION	6.39	2.03	5.04	6.78	7.90	117
LABOUR–REGULATION	4.35	1.62	3.12	4.00	5.20	117
ACCESS–CAPITAL	8.56	0.49	8.24	8.63	8.93	117
ACCESS–BY–FOREIGN	8.55	0.72	8.10	8.78	9.07	117
INDUSTRY–SHARE	2.73	5.11	0.47	1.24	2.86	4,285

Table 4. Descriptive statistics by country

This Table reports summary statistics for the 17 EU countries observed over the 1997–2003 time period.

	ENTRY–COUNTRY		ENTRY–COUNTRY–INDUSTRY		TAX–EATR		ECONOMIC–FREEDOM	
Country	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Austria	11.36	2.53	11.74	11.03	30.17	2.43	69.80	1.54
Belgium	7.53	0.66	6.74	5.39	34.91	3.12	68.61	1.26
Denmark	11.40	1.29	10.10	8.59	32.09	1.48	69.70	4.02
Finland	5.88	1.71	5.28	3.79	27.50	1.56	70.07	3.32
France	9.33	0.44	7.56	4.12	30.80	2.67	62.33	1.88
Germany	9.81	1.57	8.67	5.29	34.31	8.68	67.70	3.47
Greece	8.52	1.50	8.52	7.44	32.78	2.32	58.64	1.51
Ireland	5.71	4.38	3.97	5.36	22.26	6.36	77.27	4.23
Italy	1.47	0.77	1.32	1.43	33.55	1.87	65.04	0.82
Luxembourg	3.38	2.28	2.50	3.90	28.52	2.99	76.83	2.99
Netherlands	4.72	0.97	4.63	3.38	32.69	2.03	72.69	1.69
Norway	9.92	1.88	9.50	6.81	27.77	0.71	67.66	1.22
Portugal	5.75	1.92	5.01	4.39	28.17	3.17	65.64	0.43
Spain	8.03	1.82	7.06	7.49	34.85	1.03	66.20	1.70
Sweden	6.46	1.04	5.55	4.74	24.93	2.13	68.93	3.03
Switzerland	11.82	13.31	4.94	7.09	26.04	2.32	77.51	0.97
UK	18.90	3.62	13.32	7.25	28.77	1.40	77.85	0.57

Table 5. Country-industry within-group and GMM regressions. Base case estimation results.

This table presents results for country-industry within-group and GMM within-group regressions. The dependent variable is ENTRY–COUNTRY–INDUSTRY. The independent variables are defined in Table 2. Column (1) shows the within group regression, column (2) reports results for the GMM within-group regression where TAX–EATR and TAX–EATR2 are instrumented while in column (3) also the variable ECONOMIC–FREEDOM is instrumented. The Hansen J Statistics is the Sargan-Hansen test of overidentifying restrictions and it is distributed as chi-squared under the null hypothesis that the instruments are valid. The endogeneity test is performed in the last column to verify the exogeneity of the variable ECONOMIC–FREEDOM. The statistics is distributed as chi-squared under the null hypothesis that the specified endogenous regressor can actually be treated as exogenous. Under conditional homoskedasticity, this endogeneity test statistic is numerically equal to a Hausman test statistic. Time dummies are included but not displayed. Robust industry-level clustered standard errors are shown in parenthesis. Coefficients significant at the 10%, 5% at 1% level are marked with *, **, and ***. All estimates are performed using Stata 9.2, commands `xtreg` and `xtivreg2` by Baum, Schaffer and Stillman (2006).

	(1) WG	(2) GMM-IV1	(3) GMM-IV2
TAX–EATR	-1.384***	-1.157**	-0.760
	(0.16)	(0.58)	(0.62)
TAX–EATR2	0.023***	0.018*	0.011
	(0.00)	(0.01)	(0.01)
ECONOMIC-FREEDOM	0.130**	0.165***	0.202***
	(0.06)	(0.04)	(0.05)
Time dummies	Yes	Yes	Yes
Constant	17.933***		
	(4.73)		
Wald test regressors	99.90	108.54	138.69
d.f. [pval]	9 [0.00]	9 [0.00]	9 [0.00]
Wald test time dummies	20.15	30.92	26.13
d.f. [pval]	5 [0.00]	5 [0.00]	5 [0.00]
Hansen J Statistic		3.04	0.15
d.f. [pval]		2 [0.22]	1 [0.70]
Endogeneity Test			2.89
d.f. [pval]			1 [0.09]
N.obs	4,293	4,293	4,293

Table 6. Country-industry within-group and GMM regressions. Estimation results for tax measures that consider local taxation and debt financing

This table presents results of country-industry within-group and GMM within group regressions. The dependent variable is ENTRY–COUNTRY–INDUSTRY. The independent variables are defined in Table 2. Columns (1) and (4) show the within group regressions, columns (2) and (5) report results for the GMM within-group regression where the tax measures are instrumented while in columns (3) and (6) also the variable ECONOMIC–FREEDOM is instrumented. The Hansen J Statistics is the Sargan-Hansen test of overidentifying restrictions. The Endogeneity test is performed to verify the exogeneity of the variable ECONOMIC–FREEDOM. Time dummies are included but not displayed. Robust industry-level clustered standard errors are shown in parenthesis. Coefficients significant at the 10%, 5% at 1% level are marked with *, **, and ***.

	(1) WG	(2) GMM-IV1	(3) GMM-IV2	(4) WG	(5) GMM-IV1	(6) GMM-IV2
TAX–EATR–LOCAL	-0.903***	-0.701**	-0.574*			
	(0.10)	(0.30)	(0.30)			
TAX–EATR–LOCAL2	0.012***	0.008**	0.006			
	(0.00)	(0.00)	(0.00)			
TAX–EATR–DEBT				-0.284***	-0.809	-0.696
				(0.05)	(0.60)	(0.60)
TAX–EATR–DEBT2				0.005***	0.013	0.011
				(0.00)	(0.01)	(0.01)
ECONOMIC–FREEDOM	0.125**	0.162***	0.211***	0.133**	0.120**	0.170***
	(0.06)	(0.04)	(0.05)	(0.06)	(0.05)	(0.06)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	13.777***			0.776		
	(4.85)			(4.30)		
Wald test regressors	123.66	106.02	136.98	69.39	52.92	64.89
d.f. [pval]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]
Wald test time dummies	19.36	42.57	32.43	23.30	24.58	16.72
d.f. [pval]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]
Hansen J Statistic		4.02	0.09		2.35	0.02
d.f. [pval]		2 [0.13]	1 [0.77]		2 [0.31]	1 [0.90]
Endogeneity Test			3.93			2.33
d.f. [pval]			1 [0.05]			1 [0.13]
N.obs	4,293	4,293	4,293	4,293	4,293	4,293

Table 7. Country-industry within-group and GMM regressions. Estimation results for tax measures that consider personal taxation (taxation at the shareholder level)

This table presents results of country-industry within-group and GMM within group regressions. The dependent variable is ENTRY–COUNTRY–INDUSTRY. The independent variables are defined in Table 2. Columns (1), (4) and (7) show the within group regressions, columns (2), (5) and (8) report results for the GMM within-group regression where the tax measures are instrumented while in columns (3), (6) and (9) also the variable ECONOMIC–FREEDOM is instrumented. The Hansen J Statistics is the Sargan-Hansen test of overidentifying restrictions. The Endogeneity test is performed to verify the exogeneity of the variable ECONOMIC–FREEDOM. Time dummies are included but not displayed. Robust industry-level clustered standard errors are shown in parenthesis.

	(1) WG	(2) GMM-IV1	(3) GMM-IV2	(4) WG	(5) GMM-IV1	(6) GMM-IV2	(7) WG	(8) GMM-IV1	(9) GMM-IV2
TAX–EATR-PERS-RE	-0.003	-0.988***	-0.782**						
	(0.15)	(0.32)	(0.36)						
TAX–EATR-PERS-RE2	0.000	0.014***	0.009						
	(0.00)	(0.00)	(0.01)						
TAX–EATR-PERS-DE				0.019	-0.522**	-0.622**			
				(0.10)	(0.25)	(0.26)			
TAX–EATR-PERS-DE2				-0.000	0.009**	0.007			
				(0.00)	(0.00)	(0.00)			
TAX–EATR-PERS-NE							0.036	-0.730***	-0.583**
							(0.08)	(0.25)	(0.28)
TAX–EATR-PERS-NE2							-0.000	0.011***	0.006
							(0.00)	(0.00)	(0.00)
ECONOMIC–FREEDOM	0.133**	0.010	0.315	0.135**	0.040	0.489**	0.134**	0.001	0.430
	(0.06)	(0.07)	(0.21)	(0.06)	(0.07)	(0.23)	(0.06)	(0.07)	(0.31)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.688			-3.257			-3.743		
	(5.39)			(4.57)			(4.34)		
Wald test regressors	58.14	107.19	133.47	57.51	97.29	109.71	56.97	113.58	146.88
d.f. [pval]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]	9 [0.00]
Wald test time dummies	28.65	50.14	49.55	28.35	45.04	44.36	27.70	50.50	55.43
d.f. [pval]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.00]
Hansen J Statistic		2.26	0.01		4.46	1.45		1.84	0.00
d.f. [pval]		2 [0.32]	1 [0.91]		2 [0.11]	1 [0.23]		2 [0.40]	1 [0.97]
Endogeneity Test			2.25			3.05			1.84
d.f. [pval]			1 [0.13]			1 [0.08]			1 [0.18]
N.obs	4,293	4,293	4,293	4,293	4,293	4,293	4,293	4,293	4,293

Table 8. Country-industry within-group and GMM regressions. Estimation results for alternative tax measures

This table presents results of country-industry within-group and GMM within group regressions. The dependent variable is ENTRY–COUNTRY–INDUSTRY. The independent variables are defined in Table 2. Columns (1) and (4) show the within group regressions, columns (2) and (5) report results for the GMM within-group regression where the tax measures are instrumented while in columns (3) and (6) also the variable ECONOMIC–FREEDOM is instrumented. The Hansen J Statistics is the Sargan-Hansen test of overidentifying restrictions. The Endogeneity test is performed to verify the exogeneity of the variable ECONOMIC–FREEDOM. Time dummies are included but not displayed. Industry-level clustered standard errors are shown in parenthesis. Coefficients significant at the 10%, 5% at 1% level are marked with *, **, and ***.

	(1) WG	(2) GMM-IV1	(3) GMM-IV2	(4) WG	(5) GMM-IV1	(6) GMM-IV2
FISCAL-FREEDOM	0.091***	-0.224**	-0.171			
	(0.03)	(0.10)	(0.11)			
GOVERNMENT-RESTRAINT	-0.041***	-0.036	0.009			
	(0.01)	(0.03)	(0.04)			
PERCEPTION-TAX				0.457***	-0.397***	-0.507*
				(0.16)	(0.14)	(0.28)
ECONOMIC-FREEDOM	0.162***	0.271***	0.328***	0.103**	0.153***	0.112
	(0.06)	(0.05)	(0.06)	(0.05)	(0.04)	(0.09)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-9.037*			-3.093		
	(4.50)			(3.33)		
Wald test regressors	95.94	109.26	147.69	58.38	149.87	157.08
d.f. [pval]	9 [0.00]	9 [0.00]	9 [0.00]	7 [0.00]	7 [0.00]	7 [0.00]
Wald test time dummies	30.00	47.72	44.57	33.00	58.84	50.09
d.f. [pval]	5 [0.00]	5 [0.00]	5 [0.00]	4 [0.00]	4 [0.00]	4 [0.00]
Hansen J Statistic		6.43	4.34		5.03	4.86
d.f. [pval]		2 [0.04]	1 [0.04]		3 [0.17]	2 [0.09]
Endogeneity Test			2.10			0.16
d.f. [pval]			1 [0.15]			1 [0.68]
N.obs	4,293	4,293	4,293	3,754	3,754	3,754

Table 9. Country-industry within-group and GMM regressions. Estimation results for additional independent variables.

This table presents results of country-industry within-group and GMM within group regressions. The dependent variable is ENTRY–COUNTRY–INDUSTRY. The independent variables are defined in Table 2. Columns (1) and (4) show the within group regressions, columns (2) and (5) report results for the GMM within-group regression where the tax measures are instrumented while in column (3) also the variable ECONOMIC–FREEDOM is instrumented. The Hansen J Statistics is the Sargan-Hansen test of overidentifying restrictions. The Endogeneity test is performed to verify the exogeneity of the variable ECONOMIC–FREEDOM. Time dummies are included but not displayed. Industry-level clustered standard errors are shown in parenthesis. Coefficients significant at the 10%, 5% at 1% level are marked with *, **, and ***.

	(1) WG	(2) GMM-IV1	(3) GMM-IV2	(4) WG	(5) GMM-IV1
TAX–EATR	-1.373***	-1.171*	-0.755	-1.417***	-1.471**
	(0.16)	(0.60)	(0.65)	(0.20)	(0.72)
TAX–EATR2	0.022***	0.018*	0.011	0.023***	0.023*
	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
ECONOMIC-FREEDOM	0.129**	0.164***	0.201***		
	(0.06)	(0.04)	(0.05)		
INDUSTRY–SHARE	-0.006	-0.033*	-0.012		
	(0.03)	(0.02)	(0.03)		
ANTITRUST-REGULATION				0.773**	1.051***
				(0.34)	(0.32)
BUREAUCRACY				0.476*	0.355
				(0.24)	(0.52)
CORRUPTION				-0.200	-0.233
				(0.19)	(0.30)
LABOUR-REGULATION				-0.292	-0.297
				(0.18)	(0.31)
ACCESS-CAPITAL				0.115	0.127
				(0.45)	(0.68)
ACCESS-BY-FOREIGN				-0.527*	-0.435
				(0.28)	(0.29)
Time dummies	Yes	Yes	Yes	Yes	Yes
Constant	17.880***			27.274***	
	(4.67)			(5.23)	
Wald test regressors	11.88	13.17	16.23	8.30	20.66
d.f. [pval]	10 [0.00]	10 [0.00]	10 [0.00]	14 [0.00]	14 [0.00]
Wald test time dummies	20.45	30.06	25.08	14.95	8.24
d.f. [pval]	5 [0.00]	5 [0.00]	5 [0.00]	5 [0.02]	5 [0.14]
Hansen J Statistic		3.10	0.17		4.58
d.f. [pval]		2 [0.21]	1 [0.68]		2 [0.10]
Endogeneity Test			2.92		
d.f. [pval]			1 [0.09]		
N.obs	4,285	4,285	4,285	4,293	4,293

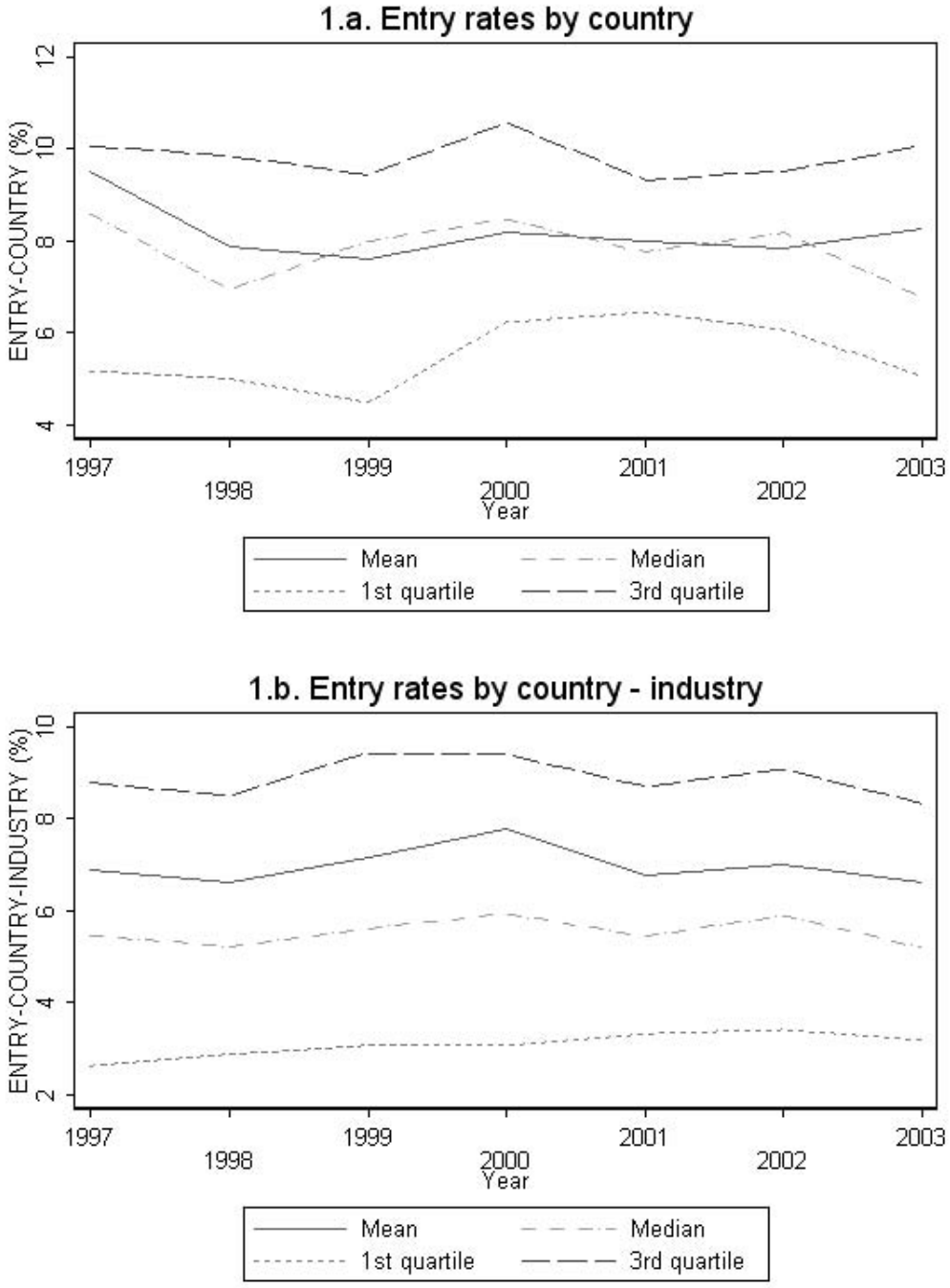

Figure 1: Entry rates by country and by country – industry (averaged over countries)

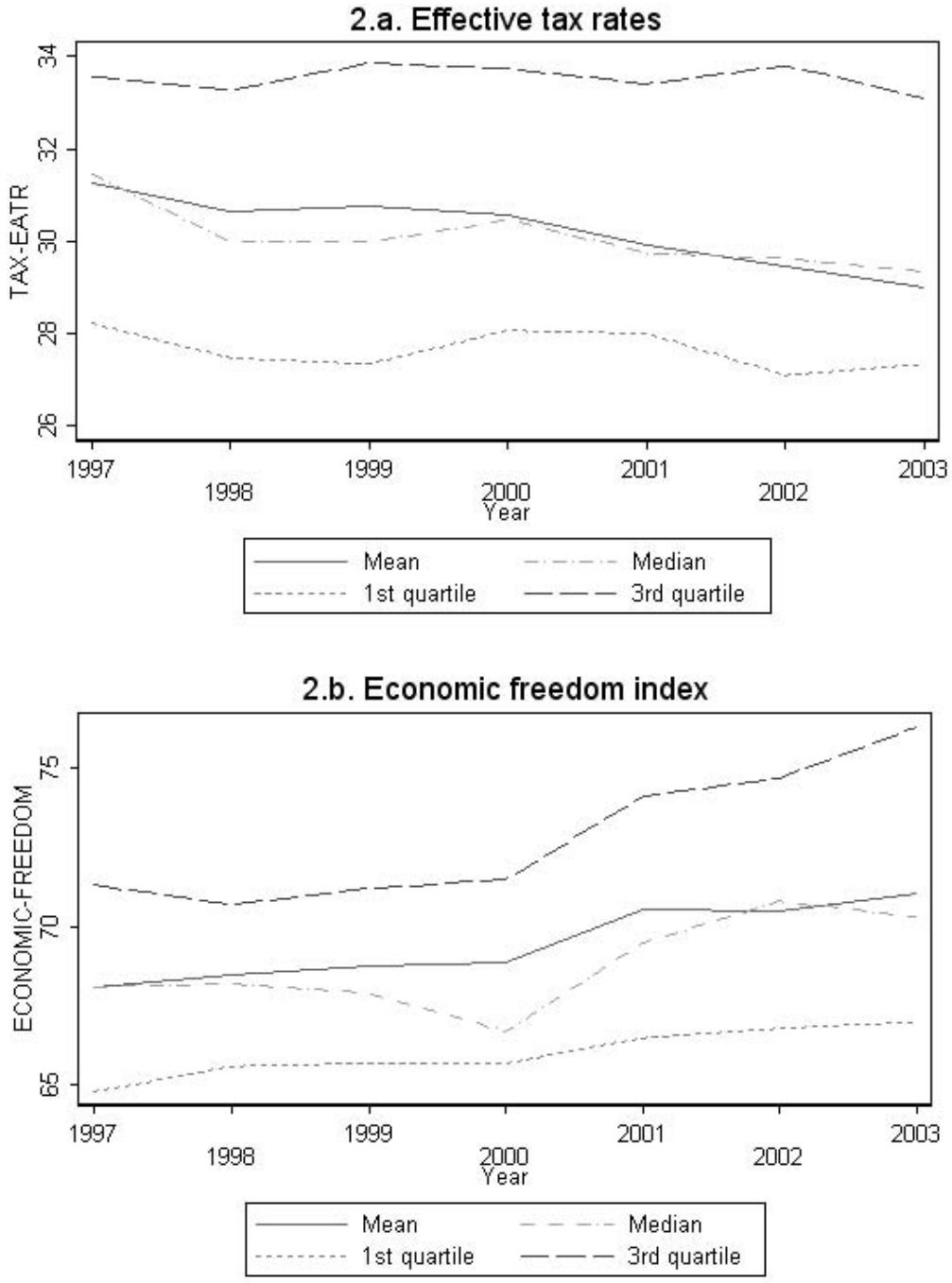

Figure 2: Effective tax rates and economic freedom scores (averaged over countries)

A Methodology to calculate effective average tax rates

This appendix sketches the methodology to calculate the effective average tax rates. More details can be found in Chennells and Griffith (1997), Devereux and Griffith (1998b), European Commission (2001).

The following table lists the main variables used in the computations. A brief definition, the sources and the assumptions imposed are also presented. Table A2 reports summary statistics for some of these variables.

Table A1. Definition of the parameters used to compute effective average tax rates (EATR)

Variable	Definition	Sources and assumptions
τ	The statutory corporate income tax rate.	In general it does not include local or municipal taxes, surtaxes and supplementary charges. Source: "Worldwide Corporate Tax Guide" by Ernst & Young.
m^i	The personal tax rate on interest income is the final tax rate on interest income from savings (e.g. bank accounts and deposits) and investments (e.g. bonds and securities).	When rates differ according to the source, the maximum tax rate on interest income from bonds and securities is considered. We use the maximum marginal tax rate for a domestic resident. Source: "The Global Executive" tax guide by Ernst & Young.
m^d	The personal tax rate on dividend income is the final maximum tax rate on dividends.	We consider the final maximum tax rate for the qualified shareholder. The definition of a qualified or substantial participation differs across the national jurisdictions and over time. We use the maximum marginal tax rate for a domestic resident. Source: "The Global Executive" tax guide by Ernst & Young.
s	The rate of tax credit available on dividends, expressed as a proportion of the gross dividend. It is available in the countries that adopt an imputation system where a share of corporate income taxes paid on distributed profits can be offset against personal income tax liabilities.	"The Global Executive" tax guide by Ernst & Young.
c	The rate of withholding tax on dividends paid by the firm to the shareholder.	"Worldwide Corporate Tax Guide" by Ernst & Young.

z	Shareholder's marginal personal capital gains tax rate is the tax rate on capital gains from the disposal of shares.	We consider the tax rate for the top rate shareholder with a qualified participation in the corporation. The definition of a qualified or substantial participation differs across the national jurisdictions and over time. We use the maximum marginal tax rate for a domestic resident. Source: "The Global Executive" tax guide by Ernst & Young.
i	Nominal interest rate	Euro bond one year rate. Source: European Central bank.
ϕ	The rate at which capital expenditure can be offset against tax.	We use the maximum allowed fiscal depreciation rate for plant and machinery. Source: "Worldwide Corporate Tax Guide" by Ernst & Young.
π	Nominal increase in prices between periods t and $t+1$. π is a general inflation rate common to output and capital.	Annual average rate of change in Harmonized Indices of Consumer Prices (HICPs) by Eurostat (country specific).
p	The marginal financial rate of return or real financial rate of return on the investment	This profitability rate is computed for each industry - year couple in the U.S. as ((Total Value Added - Total Labor Cost)/Total Value Added). Source: OECD STAN database for Industrial Analysis.
r	Real interest rate, $(1+r)(1+\pi) = (1+i)$	Our computations on formula.
δ	One period cost of depreciation	Assumed equal to 12.5% (see Devereux, Griffith and Klemme, 2002 and Yoo, 2003).
A	The net present value of tax allowances per unit of investment. The cost of one unit of physical investment in period t is therefore $(1-A)$.	Our computations on formula.
ρ	The shareholders' nominal discount rate	Our computations on formula.
γ	The term that measures the tax discrimination between new equity and distributions. It can also be interpreted as the net income received by the shareholder as a result of a one unit increase in dividends.	Our computations on formula.

R	The after tax net present value of the investment. It equals the net present value of the generated economic rent, $R_t = (1+\rho)dV_t = dD_t - dN_t + dV_{t+1}$, where dN_t and dD_t are the changes in new equity and dividends respectively in period t. V_t is the value of the firm in period t, that equals the net present value of the post tax income stream given by: $V_t = [\gamma D_t - N_t + V_{t+1}]/(1+\rho)$. R_t (after some substitutions) can be split into two parts: $R_t = R_t^{RE} + F_t$, R_t^{RE}, the rent attributable to investment financed by retained earnings; F_t the additional cost of raising external finance	Our computations on formula.
R^*	The pre tax economic rent of the investment. It is equal to $R_t^* = R_t^{*RE} + F_t^*$, as the post tax economic rent R_t. However $F_t^* = 0$, because the net present value of the additional costs due to financing by new equity or debt is zero; R_t^{*RE} can be simplified to $R_t^{*RE} = (p-r)/(1+r)$, since in absence of taxes $\tau = A = 0$ and $\gamma = 1; \rho = i$	Our computations on formula.
F	The cost of raising external finance	Our computations on formula.
$\tilde{p}$	Financial return, obtained setting $R = 0$ and solving for p.	Our computations on formula.
$EATR$	It is the proportional difference between R_t^* and R_t. It is defined for $p \geq \tilde{p}$.	Our computations on formula.

Table A2. Descriptive statistics for the parameters used to compute TAX–EATR. All variable expressed in percent.

Variable Names	Mean	Std. Dev.	25th perc.	Median	75th perc.	N. obs.
τ	32.09	4.93	28.00	33.33	35.00	117
m^i	36.25	14.38	25.00	35.00	48.50	117
m^d	32.30	15.83	25.00	30.00	45.50	117
s	11.92	15.85	0.00	0.00	28.57	117
c	22.11	9.69	20.00	25.00	28.00	117
z	27.41	13.84	20.00	27.00	35.00	117
i	3.92	1.60	2.97	3.56	4.39	117
ϕ	18.99	6.64	15.00	20.00	20.00	117
π	2.09	1.09	1.30	2.00	2.60	117
p	41.61	19.47	30.16	36.72	47.97	351

The most general formula for EATR is:

$$EATR = \frac{R^* - R}{R^*}$$

However it is common practice to substitute R^* at the denominator, which can potentially be equal to zero, with the present value of the pre tax income stream, obtaining the following formula that we apply to our data:

$$EATR = \frac{R^* - R}{\frac{p}{1+r}}$$

where:

$$R^* = \frac{p - r}{1 + r}$$

$$R = \frac{\gamma}{(1+\rho)}\{(p+\delta)(1+\pi)(1-\tau) - [(1+\rho) - (1-\delta)(1+\pi)](1-A)\} + F$$

$$\rho = \frac{(1-m^i)i}{(1-z)}$$

$$\gamma = \frac{(1-m^d)(1-c)}{(1-s)(1-z)}$$

$$A = \begin{cases} \phi\tau\dfrac{(1+\rho)}{\rho}\Big[1 - \dfrac{1}{(1+\rho)^{T+1}}\Big] & \text{if depreciation is allowed on a straight line basis, for } T = 1/\phi \\ \dfrac{\phi\tau(1+\rho)}{\rho+\phi} & \text{if depreciation is allowed on a declining balance basis} \end{cases}$$

and

$$F = \begin{cases} F^{RE} = 0 & \text{if the source of finance is retained earnings} \\ F^{NE} = \dfrac{-\rho(1-\gamma)}{1+\rho}(1-\phi\tau) & \text{if the source of finance is new equity} \\ F^{DE} = \dfrac{\gamma(1-\phi\tau)}{1+\rho}[\rho - i(1-\tau)] & \text{if the source of finance is debt} \end{cases}$$

The EATR measures in the paper are obtained imposing the following assumptions:

- TAX–EATR is obtained assuming that all personal tax rates equal zero ($m^i = m^d = c = s = z = 0$) and the source of financing is retained earnings (F^{RE})

- TAX–EATR–LOCAL is obtained calculating a new measure of corporate taxation (τ) that includes local or municipal taxes, surtaxes and supplementary charges. It is assumed that all personal tax rates equal zero ($m^i = m^d = c = s = z = 0$) and the source of financing is retained earnings (F^{RE})
- TAX–EATR–DEBT: is obtained assuming that all personal tax rates equal zero ($m^i = m^d = c = s = z = 0$) and the source of financing is debt (F^{DE})
- TAX–EATR-PERS-RE: is obtained considering all personal tax rates, while the source of financing is retained earnings (F^{RE})
- TAX–EATR-PERS-DE: is obtained considering all personal tax rates, while the source of financing is debt (F^{DE})
- TAX–EATR-PERS-NE: is obtained considering all personal tax rates, while the source of financing is new equity (F^{NE})

B Instrumental variables

Table B1. Checks and balances index

This table presents the checks and balances index for all the 17 EU countries over all the considered years as reported by Thorsten et al. (2001). Data refer to January 1 of each year.

Country	1997	1998	1999	2000	2001	2002	2003
Austria	5	5	5	4	4	4	4
Belgium	6	6	3	3	3	3	3
Denmark	7	7	7	7	7	5	5
Finland	3	3	3	5	5	5	4
France	5	5	5	5	5	5	4
Germany	5	5	4	4	4	4	4
Greece	3	3	3	3	3	3	3
Ireland	9	6	6	6	6	6	6
Italy	4	4	4	4	4	3	3
Luxembourg	4	4	4	4	4	4	4
Netherlands	6	6	5	5	5	5	7
Norway	3	5	5	5	5	6	6
Portugal	3	3	3	2	2	2	3
Spain	4	4	4	4	3	3	3
Sweden	3	3	4	4	4	4	4
Switzerland	4	4	4	3	3	3	3
UK	4	3	3	3	3	3	3

Table B2. Political parties' Herfindahl index

This table presents the Herfindahl index for all the 17 EU countries over all the considered years as reported by Thorsten et al. (2001). Data refer to January 1 of each year.

Country	1997	1998	1999	2000	2001	2002	2003
Austria	0.288	0.288	0.288	0.293	0.293	0.293	0.347
Belgium	0.124	0.124	0.109	0.109	0.109	0.109	0.109
Denmark	0.219	0.212	0.212	0.212	0.212	0.223	0.223
Finland	0.201	0.201	0.201	0.194	0.194	0.194	0.203
France	0.332	0.268	0.268	0.268	0.268	0.268	0.442
Germany	0.290	0.290	0.303	0.303	0.303	0.303	0.296
Greece	0.419	0.419	0.419	0.419	0.453	0.453	0.453
Ireland	0.286	0.333	0.333	0.333	0.333	0.333	0.284
Italy	0.368	0.368	0.368	0.368	0.368	0.503	0.503
Luxembourg	0.249	0.249	0.249	0.231	0.231	0.231	0.231
Netherlands	0.184	0.184	0.208	0.208	0.208	0.208	0.175
Norway	0.243	0.228	0.228	0.228	0.228	0.184	0.184
Portugal	0.389	0.389	0.389	0.384	0.384	0.384	0.389
Spain	0.367	0.367	0.367	0.367	0.403	0.403	0.403
Sweden	0.285	0.285	0.233	0.233	0.233	0.233	0.237
Switzerland	0.165	0.165	0.165	0.208	0.208	0.208	0.208
UK	0.437	0.473	0.473	0.473	0.473	0.464	0.464

Table B3. Chief executive party orientation

This table presents the chief executive party orientation for all the 17 EU countries over all the considered years as reported by Thorsten et al. (2001). Data refer to January 1 of each year.

Country	1997	1998	1999	2000	2001	2002	2003
Austria	Left	Left	Left	Right	Right	Right	Right
Belgium	Right	Right	Right	Right	Right	Right	Right
Denmark	Left	Left	Left	Left	Left	Right	Right
Finland	Left	Left	Left	Left	Left	Left	Center
France	Right	Left	Left	Left	Left	Left	Right
Germany	Right	Right	Left	Left	Left	Left	Left
Greece	Left	Left	Left	Left	Left	Left	Left
Ireland	Right	Center	Center	Center	Center	Center	Center
Italy	Center	Center	Center	Center	Center	Right	Right
Luxembourg	Center	Center	Center	Center	Center	Center	Center
Netherlands	Left	Left	Left	Left	Left	Left	Left
Norway	Left	Right	Right	Right	Right	Right	Right
Portugal	Left	Left	Left	Left	Left	Left	Right
Spain	Right	Right	Right	Right	Right	Right	Right
Sweden	Left	Left	Left	Left	Left	Left	Left
Switzerland	Center	Center	Center	Center	Center	Center	Center
UK	Right	Left	Left	Left	Left	Left	Left