# Firm entry dynamics and the taxation of corporate profits: Evidence from Europe

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**Abstract**

Can tax policy foster the creation of new companies? To answer this question, we assemble a novel country-industry level panel database with entry data of European companies between 1997 and 2004. We compute effective average tax rates and study the effect of corporate taxation policy on entry rates at country-industry level. Drawing on the recent political economy literature, we also account for the possible endogeneity of taxation and of other relevant policies. We find a significant negative effect of corporate income taxation on entry rates. The effect is concave and suggests that tax reductions affect entry rates only below a certain threshold tax level. We also find that a reduction in corporate tax rates is more effective in countries with better institutional infrastructure. Our results are robust to alternative measures of effective taxation 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 from 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 documented since Hause and du Rietz (1984).

Economic policies aimed at fostering the entry of new companies are high on many governments' agenda for their potentially positive effect on innovation, competition, employment, and growth (see Aghion and Howitt (2006)). Several recent studies have looked at this issue from a variety of angles, exploiting the increasing availability of firm-level data to assess the impact of different economic policies on entry and economic activity (e.g., Aghion et al. (2006), Alesina et al. (2005), Bertrand and Kramarz (2002), Bertrand, Schoar, and Thesmar (2007), Giannetti and Ongena (2006), Griffith, Harrison and Macartney (2007), Nicoletti and Scarpetta (2003)). This literature focuses on the effects of labor, credit, and product market regulations on entry and on the characteristics of entrants and incumbents.

We fill a clear gap in this literature by looking at a policy instrument that has received surprisingly little attention so far: corporate taxation. Taxation is a flexible policy instrument as it can be modified relatively easily in the budget law. It is also easier to change tax rates than to embark in a structural reform of labor or product markets, both in terms of legislative approval and of bureaucratic implementation. We base our analysis on recent studies that provide a methodology for correctly measuring the effective corporate tax rate (see Devereux (2007) for a recent survey), and construct our tax measures using the methodology of Devereux and Griffith (1998a,b).

We study the effect of corporate taxation on entry rates in a panel data setting, exploiting the longitudinal variation in the data and controlling for other time-varying institutional and regulatory factors. Our approach allows to overcome the well-known weaknesses of purely cross-sectional studies, thus providing a more solid foundation to our conclusions.

An important and novel contribution of this paper is that we consider that taxation is unlikely to be an exogenous policy instrument, but that it rather reacts to current (or past) business conditions. We account for this source of endogeneity by using several instrumental variables borrowed by the political economy literature (see Pagano and Volpin (2005)). To the best of our knowledge, our study is the first to take into account the endogeneity of tax policy in this context. Moreover, we consider that the entry decision can be influenced not only by taxation but also by other policy measures. For this purpose, we include in the analysis a summary measure of other economic policies which are likely to influence the creation of new businesses, and we consider that this, too, is potentially

endogenous.

Our empirical investigation therefore advances in several dimension the recent strand of literature which employs cross-country data to study the effect of policy measures and country characteristics on entry, on the incorporation decision, and on the characteristics of entrants (see Beck, Demirgüç-Kunt, and Maksimovic (2006), Ciccone and Papaioannou (2007), Demirgüç-Kunt, Love, and Maksimovic (2006), Desai, Gompers, and Lerner (2006), Djankov et al. (2002), Klapper, Laeven, and Rajan (2006), and Perotti and Volpin (2007)). In particular, a concurrent study by Djankov et al. (2008) analyzes a cross-section of 85 countries. They use survey-based information to build the tax burden of a 'standard' company with similar characteristics across all countries (the company produces and sells flower pots). This approach allows a direct comparison of the tax burden across countries using the 'effective' tax rate which applies to the chosen 'standard' company. However, it also limits the generality of the results, since the behavior of the 'standard' company may not be representative of a country's businesses. The main result is that the average entry rate over the years 2000 to 2005 is negatively affected by an increase in the 2004 corporate tax rate. Measured at the mean, a 10 percentage point decrease in the effective corporate tax rate is associated with an increase in the entry rate of 1.4 percentage points—with the average entry rate being about 8 percent.

We develop our analysis assembling a novel firm-level panel dataset which covers 17 West European countries in the period between 1997 and 2004. The dataset is derived from the Amadeus database published by Bureau van Dijk, which contains data on over 9 million European companies and has already been studied by Klapper, Laeven, and Rajan (2006) in the context of entry regulation. These data allow us to measure in a precise, consistent way, the entry of incorporated firms in 17 European countries for each of the 8 sample years. In particular, the data allow us to build measures at the country-industry-year level, thus bringing the analysis to a more disaggregate level than most previous studies.

Europe offers a particularly interesting testing ground, both for the quality of these data and for the fact that relatively similar economies have experienced a diversity of tax and other economic policies over the last decade. 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 exploit econometrically.

We measure the effective average corporate tax rate using detailed yearly information for each country from Ernst&Young, a major multinational tax consultancy. Building on Devereux and Griffith (1998a), we account for the effects of corporate taxation at the local level, for alternative capital structures of entering firms, for personal taxation, and also for alternative measures of the tax burden, thus measuring taxation in a more precise way

than previous studies.

What do the data tell about the effect of corporate taxation on entry? There is strong evidence that corporate taxation has indeed an effect on entry rates that is statistically significant and economically relevant. This evidence is consistently robust across a variety of specifications. Two results stand out. One is the evidence supporting a non-linear relation. This suggests that the effect of a tax reduction is at work only below a given initial threshold tax level. The effect is economically non-negligible. In our preferred specification, a reduction of the corporate tax rate from the median (30.08%) to the first quartile (27.57%) implies a 0.880 percentage point increase in the entry rate. A second intriguing result is that a reduction of the effective corporate tax rate is more effective in countries with a good institutional infrastructure, which we measure with the quality of accounting standards since these determine the extent to which profits can be hidden from taxation. On the whole, these findings point to the importance of corporate taxation for the creation of new successful businesses, and the need for including this policy in future research.

The rest of the paper is organized as follows: Section 2 describes the data. Section 3 computes the entry rates. Section 4 computes effective tax rates. Section 5 presents our results and is followed by a brief conclusion.

## 2 Data Sources and Definitions

### 2.1 Entry data

Our first data source is the Amadeus database published by Bureau van Dijk Electronic Publishing. The database is updated monthly and our analysis is based on each year's December issue, from 2000 to 2007. Amadeus collects company accounts from 38 European countries, covering financial information, industry activity codes, legal form, legal status and date of incorporation. The coverage has increased over time and in 2007 reached almost 9 million firms. Data are collected mainly from each country's Company Registrar, and are checked for consistency. A detailed description of the Amadeus database can be found in Klapper, Laeven, and Rajan (2006). Table 1 provides the definitions of all variables.

We use information from Amadeus to construct our dependent variable: entry rates at country–industry level. Section 3 details the steps involved in constructing this variable. While Bureau van Dijk made available an enlarged version of Amadeus since 1999, we cautiously build our dataset starting with the 2000 edition because only since that year we observe the coverage of European companies to increase substantially. In principle,

any non-financial company required to file its accounts should enter the database.[1]

### 2.2 Taxation data

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

From the *Worldwide Corporate Tax Guide*, we gather information on statutory corporate 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. TAX–EATR is the resulting effective average tax rate.

In order to compute effective tax rates at the country-industry level we need information about each industry's profitability, that we gather from the OECD's STAN database. Section 4 details the steps involved in constructing effective average tax rates.

### 2.3 Economic policy data

Our second independent variable, PRO-BUSINESS–POLICY, is the Index of Economic Freedom, published yearly by the Heritage Foundation (www.heritage.org) and the Wall Street Journal. We use this measure to account for a country's overall policy towards business creation. For each country and year, the Index spans nine specific policy factors (and the resulting economic 'freedom'): regulation of business activity (business freedom), regulation of international trade flows (trade freedom), extent of tax burden (fiscal freedom), extent of public ownership (freedom from the government), price stability (monetary freedom), regulation of banks and financial institutions (financial freedom), regulation of foreign investments (investment freedom), quality of property rights (property rights), and the enforcement of anti-corruption laws (freedom from corruption). Each factor is evaluated using 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 (see Beach and Kane (2007)).

A second set of policy variables comes from the *World Competitiveness Yearbook* (WCY) published each year by the Institute of Management Development (IMD), a Swiss

[1]Before 1999 Bureau van Dijk published what is now the "Top 250,000" version, which includes only large companies.

business school. The WCY variables have already been used in economic studies as measures of economic policies and quality of the country institutional infrastructure (e.g., Djankov et al. (2002)).

The WCY contains a set of indicators that are meant to capture the degreee of business-friendliness of specific dimensions of the regulatory framework for each country and year. A higher score denotes a 'better' policy from business' point of view. These measures vary across countries and time, and cover the following areas: anti-trust regulations (ANTITRUST–REGULATION), the quality of the country's bureaucracy (BUREAUCRACY), the extent of corruption in the public administration (CORRUPTION), the strictness of hiring and firing regulations (LABOR–REGULATION), and the ease of access to (domestic or foreign) capital by companies (ACCESS–CAPITAL). From the WCY we also employ an alternative measure of fiscal burden (PERCEPTION–TAX), that is a survey-based measure of whether corporate taxes are perceived by business leaders to discourage entrepreneurial activity.

### 2.4 Instrumental variables

An important part of our analysis consists of accounting for the likely endogeneity of tax policy. In our analysis we use five variables as instruments to account for the endogeneity of the political process. They come from three different sources. From the World Bank's Database of Political Institutions, which has been extensively used in the political economy literature, we take the ideological orientation of the chief executive's party (GOV–CENTER–LEFT), the number of players with veto power in the political system (VETO–POWER), and the degree of government fragmentation (GOV–FRAGMENTATION). From the International Country Risk Guide published by the PRS Group Inc. (www.prs.com) we take a measure of government stability (GOV–STABILITY), and from Wolfram Nordsieck's online database of parliamentary elections (www.parties-and-elections.de) we obtain the dates of legislative election in each country (ELECTION–DATE).

## 3 Computing entry rates

We build our sample of companies with the goal of obtaining a homogeneous, comparable set of firms across countries and over time. Table A1 in the Appendix provides all the steps we follow in selecting the firms that we include in the dataset. Our approach closely follows the strategy of Klapper, Laeven, and Rajan (2006).

First, we select countries. We include all the 15 Western European countries which are members of the European Union: Austria, Belgium, Denmark, Finland, France, Ger-

many, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom. We also include two European contries not members of the EU, Norway and Switzerland, obtaining a final sample of 17 countries.[2]

Second, we include all incorporated and limited liability companies, but exclude partnerships, sole proprietorships, cooperatives and other legal forms. One reason for this is that we want to focus on the creation of successful companies, rather than on firm creation *per se*. That larger firms are more likely to incorporate is documented by studies of the effect of taxation on organizational form.[3] In fact, incorporation provides entrepreneurs with protection from creditors, thus allowing them to take riskier, but potentially more rewarding strategies. Incorporation also imposes more transparency, which in turn allows better access to external finance (see Egger, Keuschnigg, and Winner (2008), who also show that incorporated companies are more profitable). Both features should result in more growth. Indeed, Europe-wide data from Eurostat for 2004 show that the average employment for unincorporate companies is 1.9, as compared to 38.5 for incorporated companies. The second reason for excluding unincorporated firms is coverage. Amadeus coverage of incorporated companies is substantial and regular, largely because incorporated companies typically have to file their accounts. Coverage is instead sparse and erratic for the other legal forms.

Third, we include firms active in manufacturing and in business-related services, and we exclude companies in the primary sector and in regulated services.[4] This gives us 39 industries, measured at 2-digit NACE Revision 1 classification code level, the standard classification system used in Europe. There are 5,304 industry-country-year potential observations; from these we drop 421 observations for which we have less than five companies, and 78 observations relative to UK and Irish industries in 1997, for which data are missing. We obtain 4,805 usable observations.

Fourth, when a company reports both consolidated and unconsolidated statements, we only include the observation corresponding to the unconsolidated statements in order to avoid double counting. We do so to avoid double-counting firms with subsidiaries (see Klapper, Laeven, and Rajan (2006) for a discussion).

Finally, we need to make some assumptions on the timing of our data. Amadeus includes all companies which are required to file their accounts; it keeps a company for

[2]We do not consider Malta and Cyprus, which recently accessed the EU, because of their small size. We do not include also Baltic and Central European accession countries because of the different coverage in the years we consider.

[3]See, among others, Cullen and Gordon (2007), Fan and White (2003), Gentry and Hubbard (2004), Mackie-Mason and Gordon (1997), and Georgellis and Wall (2006).

[4]We exclude these industries because their coverage 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).

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.[5] We therefore expect that a company entering Amadeus in 2000 will remain in the database at least until 2004, and it will be deleted starting from 2005 if it stops filing accounts after 2000. The fact that firms are continuously included into and deleted from Amadeus justifies our choice of gathering data from consecutive Amadeus issues. While it requires more work than downloading the historical data from one single issue, this choice provides a more careful strategy for the computation of entry rates.

We also need to choose how far back in time we gather information from. Because of delays in firms filing their reports, and because of the time it takes to enter them in the database, we expect that a new company should appear in the database only two to three years after its incorporation.[6] Computing entry rates from 'too recent' Amadeus issues brings the risk of over-estimating entry rates when many incumbents have been dropped because they stopped filing. At the same time, computing entry rates from 'too distant' Amadeus issues brings the risk of under-estimating entry rates by losing entrants whose records are entered with a delay. We strike a balance by choosing to compute entry rates with respect to year $t-3$, where $t$ is the issue year of the database for our base case analysis. We then use data from year $t-2$ to check the robustness of our results to this choice.

The final steps consists of counting, for each of the eight available Amadeus December issues (from 2000 to 2007), the number of firms, for each country and industry, 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 $t-2$).[7] Our entry rate (ENTRY–COUNTRY–INDUSTRY) is given by the ratio of these two numbers:

$$ENTRY-COUNTRY-INDUSTRY_{ict} = \frac{(Number\ of\ entrants)_{ict}}{(Number\ of\ active\ incumbents)_{ict}}$$

where $i$ indexes industries, $c$ indexes countries and $t$ indexes time. Entry rates for t=1997 are computed from the 2000 Amadeus issue, entry rates for 1998 from the 2001 issue, and so on. Country-industry entry rates (ENTRY–COUNTRY–INDUSTRY) constitute our main dependent variable. For comparison with previous studies, we also report descriptive

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

[6] Countries differ in the period a company can take to file its accounts after its year end. There can also be delays between the filing of the accounts and their recording in the database because BvD assembles data from local information providers. This data gathering process increases data quality but may also cause delays in the appearance of information in the database.

[7] 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).

statistics for entry rates at the country level (ENTRY–COUNTRY). Notice that the fact that the denominator includes only active companies provides us with a sort of 'net' entry rate, 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 statutory tax rate is not a satisfactory measure because taxation depends also on the tax base, i.e. taxable corporate income. A high corporate income tax rate with a thin tax base can in fact be more attractive for companies than a lower tax rate with a much larger tax base.

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 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 European Commission (2001)), where the computation of the tax burden is based on a 'standard' firm characterized by a set of features with respect to its industry, its balance sheet structure and size, its revenues, and its expected development over a given number of years. This methodology has the advantage of making comparisons across countries straightforward, even if one includes a large 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 specific characteristics of the 'standard' firm. This is the approach used by Djankov et al. (2008).

Some authors have suggested using 'effective' tax measures to overcome 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, while Devereux and Griffith (1998b) propose the effective average tax rate (EATR). These measures have the advantage of being both theoretically grounded—they are based on a neoclassical theoretical model with forward-looking agents—and relevant for corporate decisions. Moreover, the EATR has been developed to study discrete investment choices like the decision to incorporate in a given country, which well suits our analysis. This is the approach we follow.

The computation of the EATR is based on the definition of an hypothetical investment project characterized by a set of assumptions about the type of assets purchased, the way it is financed, and the type of their investors. Taxes affect the rate of return of the investment, and the EATR is defined as the proportional fall in the profitability rate that

follows taxation to the income stream generated by the investment:

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

where $R^*$ is the pre-tax economic value associated to the project, i.e. its net present value, and $R$ is the project's after-tax economic value. Like the 'Tax Analyser model,' also the size and distribution of the EATR depend on some assumptions, but with the advantage of capturing the main features of national tax systems while ensuring more generality in the evaluation of the corporate tax burden and requiring less specific assumptions.

Many authors have adopted the EATR as the relevant measure of corporate tax burden for companies' decision among mutually exclusive discrete investment projects. For instance, Devereux and Griffith (1998a) study the effect of taxes on the location decisions of US multinational companies, while Bénassy-Quéré, Fontagné and Lahrèche-Révil (2005) and Buettner and Ruf (2007) analyse the link between corporate income tax rates and foreign direct investments in European countries. Below we detail the assumptions underlying the computation of EATR, following the methodology of Devereux and Griffith (1998b).

### 4.1 Assumptions on the investment project

The investment we consider is a domestic investment in plant and machinery by a resident company. As we discuss in Section 5.5, our empirical results are unchanged when the investment also includes industrial buildings, office equipment or intangible assets.

The project is characterized by a rate of return and a cost of capital. The rate of return of the investment is assumed to be industry-specific. The project's rate of return used in the incorporation decision should be based on a forward-looking expectation of future income. Our hypothesis is that the rate of return associated with the project undertaken in a particular European country is equal to the rate of return in the corresponding US industry. In other words, we conjecture that profitability in US industries is closer to its 'natural' rate because of fewer regulations and restrictions to competition and entry, and therefore a more competitive environment. This approach is similar in spirit to the methodology introduced by Rajan and Zingales (1998), which we modify to a panel data setting. We approximate the profitability rate by the difference between an industry's total value added and total cost of labour as a percentage of total value added: (Total Value Added – Total Labor Cost)/Total Value Added. We obtain data to compute yearly profit rates for US industries from the OECD STAN Database.[8]

[8]Devereux and Griffith (2003) show that the EATR approaches the statutory tax rate as profitability increases, and the two coincide for profitability rates close to 100%. When the investment is very profitable, the stream of income of the project largely exceeds its costs, and tax allowances become less important. In our data, in the absence of personal taxes, industries with very high profitability rates in the US

The cost of the investment is given by the cost of capital, so that we need to make assumptions about the sources of finance. In our base case we assume that the investment is fully financed by retained earnings, but we also experiment with financing with debt. The main effect of allowing debt is the possibility to deduct interest payments, creating a 'debt tax shield' which reduces the amount of taxable profits. Therefore, the inclusion of debts leads to lower effective tax rates, all else equal.

Inflation rates and interest rates also affect the cost of the investment, through their effect on the discount rate and on tax allowances on assets. Tax allowances on assets depend on fiscal depreciation rates that are applied to the historical cost of the asset, without adjusting for inflation. As inflation increases, nominal interest rates increase and the net present value of tax allowances decreases, all else equal. Lower tax allowances mean higher after-tax investment cost and a higher effective tax rate, all else equal.

We obtain inflation rates 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 rate is then obtained as $(1 + r) = (1 + i)/(1 + \pi)$, where $r$ is the real interest rate, $\pi$ is the inflation rate and $i$ the nominal interest rate. The nominal interest rate is year- and country-specific and it is the one-year interest rate on public bonds, obtained from the Bulletin of the European Central Bank.

### 4.2 Assumptions on the tax system

The assumptions about the investment project allows us to obtain an estimate for the pre-tax value of the project (R*). To compute the after-tax value of the investment (R) we need to introduce a set of assumptions on corporate and personal tax rates. In the Appendix we provide formal definitions and further details, which largely follow Devereux and Griffith (1998a).

First, in our baseline specification we focus on the statutory corporate tax rate and consider a set of depreciation rates or capital allowances. 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 on assets.

Second, we experiment with a variety of fiscal depreciation rates and tax allowances. Higher capital allowances lower the cost of the investment, a firm's tax liabilities and the effective tax rate. In the baseline specification we present results based on the maximum

experience an EATR that is larger than for industries with low profitability. Examples of industries with high profitability rates are public utilities (76% on average), real estate (90%) and renting of machinery and equipment (77%). Industries with low profitability include textiles (26%), and medical, precision and optical instruments (13%).

fiscal depreciation rate for plant and machinery. However, all our results are robust to the inclusion of a large variety of weighted averages of depreciation rates for plant and machinery, industrial buildings, office equipment and intangible assets.

Third, as a robustness check, we also consider a specification which includes personal taxation.[9] The relevant personal income includes interest income, dividend income, and capital gains.[10] We collect data on the three relative tax rates assuming a resident qualified shareholder as our 'standard' taxpayer.

The personal tax rate on interest income is the final (i.e., after witholdings) tax rate on income from interest-bearing investments (deposit accounts, bonds, and other securities). When tax rates differ across interest-bearing investments, we take the (marginal) tax rate on interest income from bonds and securities. The personal tax rate on dividends (and the corresponding tax credit) is the final maximum tax rate for qualified shareholders.[11] Finally, the personal capital gains tax rate is the tax rate on capital gains from the disposal of shares by qualified shareholders.

The personal tax rate on interest income negatively affects shareholders' discount rate. Higher taxation of dividends increases the effective tax rate associated to the investment, while a higher tax credit on dividends decreases it. The taxation of capital gains has an ambiguous effect since it influences both the shareholder' discount rate and the return of the investment.

# 5 Empirical analysis

## 5.1 Descriptive evidence

We start our analysis by describing the data used in our empirical applications. Table 1 provides the definitions and sources of all variables. Table 2 reports descriptive statistics for the whole sample, while Table 3 reports descriptive statistics by country for entry rates and the two main independent variables. In addition, Figures 1, 2, and 3 describe

[9]The exclusion of personal taxation can be justified on a number of grounds. First, in the absence of personal taxation, we are able to concentrate on the effect of the corporate tax rate, through the effective tax rate, on our measure of entry. Second, introducing personal taxation requires making assumptions about shareholders' attributes like nationality or income, so that the choice of the 'correct' shareholder is to some extent 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.

[10]From the point of view of a shareholder, the stream of taxable income that the investment generates is given by dividends and capital gains. The tax rate on interest income instead affects the shareholder's nominal discount rate.

[11]The definition of 'qualified' participation differs across jurisdictions and over time. Notice also that the tax credit exists only in those countries that adopt an imputation system, where corporate income taxes paid on distributed profits can be offset against personal income tax liabilities.

the evolution over time of the main variables of interest.[12] Four empirical features are worth mentioning at this stage.

Firstly, a simple comparison between the distributions of our main measures 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–PERSONAL) shows that the inclusion of personal taxation increases not only the mean—as obviously expected—but also the variance (Table 2). To what extent this is a genuine feature of taxation in European countries or instead an undesired effect of the difficulties in obtaining country-year consistent series on personal taxation is difficult to say. We 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 (8.27% for the ENTRY–COUNTRY variable, and 7.02% for the ENTRY–COUNTRY–INDUSTRY variable, see Table 2) hide a significant between-country variation (see Table 3). The UK, Denmark and Austria show consistently high entry rates, while Italy, Luxembourg, the Netherlands and Portugal show consistently low entry rates. Rather comfortingly, our ranking of countries is very similar to the one reported in Djankov et al. (2008) and 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 practices across countries.[13] For this reason it is crucial to be able to rely on panel data, which allow us to exploit the longitudinal dimension to control for any possible industry–country systematic differences in the data collection.

Thirdly, as it is apparent from Table 3, there is a negative correlation at the country level between corporate taxation (TAX–EATR) and a country 's policy attitude towards entrepreneurship as proxied by the PRO-BUSINESS–POLICY variable. For instance, Ireland has the lowest corporate tax rate and the highest score for the PRO-BUSINESS–POLICY index. At the opposite, most Latin countries (France, Italy, Portugal, and Spain) have high corporate tax rates and at the same time denote a relatively unfriendly attitude towards entrepreneurship. This implies 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

[12]Notice that our data constitute an unbalanced panel because of missing observations for some country-industry pairs and/or years, as we explain in Section 3. Notice also that in Table 2 and Figure 1 Switzerland has a very high country level entry rate which is due to the high rate for 1997, probably due to a change in filing requirements or in reporting in that year. Industry-country level entry rates for Switzerland do not present this problem because many companies do not have sectoral coding.

[13]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' variable, respectively.

variation, we also provide some *prima facie* evidence on the evolution of the empirical distributions of our main variables of interest over time (see Figure 1). Overall, entry rates show a moderately pro-cyclical pattern not only at the mean but also at most quartiles. Effective average tax rates are characterized instead by a pronounced downward trend at the mean, which is only partially reproduced at the quartiles (see Figure 2), consistent with the results of Slemrod (2004), among others. On the contrary, PRO-BUSINESS–POLICY shows a clear upward trend both at the mean and at the quartiles (see Figure 3). Again, this points to the potential identification problems associated to the omission of country-specific time-varying controls, and provides additional motivation for the use of panel data.

### 5.2 Estimation Strategy

We now 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 $c$. We estimate the following equation:

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

The main variable of interest is $Tax_{ict-1}$ ,which represents the (lagged) 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 $\alpha_t$ is a time effect that we model by introducing year dummies. The vector $\mathbf{x}_{ct-1}$ includes a set of (lagged) 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; in some specifications this vector will also include alternative measures proxying for corporate taxation.

The two remaining variables in equation (1) are unobservable error components. In particular, the term $\eta_{ic}$ represents a country-industry 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 country (e.g. cultural attitudes towards entrepreneurship) and industry (e.g. structural entry barriers) specific characteristics as well as unobservable factors which vary across both industries and countries but that can be reasonably thought to be constant over time, at least during our sample period (e.g. industry specialization).

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, country-industry level omitted variables. To overcome this first source of endogeneity it is standard practice to use appropriate transformations (e.g. 'within group' or 'first differences') which remove unobserved heterogeneity, $\eta_{ic}$, from the original model. Notice that in our set-up standard errors are robust to within-unit ($ic$) heteroskedasticity and autocorrelation of unknown forms. Given our within-group transformation we also allow for any arbitrary form of spatial correlation in both dimensions (industry and country) to the extent that spatial clustering is captured through the unobserved effect, $\eta_{ic}$ (see Wooldridge (2006), p.12).

The second problem is that the identification of structural effects through regression coefficients in deviations from country-industry specific means (i.e. the within-group transformation) requires 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 negatively 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 explore the possibility of using a variety of complementary measures of the political process (see, e.g., Pagano and Volpin (2005)). These include the date of election (ELECTION–DATE), the ideological orientation of the elected government (GOV–CENTER–LEFT) as well as its perceived stability (GOV–STABILITY). Furthermore, proxies for the fragmentation of the political system (VETO–POWER, GOV–FRAGMENTATION, a measure of opposition fragmentation, and a measure of ideological heterogeneity in the cabinet) are also taken into account. As it is well known, good instruments have to be both valid—that is orthogonal to the transformed error term $\varepsilon_{ict}$—and relevant, or non–weak, that is 'significantly' correlated with the endogenous variables. Accordingly, the set of instruments to be included in the relevant first stages has been selected from the available list on the basis of appropriate specification tests for instrument validity (Hansen J and C tests)[14] and relevancy (Cragg-Donald and Kleibergen-Paap tests).[15] Notice that the nature of

[14]Hansen's 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.

[15]Note, however, that weak-identification tests are not fully developed for the case of non-i.i.d. errors. In particular the weak identification test that uses the Cragg-Donald statistic (Cragg and Donald (1993)) requires an assumption of i.i.d errors (Stock and Yogo (2005)). This is potentially a serious problem in our context (and indeed in most applications), where heteroskedastcity, autocorrelation and possibly clustering are likely to be present. Under these circumstances a large test statistic might not be a signal of model

our analysis prevents us from using time-invariant instruments which are widely employed in cross-country studies, and which relate to the nature of the electoral system, such as the use of majoritarian or proportional electoral rules, the tenure of democracy, or the minimum share of votes necessary to obtain parliamentary representation etc. (see, e.g., Milesi-Ferretti, Perotti, and Rostagno (2002) and Persson and Tabellini (2004)).

### 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 PRO-BUSINESS–POLICY. We also experimented with higher order terms in TAX–EATR, but these 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. TAX–EATR is the relevant tax rate to be applied to discrete investment projects and it is expected to have a negative effect on the entry rate. PRO-BUSINESS–POLICY, the economic freedom score, proxies for time-varying country-specific policies towards firm creation. This variable is expected to enter our equations with a positive sign. Within-group estimation results are reported in the first column of Table 4.

Our findings can be summarized as follows. Firstly, the coefficients on corporate taxation (TAX–EATR and TAX–EATR–SQ) are found to be respectively negatively and positively signed. They are also both significant at conventional statistical levels. Secondly, as expected, PRO-BUSINESS–POLICY is found to be positive and significant.

We find that a reduction of the tax rate from the median (30.04%) to the first quartile (27.57%) implies a 0.107 percentage point increase in the entry rate. On the other hand, a reduction from the third quartile (33.44%) to the median is found to have the wrong sign (–0.145). Furthermore, both effects are significant at conventional statistical levels. Taken at its face value, this implies that the marginal effect on entry rates is a negative function of the initial tax rate.[16]

Before drawing strong conclusions, however, we need to address the main limitation of our estimation approach, namely the strong exogeneity assumption for TAX–EATR, and TAX–EATR–SQ. For this reason we report in columns 2 and 3 of Table 4 additional estimates based on alternative—and more plausible—orthogonality assumptions. Building

adequacy but simply reflects the fact that the disturbances are not i.i.d.. Therefore Baum et al. (2007) suggest to report the Kleibergen-Paap statistic (Kleibergen and Paap (2006)) as the robust analog of the Cragg-Donald statistic, and to use with caution the critical values computed by Stock and Yogo, since critical values for this statistic are not available.

[16]If we impose linearity (which is rejected by the data) we find a negative and significant coefficient equal to –0.028. This effect is smaller than that found by Djankov et al. (2008), who find that a decrease of ten percentage points in taxation brings to an 1.4 percentage point increase in the entry rate.

on the recent political economy literature, we use as instruments four variables: GOV–CENTER–LEFT, VETO–POWER, GOV–STABILITY, and ELECTION–DATE. These variables are defined in Table 1. The crucial identification assumption is that these variables do not affect entry rates directly, but only indirectly, that is through their effect on corporate tax decisions at the political level. In the first stage regressions (column 3) more stable governments (GOV–STABILITY) at the beginning of their term (ELECTION–DATE) and operating in less fragmented political systems (VETO–POWER) turn out to be associated with lower levels of corporate taxation.[17] Comfortingly, both the validity of this set of instruments and the exogeneity assumption for the PRO-BUSINESS–POLICY variable are not rejected by the data according to Hansen's J and C statistics. This suggests that the data, in our context, support our choice to treat policy towards firm creation as exogenous. As we show in the next Section, our results however hold also in the case where we treat PRO-BUSINESS–POLICY as endogenous and instrument it along with taxation. Analogously, the null of weak identification is rejected at conventional statistical levels according to both the Cragg-Donald and the Kleibergen-Paap statistics.

Once we instrument TAX–EATR, the effect we detect (see column 2 of Table 4) is statistically significant and economically non-negligible. A reduction of the corporate tax rate from the median (30.04%) to the first quartile (27.57%) implies a 0.880 percentage point increase in the entry rate. A reduction from the third quartile (33.44) to the median implies a 0.270 percentage point increase in the entry rate. This result is strikingly consistent with the well known-fact that the distribution of many firm level variables, including the size and the profitability of entrants, is highly skewed (Cabral and Mata (2003)). It is therefore not surprising that a reduction of corporate taxation occurring at the upper part of the corporate tax distribution (from, say, 50% to 40%) will attract fewer additional entrants compared to a reduction occurring at the lower part (from, say, 30% to 20%).

### 5.4 Extensions

In this section we extend our results in two directions. First, we consider including alternative time-varying potential policy determinants of entry. Second, we put our results in context, and make a first step in asking when taxation policy is more effective.

[17] At first sight, the sign of the GOV–CENTER–LEFT might seem counterintuitive. Note, however, that identification here is achieved only through within-country variation, and therefore this result is likely to be sensitive to single specific episodes. Indeed, from a closer inspection to the data it emerges that the negative sign on GOV–CENTER–LEFT reflects almost exclusively the reduction in corporate taxation introduced by the left-wing German government of chancellor Schroeder after 1998.

### 5.4.1 Alternative economic policy measures

In Table 5 we replace the PRO-BUSINESS–POLICY variable with a set of alternative variables which are meant to capture separately specific country characteristics which reflect non-tax economic policies with a potential effect on entry rates. For example, Klapper, Laeven and Rajan (2006) show that higher entry regulation costs reduce entry rates. Ciccone and Papaioannou (2007) find evidence of a negative relationship between bureaucracy (measured by the number of procedures a start-up has to comply with) and entry, while Perotti and Volpin (2007) highlight the role of financial development and investor protection in incorporation decisions. We therefore look at policies aimed at increasing market competition (ANTITRUST–REGULATION), reducing bureaucratic red tape (BUREAUCRACY), avoiding corruption in the public sector (CORRUPTION), lifting hiring and firing constraints (LABOR–REGULATION), and fostering financial development (ACCESS–CAPITAL). Since these variables capture different aspects of a government's overall attitude towards the economy, it is not surpring that they are highly collinear. For this reason we introduce them one at a time.[18]

All of these variables have the expected sign, and three out of five are significant. This result is quite interesting as it points to the importance of several different policy dimensions for entry. In fact, the precision of the point estimates is almost surprising since we already control for time-invariant country-industry 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 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.

### 5.4.2 When is corporate tax policy most effective?

Now that we have established the importance of tax policy for entry rates, one interesting question is to further ask whether the relationship between corporate taxation and entry rates is constant, or whether it is instead a function of country-specific characteristics. To explore this issue we look at accounting standards. These are a relevant element of a country's institutional infrastructure in our context because the benefits of a corporate tax reduction are likely to be smaller in countries where it is easier to avoid the tax burden through the manipulation of accounting books. In such countries, it may be easier to hide profits from taxation, so that a lower corporate tax rate has less influence on the incentives to create a new company. For this reason, we partition our set of countries

[18]We only report the GMM-IV regressions to fit the results in a single table; within-group and first stage regressions conform to the results of Table 4 and are available upon request.

according to whether their accounting standards are relatively 'bad' (Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy, and Portugal) or 'good' (Finland, France, Luxembourg, the Netherlands, Norway, Spain, Sweden, Switzerland, and the UK).[19]

Results are reported in Table 6. A quadratic specification is found to be valid for both subsets of countries, especially in column 2, where the GMM-IV estimation method is used. However, an important difference emerges when our preferred estimation method is applied. In fact, given the different shape of the two quadratic functions, the effect of a reduction in TAX–EATR has a larger effect in countries with 'good' accounting standards at the lower tail of the distribution of corporate taxation, that is when corporate taxation is found to have a larger and more significant effect. The normative implication of this finding is that policy-makers may increase the efficacy of a reduction of corporate taxation by first making accounting standards more rigorous.

### 5.5 Robustness checks

In this section we assess the robustness of our base case results with respect to four issues: (i) alternative assumptions in the computation of the effective tax rates (Table 7); (ii) alternative taxation measures (Table 8); (iii) endogenising PRO-BUSINESS–POLICY (Table 9); and (iv) robustness to several of the assumptions we make for our base case estimations.

#### 5.5.1 Alternative assumptions in the computation of TAX–EATR

As it is apparent from the discussion in Section 4 and the Appendix, several assumptions have to be made in order to derive an appropriate measure of the effective corporate tax rate. In building our data we face a trade-off between theoretical soundness and data availability/reliability, and need to make several choices on how the project is financed (by retaining earnings, by obtaining new debt, or issuing new equity). 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. Still, 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; this derives from the need to compute the appropriate tax base for local taxes, which often differs for the tax base applicable to the national corporate income tax. 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 7 address this

[19] We take this partition from LaPorta et al. (1998), by dividing countries on the basis of the reported ranking and using the median as the watershed.

issue by replacing TAX–EATR with an alternative tax measure (TAX–EATR–LOCAL) which includes these additional tax components. In spite of these concerns, reported results turn out to be very similar to those already discussed in the previous section.

Columns 4 to 6 of Table 7 address the assumptions on the sources of finance. 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.[20] The results show that punctual estimates tend to be slightly lower compared to the baseline case when WG estimation is used. However, the GMM-IV coefficients reported in column 5 are very similar to the GMM-IV estimates reported in Table 4, although our diagnostics signal potential weak identification problems.

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, in turn, makes the identification of the 'representative' investor quite arbitrary. With this caveat in mind, following Devereux and Griffith (1998b), we have computed an additional tax measure: TAX–EATR–PERSONAL, which incorporates personal taxation in our benchmark case where the firm is fully financed by retained earnings.[21] As it can be seen from column 7 of Table 7, within-group estimates of the coefficients on the tax variable turn out to be insignificant, both statistically and economically. The fact the within-group estimator provides an imprecise point estimate 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. Finding an appropriate set of instruments for TAX–EATR–PERSONAL has also proved to be a very difficult task.[22] As an illustrative example, in columns 8 and 9 we present the results obtained when using as instruments GOV–CENTER–LEFT, VETO–POWER, and GOV–FRAGMENTATION. Comfortingly, estimated coefficients come closer to those reported in Table 4 even if they are not statistically significant at conventional levels. Note also that our specification tests signal some unsolved mis-specification issues.

[20]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.

[21]Similar results are found with a more realistic mix of financing sources, e.g. retained earnings 50%, new debt 25%, and new equity 25%.

[22]Note that TAX–EATR–PERSONAL is only very weakly correlated with all other tax measures: TAX–EATR, TAX–EATR–LOCAL, and TAX–EATR–DEBT.

### 5.5.2 An alternative corporate tax measure

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 government behavior towards corporate taxation. To address this issue we replace TAX–EATR with an alternative— more qualitative—proxy: PERCEPTION–TAX, a survey-based variable obtained from the World Competitiveness Yearbook which tries to measure the perceived attitude of national fiscal policies toward entrepreneurship. Results are presented in Table 8 and conform to expectations. In fact, both in column 1 (within-group) and in column 2 (GMM-IV) the coefficient of PERCEPTION–TAX is negative and significant. Note, however, that the Hansen's J statistic is very high, casting some doubts on the validity of our instruments in this particular equation.

### 5.5.3 The endogeneity of economic policy

Even if our endogeneity tests do not reject the null of exogeneity for PRO-BUSINESS–POLICY, some legitimate concerns could still be raised on the basis of speculative economic reasoning.[23] In principle, in fact, entry rates and some of the variables which are part of the aggregate index (e.g., foreign investment) could be simultaneously affected by transitory unobserved shocks. To address this potential criticism, Table 9 reports the results of additional IV estimates, where PRO-BUSINESS–POLICY is treated as endogenous and instrumented with the same set used for TAX–EATR and TAX–EATR–SQ. Two interesting findings are worth highlighing. First, not only our weak identification tests allow us to reject the null, but also our first stage results are consistent with reasonable priors. Second, and more important for the purpose of the present paper, all our previous results are confirmed. In fact, the coefficients on TAX–EATR and TAX–EATR–SQ retain their sign, magnitude, and statistical significance. Furthermore, PRO-BUSINESS–POLICY is found to have a positive coefficient, although this is not significant at conventional statistical levels.

We follow the same procedure for our five measures of individual policies obtained from the *World Competitiveness Report*. The results, which are available upon request, confirm those of Table 5, in that the effect of corporate taxation retains the same levels of both statistical and economic significance. In this case we also find that all five policy measures retain their statistical and economic significance. The only exception is in the case of labor regulations, where the effect of corporate taxation becomes insignificant at conventional levels.

[23]The endogeneity test (Hansen's C statistic) is performed to verify the exogeneity of PRO-BUSINESS–POLICY. The statistics is distributed as chi-squared under the null hypothesis that the specified endogenous regressors are exogenous.

### 5.5.4 Additional robustness checks

In building our analysis we have relied on a number of assumptions. We have already reported our checks on the robustness of our results against the main assumptions, but we also want to mention, without reporting for space reasons, several additional checks we have made. They are are all available upon request.

First, we reported all our results for entry rates computed at $t-3$. We built our data also with entry rates computed with information on $t-2$. We find that our results do not depend on this choice, neither in terms of statistical significance, nor in terms of economic magnitude.

Second, we ran robustness checks on the other assumptions underlying the computation of TAX–EATR. This included alternative composition of the asset base (i.e., a different mix of machinery and buildings, office equipment, and motor vehicles), and a range of alternative economic depreciation rates, from 5% to 20%. We also include intangible assets in the composition of the asset base. We find that these different assumptions do not affect any of our results.

Third, we introduce additional time-varying covariates which have been found in the literature to affect entry rates. Klapper, Laeven and Rajan (2006) 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. In unreported regressions, we find that the coefficient for the industry share is negative, as expected, but not statistically significant. More importantly, the effect of taxation on entry retains its magnitude and remains significant.

Fourth, in our analysis we have not included loss carry-forward provisions because obtaining a measure of these provisions requires some additional assumptions.[24] We therefore checked our results when we included these provisions (which vary at the country level) as an additional regressor, to account for the possibility that entry decision are driven by this form of tax saving afforded to new entrants. The effect of these provision turns out to be positive and marginally significant at conventional levels. The estimates of TAX–EATR and TAX–EATR–SQ are not affected, retaining the size, magnitude, and statistical significance of those of Table 4.

Fifth, we consider the possibility that business cycles unfold differently across countries. For this, we introduce two measures of the economic cycle for each country and year: the level of GDP and its percentage variation (source: Eurostat). We obtain results which are very similar, in both economic and statistical significance, to those of our baseline

[24] See Da Rin, Nicodano, and Sembenelli (2006) for a discussion.

specification.[25]

Finally, we consider that our main dependent measure is an entry ratio. The reason we look at a ratio is that we want to capture the importance of entry relative to the current size of an industry. However, we want to make sure that the effect we are capturing does not depend on the distribution of incumbents across industries. For this, we also estimate our equations by considering an absolute measure of the number of entrants. Since there is high variability in this measure we adopt two alternative approaches. First, we use the logarithm of the number of entrants. Second, we normalize the number of entrants by the country's population, which is arguably independent of the number of each industry incumbents. The results we obtain for these specifications are very close to those of our main specification of Table 4, confirming a concave effect of corporate taxation.

Overall, therefore, our results appear to be consistently robust to a wide variety of modification of our baseline specification.

# 6 Conclusion

In this paper we pose ourselves a research question which is also relevant from a policy perspective, that is whether, and to what extent, lowering corporate taxation can induce firm entry. To answer this question we have exploited a newly constructed dataset which allows us to improve significantly on the existing literature. In particular, the availability of disaggregate data with a longitudinal dimension allows us to control for unobserved heterogeneity at the country-industry level, 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 are likely to arise in this context 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. Importantly, we also find evidence supporting a non-linear relation which suggests that the

[25] As a further check we also employ a set of country-year dummies. Naturally, these absorb most of the variation we are using to identify econometrically the parameters of interest. Therefore, it is not surprising that the significance of the taxation measures falls below conventional levels. However, we notice that the magnitude and size of the estimated coefficients for TAX–EATR and TAX–EATR–SQ remain very close to those in the baseline specification.

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 (30.04%) to the first quartile (27.57%) implies a 0.880 percentage point increase in the (country-industry) entry rate, or 12.5% of the 7.02% mean entry rate. Interestingly, we also find that a reduction in corporate tax rates is more effective in countries with better institutional infrastructure, as measured by the quality of accounting standards, suggesting that a reduction in corporate tax rate would generate the creation of more companies in countries where it is more difficult to hide profits by manipulation of the profit and loss accounts.

## References


[1] Aghion, Philippe, and Peter Howitt (1992) 'A Model of Growth through Creative Destruction,' *Econometrica*, **60** (2): 323–51.

[2] Aghion, Philippe, and Peter Howitt (2006) 'Joseph Schumpeter lecture: Appropriate growth policy: A unifying framework,' *Journal of the European Economic Association*, **4** (2-3): 269 –314.

[3] Aghion, Philippe, Richard Blundell, Rachel Griffith, Peter Howitt and Susanne Prantl (2006) 'The effects of entry on incumbent innovation and productivity,' forthcoming, *Review of Economics and Statistics*.

[4] Alesina, Alberto, Silvia Ardagna, Giuseppe Nicoletti and Fabio Schiantarelli (2005) 'Regulation and investment,' *Journal of the European Economic Association*, **3** (4): 791–825.

[5] Appelbaum, Elie, and Eliakim Katz (1996) 'Corporate Taxation, Incumbency Advantage and Entry,' *European Economic Review*, **40**: 1817–28.

[6] Baum, Christopher, Mark Schaffer and Steven Stillman (2007) 'Enhanced routines for instrumental variables/GMM estimation and testing,' Boston College Economics Working Paper n. 667.

[7] Beach, William, and Tim Kane (2007) 'Methodology: Measuring the 10 Economic Freedoms,' available at www. heritage. org

[8] Beck, Thorsten, George Clarke, Alberto Groff, Philip Keefer, and Patrick Walsh (2001) 'New tools in comparative political economy: The Database of Political Institutions,' *World Bank Economic Review*, **15**(1): 165–176.

[9] Beck, Thorsten, Asli Demirgüç-Kunt, and Vojislav Maksimovic (2006) 'The influence of financial and legal institutions on firm size,' *Journal of Banking and Finance*, **30** (5): 2995–3015.

[10] Bénassy-Quéré, Agnès, Lionel Fontagné, and Amina Lahrèche-Révil (2005) 'How Does FDI React to Corporate Taxation?' *International Tax and Public Finance*, **12**: 583–603.

[11] Bertrand, Marianne, and Francis Kramarz (2002) 'Does Entry Regulation Hinder Job Creation? Evidence from the French Retail Industry,' *The Quarterly Journal of Economics* **117** (4): 1369–413.

[12] Bertrand, Marianne, Antoinette Schoar and David Thesmar (2007) 'Banking deregulation and industry structure: Evidence from the French banking reforms of 1985,' *Journal of Finance*, **57** (2): 597–628.

[13] Buettner, Thiess, and Martin Ruf (2007) 'Tax incentives and the location of FDI: Evidence from a panel of German multinationals,' *International Tax and Public Finance*, **14**: 151–164.

[14] Cabral, Luís, and José Mata (2003) 'On the Evolution of the Firm Size Distribution: Facts and Theory,' *American Economic Review,* **93** (4): 1075–1090.

[15] Ciccone, Antonio, and Elias Papaioannou (2007) 'Red Tape and Delayed Entry,' *Journal of the European Economic Association*, **5** (2-3): 444–458.

[16] Ciccone, Antonio, and Elias Papaioannou (2008) 'Entry Regulation and Intersectoral Reallocation,' mimeo, Universitat Pompeu Fabra.

[17] Cragg, John, and Stephen Donald (1993) 'Testing identifiability and specification in instrumental variables models,' *Econometric Theory*, **9**: 222 – 240.

[18] Cullen, Julie, and Roger Gordon (2007) 'Taxes and Entrepreneurial Activity: Theory and Evidence for the U.S,' *Journal of Public Economics*, **91** (7-8): 1479–1505.

[19] Da Rin, Marco, Giovanna Nicondano, and Alessandro Sembenelli (2005) 'Public Policy and the Creation of Active Venture Capital Markets,' *Journal of Public Economics*, **80** (8-9): 1699–723.

[20] Demirgüç-Kunt, Asli, Inessa Love, and Vojislav Maksimovic (2006) 'Business Environment and the Incorporation Decision,' *Journal of Banking and Finance*, **30** (5): 2967–93.

[21] Desai, Mihir, Paul Gompers and Josh Lerner (2003) 'Institutions, capital constraints and entrepreneurial firm dynamics: evidence from Europe,' NBER Working Paper 10165.

[22] Devereux, Michael, and Rachel Griffith (1998a) 'Taxes and the location of production: evidence from a panel of US multinationals,' *Journal of Public Economics*, **68** (1): 335–67.

[23] Devereux, Michael, and Rachel Griffith (1998b) 'The Taxation of Discrete Investment Choices,' IFS Working Paper N. 98/16.

[24] Devereux, Michael, and Rachel Griffith (2003) 'Evaluating tax policy for location decision,' *International Tax and Public Finance*, **10**: 107–26.

[25] Djankov, Simeon, Tim Ganser, Caralee McLiesh, Rita Ramalho, and Andrei Shleifer (2008) 'The effect of corporate taxes on investment and entrepreneurship,' NBER Working Paper n. 13756.

[26] Djankov, Simeon, Rafael Laporta, Florencio Lopez-de-Silanes, and Andrei Shleifer (2002) 'The Regulation of Entry,' *Quarterly Journal of Economics*, **117** (1): 1–37.

[27] Egger, Peter, Christian, Keuschnigg, and Hannes Winner (2008) 'Incorporation and Taxation: Theory and Firm-Level Evidence,' mimeo.

[28] Ernst & Young, *The Global Executive*, various years.

[29] Ernst & Young, *Worldwide Corporate Tax Guide*, various years.

[30] European Commission (2001) 'Company Taxation in the Internal Market', European Commission Staff Working Paper COM(2001)582.

[31] Fan, Wei and Michelle White (2003) 'Personal Bankruptcy and the Level of Entrepreneurial Activity,' *Journal of Law and Economics*, **46** (2): 543–567.

[32] Gentry, William, and Glenn Hubbard (2004) 'Tax Policy and Entry into Entrepreneurship,' mimeo, Columbia University.

[33] Georgellis, Yannis, and Howard Wall (2006) 'Entrepreneurship and the Policy Environment,' *Federal Reserve Bank of St. Louis Review*, **88** (2): 95–111.

[34] Giannetti, Mariassunta, and Steven Ongena (2006) 'Financial Integration and Entrepreneurial Activity. Evidence from Foreign Bank Entry in Emerging Markets,' *The Review of Finance*, forthcoming.

[35] Griffith, Rachel, Rupert Harrison and Gareth Macartney (2007) 'Product market reforms, labour market institutions and unemployment,' *The Economic Journal*, **117** (519): C142–C166.

[36] Hause, John C., and Gunnar du Rietz (1984) 'Entry, Industry Growth, and the Microdynamics of Industry Supply,' *Journal of Political Economy*, **92**, 733–57.

[37] Keefer, Philip, and David Stasavage (2003) 'The Limits of Delegation: Veto Players, Central Bank Independence and the Credibility of Monetary Policy,' *American Political Science Review*, **97** (3): 407–23.

[38] Keuschnigg, Christian (2008) 'Corporate Taxation and the Welfare State,' mimeo, University of St. Gallen.

[39] King, Mervyn., and Don Fullerton (1984) *The taxation of income from capital*, University of Chicago Press, Chicago.

[40] Klapper, Leora, Luc Laeven and Raghuram Rajan (2006) 'Entry Regulation as a Barrier to Entrepreneurship,' *Journal of Financial Economics* **82** (3): 591–629.

[41] Kleibergen, Frank, and Richard Paap (2006) 'Generalized reduced rank tests using the singular value decomposition,' *Journal of Econometrics*, **127**(1): 97–126.

[42] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny (1998) 'Law and Finance,' *Journal of Political Economy*, **106** (6): 1133–1155.

[43] MacKie-Mason, Jeffrey, and Roger Gordon (1997) 'How Much Do Taxes Discourage Incorporation?' *Journal of Finance*, **52** (2): 477–505.

[44] Milesi-Ferretti, Gian Maria, Roberto Perotti, and Massimo Rostagno (2002) 'Electoral Systems and Public Spending,' *Quarterly Journal of Economics* **117** (2): 609–657.

[45] Nicoletti, Giuseppe and Stefano Scarpetta (2003) 'Regulation, productivity and growth: OECD evidence,' *Economic Policy*, **18** (36): 9–72.

[46] Pagano, Marco, and Paolo Volpin (2005) 'The Political Economy of Corporate Governance,' *American Economic Review*, **95** (4): 1005–1030.

[47] Perotti, Enrico and Paolo Volpin (2007) 'Investor Protection and Entry,' Tinbergen Institute Discussion Papers 07-006/2, Tinbergen Institute.

[48] Persson, Torsten, and Guido Tabellini (2004) 'Constitutional Rules and Fiscal Policy Outcomes,' *American Economic Review,* **94** (1): 25–45.

[49] Rajan, Raghuram, and Luigi Zingales (1998) 'Financial Dependence and Growth,' *American Economic Review,* **88** (3), 559–586.

[50] Schumpeter, Joseph (1982 [1911]) *The Theory of Economic Development*, Edison, NJ, Transition Books.

[51] Schumpeter, Joseph (1975 [1942]) *Capitalism, Socialism, and Democracy*, New York, NY Harper.

[52] Slemrod, Joel (2004) 'Are Corporate Tax Rates, or Countries, Converging?' *Journal of Public Economics*, **88** (6): 1169–1186.

[53] Stock, James, and Motohiro Yogo (2005) 'Testing Instruments in Linear IV Regressions,' in D.W. Andrews and James Stock (Eds.) *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothemberg*, Cambridge, Cambridge University Press.

[54] Wooldridge, Jeffrey (2006), 'Cluster - Sample methods in applied econometrics: An extended Analysis,' mimeo Michigan State University.

# Table 1. Variable definitions

This Table describes all the variables used in the analysis.

| VARIABLE | DEFINITION AND SOURCES |
|---|---|
| ENTRY–COUNTRY | *Definition:* For each year $t$ and country $c$, we identify: (a) all firms whose date of incorporation is $t-3$, and (b) all firms whose date of incorporation precedes year $t-3$ which are still active in year $t-3$. A company is considered to be active in year $t-3$ if it reports accounting data for at least one of the following: total assets, total sales, operating profits, number or cost of employees. The entry rate is computed as the ratio of (a) over (b).<br>*Source:* Bureau van Dijk's Amadeus database, 2000–2007 December issues. |
| ENTRY–COUNTRY–INDUSTRY | *Definition:* For each year $t$, country $c$, and industry $i$, we identify: (a) all firms 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 $t-3$. A company is considered to be active in year $t-3$ if it reports accounting data for at least one of the following: total assets, total sales, operating profits, number or cost of employees. We drop industries with less than 5 companies.<br>*Source:* Bureau van Dijk's Amadeus database, 2000–2007 December issues. |
| TAX–EATR; TAX–EATR–SQ | *Definition:* The Effective Average Tax Rate is defined by Devereux and Griffith (1998b) as the proportional fall in a projects' profitability rate upon taxation of the income generated by the project. If $R^*$ denotes the project's pre-tax net present value, and $R$ its after-tax net present value, TAX–EATR $\equiv (R^* - R)/R^*$. The following assumptions are made: (a) the statutory corporate tax rates do not include local or municipal taxes, surtaxes and supplementary charges; (b) the industry-specific profitability rate equals the industry profitability rate in the US, computed for each industry-year as (Total Value Added – Total Labor Cost)/Total Value Added, with data from OECD's STAN Database; (c) the investment is financed fully by retained earnings; (d) personal taxes on interest income, dividends and capital gains are not included; (e) the inflation rate is the country-specific inflation rate as measured by Eurostat; (f) the nominal interest rate is the one-year interest rate on public bonds, obtained from the European Central Bank; (g) the economic depreciation rate is set equal to 12.5%; (h) the fiscal depreciation rates are those reported, for each country and year, by the "Worldwide Corporate Tax Guide" for plant and machinery. TAX–EATR–SQ is the squared Effective Average Tax Rate.<br>*Source:* Authors' computation on data from Ernst & Young's "Worldwide Corporate Tax Guide," Eurostat and OECD STAN Database. |
| TAX–EATR–LOCAL; TAX–EATR–LOCAL–SQ | *Definition:* Computed as TAX–EATR but with the inclusion of local and municipal taxes, surtaxes and supplementary charges. TAX–EATR–LOCAL–SQ is the square of TAX–EATR–LOCAL. |

| | |
|---|---|
| | *Source:* Authors' computation on data from Ernst & Young's "Worldwide Corporate Tax Guide," Eurostat and OECD STAN Database. |
| TAX–EATR–DEBT; TAX–EATR–DEBT–SQ | *Definition:* Computed as TAX–EATR but assuming that the investment is financed fully by debt. TAX–EATR–DEBT–SQ is the square of TAX–EATR–DEBT.<br>*Source:* Authors' computation on data from Ernst & Young's "Worldwide Corporate Tax Guide," Eurostat and OECD STAN Database. |
| TAX–EATR–PERSONAL; TAX–EATR–PERSONAL–SQ | *Definition:* Computed as TAX–EATR but including personal taxation. TAX–EATR–PERSONAL–SQ is the square of TAX–EATR–PERSONAL.<br>*Source:* Authors' computation on data from Ernst & Young's "Worldwide Corporate Tax Guide," and "The Global Executive Guide," Eurostat and OECD STAN Database. |
| PRO-BUSINESS–POLICY | *Definition:* It is the simple average of the nine 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). Each component scores is based on institutional national and international data, economic indicators, views by a panel of academic advisors.<br>*Source:* Economic Freedom Index, published by the Heritage Foundation and the Wall Street Journal (www.heritage.org), various years. |
| PERCEPTION–TAX | *Definition:* Survey-based measure which answers the question: Do corporate taxes discourage entrepreneurial activity? It ranges from 0 (the tax system does not discourage entrepreneurial activity) to 10 (the tax system discourages entrepreneurial activity).<br>*Source:* World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years. |
| ANTITRUST–REGULATION | *Definition:* Survey based 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)<br>*Source:* World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years. |
| BUREAUCRACY | *Definition:* Survey based 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)<br>*Source:* World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years. |

| | |
|---|---|
| CORRUPTION | *Definition:* Survey based 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)<br>*Source:* World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years. |
| LABOUR–REGULATION | *Definition:* Survey based 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)<br>*Source:* World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years. |
| ACCESS–CAPITAL | *Definition:* Survey based 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)<br>*Source:* World Competitiveness Yearbook, published by the International Institute for Management Development (www.imd.ch/wcy), various years. |
| ACCOUNTING–GOOD; ACCOUNTING–BAD | *Definition:* GOOD–ACCOUNTING is a dummy which equals 1 for Finland, France, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland and UK and 0 for all other countries. BAD–ACCOUNTING is a dummy that equals 1 for Austria, Belgium, Denmark, Germany, Greece, Ireland, Italy and Portugal and zero for all other countries.<br>*Source:* LaPorta et al. (1998) |
| VETO–POWER | *Definition:* The 'Checks' variable counts the number of players with veto power present in a political system, and is computed for each year. For presidential systems, this variable counts the number of players with veto power, counting the executive and legislative chamber(s) separately only if they are controlled by different parties. For parliamentary systems, it counts the number of parties in the government coalition. The measure also takes into account the effect that certain electoral rules (e.g., closed versus open list) have on the cohesiveness of governing coalitions.<br>*Source:* World Bank's Database of Political Institutions, described by Beck et al. (2001) and Keefer and Stasavage (2003). |
| GOV–STABILITY | *Definition:* It is a survey-based measure assessing both governments ability to carry out its declared program, and its ability to stay in office. It ranges from 0 (low stability) to 12 points (high stability).<br>*Source:* International Country Risk Guide, published by The PRS Group Inc. (www.prsgroup.com), various years. |

| | |
|---|---|
| GOV–CENTER–LEFT | *Definition:* This variable is a dummy variables that equal one if the chief executive party is a center-left-wing party and zero otherwise, and is computed for each year.<br>*Source:* World Bank's Database of Political Institutions, described by Beck et al. (2001) and Keefer and Stasavage (2003). |
| GOV–FRAGMENTATION | *Definition:* This variable is the Herfindahl index for a country's political parties, computed as the sum of the squared seat shares of all parties in the parliament, and is computed for each year.<br>*Source:* World Bank's Database of Political Institutions, described by Beck et al. (2001) and Keefer and Stasavage (2003). |
| ELECTION–DATE | *Definition:* It is a dummy variable equal to one for all years when legislative elections took place.<br>*Source:* The European parliamentary elections and political parties database, www.parties-and-elections.de. |

## Table 2. Descriptive statistics

This Table reports summary statistics for the sample of 17 EU countries observed over the 1997–2004 time period. Variables are defined in Table 1. PERCEPTION–TAX is missing for 1997. For variables that do not vary over industries the descriptive statistics are reported with respect to the country-year dimensions.

| Variable | Mean | S.D. | 25th perc. | Median | 75th perc. | Observations |
|---|---|---|---|---|---|---|
| ENTRY–COUNTRY | 8.27 | 5.07 | 5.47 | 8.08 | 10.11 | 134 |
| ENTRY–COUNTRY–INDUSTRY | 7.02 | 6.68 | 3.29 | 5.59 | 8.91 | 4,805 |
| TAX–EATR | 30.08 | 4.99 | 27.57 | 30.04 | 33.44 | 4,805 |
| TAX–EATR–LOCAL | 31.55 | 6.14 | 28.25 | 31.33 | 34.73 | 4,805 |
| TAX–EATR–DEBT | 26.67 | 5.83 | 23.89 | 27.03 | 30.49 | 4,805 |
| TAX–EATR–PERSONAL | 40.70 | 16.99 | 24.95 | 47.58 | 51.77 | 4,805 |
| PRO-BUSINESS–POLICY | 69.68 | 5.88 | 65.70 | 68.80 | 74.40 | 134 |
| PERCEPTION–TAX | 5.44 | 1.36 | 4.18 | 5.57 | 6.50 | 119 |
| ANTRITRUST–REGULATION | 6.38 | 0.88 | 5.70 | 6.45 | 7.00 | 134 |
| BUREAUCRACY | 3.96 | 1.52 | 2.68 | 3.88 | 5.33 | 134 |
| CORRUPTION | 6.39 | 2.01 | 5.09 | 6.79 | 7.84 | 134 |
| LABOUR–REGULATION | 4.36 | 1.61 | 3.15 | 4.05 | 5.20 | 134 |
| ACCESS–CAPITAL | 8.49 | 0.54 | 8.10 | 8.51 | 8.90 | 134 |

## Table 3. Descriptive statistics, by country

This Table reports summary statistics for the entry rates and for the two main independent variables, for the 17 EU countries observed over the 1997–2004 time period. Variables are defined in Table 1.

| | ENTRY–COUNTRY | | ENTRY–COUNTRY–IND. | | TAX–EATR | | PRO-BUSINESS–POLICY | | |
|---|---|---|---|---|---|---|---|---|---|
| Country | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Observations |
| Austria | 12.01 | 2.99 | 11.80 | 10.90 | 30.40 | 2.38 | 69.66 | 1.48 | 295 |
| Belgium | 7.36 | 0.79 | 6.57 | 5.21 | 34.44 | 3.18 | 69.19 | 0.46 | 312 |
| Denmark | 11.78 | 1.61 | 10.10 | 8.18 | 31.79 | 1.60 | 70.45 | 4.28 | 306 |
| Finland | 5.87 | 1.58 | 5.29 | 3.64 | 27.56 | 1.48 | 70.61 | 3.43 | 299 |
| France | 9.57 | 0.79 | 7.61 | 4.25 | 31.15 | 2.65 | 62.30 | 1.74 | 304 |
| Germany | 9.62 | 1.55 | 8.50 | 5.31 | 33.13 | 8.70 | 67.99 | 3.32 | 312 |
| Greece | 8.45 | 1.40 | 8.45 | 7.22 | 32.99 | 2.25 | 58.47 | 1.47 | 298 |
| Ireland | 6.73 | 4.82 | 5.34 | 5.88 | 19.46 | 6.53 | 79.32 | 2.39 | 215 |
| Italy | 2.40 | 2.73 | 2.05 | 2.60 | 33.45 | 1.77 | 65.04 | 0.76 | 312 |
| Luxembourg | 3.73 | 2.34 | 2.80 | 3.99 | 27.62 | 3.53 | 77.18 | 2.94 | 146 |
| Netherlands | 4.72 | 0.90 | 4.58 | 3.31 | 32.67 | 1.60 | 73.00 | 1.80 | 304 |
| Norway | 9.86 | 1.75 | 9.42 | 6.68 | 27.80 | 0.66 | 67.47 | 1.24 | 304 |
| Portugal | 5.72 | 1.78 | 5.12 | 4.60 | 28.03 | 3.01 | 65.55 | 0.48 | 282 |
| Spain | 8.16 | 1.72 | 7.07 | 7.13 | 35.00 | 1.05 | 66.54 | 1.84 | 312 |
| Sweden | 6.59 | 1.04 | 5.71 | 4.54 | 25.01 | 2.04 | 69.45 | 3.17 | 302 |
| Switzerland | 10.48 | 12.89 | 4.47 | 6.72 | 26.31 | 2.32 | 77.64 | 0.97 | 268 |
| UK | 18.67 | 3.36 | 12.97 | 6.54 | 28.77 | 1.36 | 78.03 | 0.39 | 234 |

# Table 4. Base case estimation results

This table presents our base results. The dependent variable is ENTRY–COUNTRY–INDUSTRY in columns (1) and (2), and TAX–EATR in column (3). The independent variables are defined in Table 1. Column (1) reports results from the within-group regression, column (2) reports results for the GMM within-group regression where TAX–EATR and TAX–EATR–SQ are instrumented, while column (3) presents the pseudo first stage regression corresponding to column (2). Time dummies are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroscedasticity and autocorrelation. All the reported tests are discussed in Section 5.2. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and ***. Estimates are performed using the command `xtivreg2` for Stata 10 by Baum, Schaffer and Stillman (2007) and Schaffer (2007).

| | (1) WG | (2) GMM-IV | (3) FIRST-STAGE |
|---|---|---|---|
| TAX–EATR | -0.886*** | -3.417*** | |
| | *(0.16)* | *(0.58)* | |
| TAX–EATR–SQ | 0.015*** | 0.053*** | |
| | *(0.00)* | *(0.01)* | |
| PRO-BUSINESS–POLICY | 0.127*** | 0.057 | -0.396*** |
| | *(0.04)* | *(0.05)* | *(0.03)* |
| GOV–CENTER–LEFT | | | -2.596*** |
| | | | *(0.21)* |
| VETO–POWER | | | 0.622*** |
| | | | *(0.07)* |
| GOV–STABILITY | | | -0.337*** |
| | | | *(0.08)* |
| ELECTION–DATE | | | -0.541*** |
| | | | *(0.08)* |
| Time dummies | Yes | Yes | Yes |
| Wald test on regressors | 94.47 | 78.88 | 380.06 |
| degrees of freedom [p-value] | 10 [0.00] | 10 [0.00] | 12 [0.00] |
| Wald test on time dummies | 31.83 | 51.35 | 81.65 |
| degrees of freedom [p-value] | 7 [0.00] | 7 [0.00] | 7 [0.00] |
| Hansen J Statistic | | 3.31 | |
| degrees of freedom [p-value] | | 2 [0.19] | |
| Endogeneity Test (Hansen C Statistic) | | 0.50 | |
| degrees of freedom [p-value] | | 1 [0.48] | |
| Cragg-Donald Statistic | | 29.91 | |
| Kleibergen-Paap Statistic | | 20.07 | |
| Observations | 4,805 | 4,805 | 4,805 |

# Table 5. Extension: estimation results controlling for additional policy determinants

This table presents results for additional policy determinants. The dependent variable is ENTRY–COUNTRY–INDUSTRY. The independent variables are defined in Table 1. All columns report results for the GMM within-group regression where TAX–EATR and TAX–EATR–SQ are instrumented. Time dummies are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroscedasticity and autocorrelation. All the reported tests are discussed in Section 5.2. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and ***. Estimates are performed using the command `xtivreg2` for Stata 10 by Baum, Schaffer and Stillman (2007) and Schaffer (2007).

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | GMM-IV | GMM-IV | GMM-IV | GMM-IV | GMM-IV |
| TAX–EATR | -3.615*** | -3.039*** | -3.286*** | -3.060*** | -3.510*** |
| | *(0.57)* | *(0.45)* | *(0.43)* | *(0.50)* | *(0.57)* |
| TAX–EATR–SQ | 0.056*** | 0.047*** | 0.051*** | 0.047*** | 0.054*** |
| | *(0.01)* | *(0.01)* | *(0.01)* | *(0.01)* | *(0.01)* |
| ANTRITRUST–REGULATION | 0.158 | | | | |
| | *(0.23)* | | | | |
| BUREAUCRACY | | 0.734*** | | | |
| | | *(0.17)* | | | |
| CORRUPTION | | | 0.463*** | | |
| | | | *(0.17)* | | |
| LABOUR–REGULATION | | | | 0.334* | |
| | | | | *(0.18)* | |
| ACCESS–CAPITAL | | | | | 0.429 |
| | | | | | *(0.36)* |
| Time dummies | Yes | Yes | Yes | Yes | Yes |
| Wald test on regressors | 73.12 | 81.57 | 97.08 | 77.35 | 90.25 |
| degrees of freedom [p-value] | 10 [0.00] | 10 [0.00] | 10 [0.00] | 10 [0.00] | 10 [0.00] |
| Wald test on time dummies | 50.28 | 47.84 | 52.22 | 46.28 | 48.27 |
| degrees of freedom [p-value] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] |
| Hansen J Statistic | 3.16 | 0.60 | 0.98 | 2.90 | 3.12 |
| degrees of freedom [p-value] | 2 [0.21] | 2 [0.74] | 2 [0.61] | 2 [0.23] | 2 [0.21] |
| Endogeneity Test (Hansen C Statistic) | 3.01 | 0.60 | 0.39 | 2.76 | 1.99 |
| degrees of freedom [p-value] | 1 [0.08] | 1 [0.44] | 1 [0.53] | 1 [0.10] | 1 [0.16] |
| Cragg-Donald Statistic | 32.45 | 54.39 | 67.07 | 42.60 | 32.23 |
| Kleibergen-Paap Statistic | 20.55 | 25.65 | 29.70 | 29.05 | 19.15 |
| Observations | 4,805 | 4,805 | 4,805 | 4,805 | 4,805 |

# Table 6. Extension: Estimation results controlling for the quality of accounting standards

This table presents results where we distinguish between countries with above average and below average quality of accounting standards. The dependent variable is ENTRY–COUNTRY–INDUSTRY in columns (1) and (2), TAX–EATR*ACCOUNTING–GOOD in column (3), and TAX–EATR*ACCOUNTING–BAD in column (4). The independent variables are defined in Table 1. Column (1) reports results from the within-group regression, column (2) reports results for the GMM within-group regression where TAX–EATR and TAX–EATR–SQ are instrumented, while columns (3) and (4) present the pseudo first stage regressions corresponding to column (2). Time dummies are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroscedasticity and autocorrelation. All the reported tests are discussed in Section 5.2. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and ***.

| | (1) WG | (2) GMM-IV | (3) FIRST-STAGE *ACCOUNT.–GOOD* | (4) FIRST-STAGE *ACCOUNT.–BAD* |
|---|---|---|---|---|
| TAX–EATR*ACCOUNTING–GOOD | -0.647 | -7.480*** | | |
| | *(0.40)* | *(2.11)* | | |
| TAX–EATR*ACCOUNTING–BAD | -0.905*** | -3.043*** | | |
| | *(0.18)* | *(0.46)* | | |
| (TAX–EATR*ACCOUNTING–GOOD)–SQ | 0.010 | 0.132*** | | |
| | *(0.01)* | *(0.03)* | | |
| (TAX–EATR*ACCOUNTING–BAD)–SQ | 0.015*** | 0.049*** | | |
| | *(0.00)* | *(0.01)* | | |
| PRO-BUSINESS–POLICY | 0.125*** | 0.137*** | -0.034*** | -0.308*** |
| | *(0.04)* | *(0.04)* | *(0.01)* | *(0.02)* |
| GOV–CENTER–LEFT*ACCOUNTING–GOOD | | | -0.465*** | -0.989*** |
| | | | *(0.11)* | *(0.10)* |
| VETO–POWER*ACCOUNTING–GOOD | | | -0.097** | 0.154*** |
| | | | *(0.04)* | *(0.05)* |
| GOV–STABILITY*ACCOUNTING–GOOD | | | 0.212*** | -0.244*** |
| | | | *(0.04)* | *(0.05)* |
| ELECTION–DATE*ACCOUNTING–GOOD | | | 0.289*** | 0.135** |
| | | | *(0.05)* | *(0.06)* |
| GOV–CENTER–LEFT*ACCOUNTING–BAD | | | 0.134*** | -3.830*** |
| | | | *(0.03)* | *(0.27)* |
| VETO–POWER*ACCOUNTING–BAD | | | 0.330*** | 1.109*** |
| | | | *(0.02)* | *(0.11)* |
| GOV–STABILITY*ACCOUNTING–BAD | | | 0.082*** | -0.736*** |
| | | | *(0.02)* | *(0.10)* |
| ELECTION–DATE*ACCOUNTING–BAD | | | -0.113*** | -1.337*** |
| | | | *(0.03)* | *(0.12)* |
| Time dummies | Yes | Yes | Yes | Yes |
| Wald test on regressors | 103.29 | 140.46 | 540.12 | 645.66 |
| degrees of freedom [p-value] | 12 [0.00] | 12 [0.00] | 16 [0.00] | 16 [0.00] |
| Wald test on time dummies | 30.39 | 56.06 | 466.20 | 254.37 |
| degrees of freedom [p-value] | 7 [0.00] | 7 [0.31] | 7 [0.08] | 7 [0.08] |
| Hansen J Statistic | | 2.64 | | |
| degrees of freedom [p-value] | | 4 [0.62] | | |
| Endogeneity Test (Hansen C Statistic) | | 0.10 | | |
| degrees of freedom [p-value] | | 1 [0.75] | | |
| Cragg-Donald Statistic | | 7.51 | | |
| Kleibergen-Paap Statistic | | 9.56 | | |
| Observations | 4,805 | 4,805 | 4,805 | 4,805 |

## Table 7. Estimation results for alternative tax measures

This table presents results for alternative tax measures. The dependent variable is ENTRY–COUNTRY–INDUSTRY in columns (1), (2), (4), (5), (7), and (8), and TAX–EATR in columns (3), (6), and (9). The independent variables are defined in Table 1. Columns (1), (4), and (7) report results from the within-group regression, columns (2), (5), and (8) report results for the GMM within-group regression where TAX–EATR and TAX–EATR–SQ are instrumented, while columns (3), (6), and (9) present the corresponding pseudo first stage regressions. Time dummies are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroscedasticity and autocorrelation. All the reported tests are discussed in Section 5.2. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and ***. Estimates are performed using the command `xtivreg2` for Stata 10 by Baum, Schaffer and Stillman (2007) and Schaffer (2007).

**Table 7. Estimation results for alternative tax measures (continued)**

| | (1) WG | (2) GMM-IV | (3) FIRST-STAGE | (4) WG | (5) GMM-IV | (6) FIRST-STAGE | (7) WG | (8) GMM-IV | (9) FIRST-STAGE |
|---|---|---|---|---|---|---|---|---|---|
| TAX–EATR–LOCAL | -0.641*** | -2.379*** | | | | | | | |
| | *(0.10)* | *(0.42)* | | | | | | | |
| TAX–EATR–LOCAL–SQ | 0.009*** | 0.029*** | | | | | | | |
| | *(0.00)* | *(0.00)* | | | | | | | |
| TAX–EATR–DEBT | | | | -0.103** | -3.303*** | | | | |
| | | | | *(0.05)* | *(0.84)* | | | | |
| TAX–EATR–DEBT–SQ | | | | 0.002*** | 0.055*** | | | | |
| | | | | *(0.00)* | *(0.01)* | | | | |
| TAX–EATR–PERSONAL | | | | | | | 0.075 | -1.714 | |
| | | | | | | | *(0.05)* | *(1.18)* | |
| TAX–EATR–PERSONAL–SQ | | | | | | | -0.001 | 0.019 | |
| | | | | | | | *(0.00)* | *(0.01)* | |
| PRO-BUSINESS–POLICY | 0.130*** | 0.035 | -0.419*** | 0.130*** | 0.017 | -0.337*** | 0.121*** | -0.084 | 0.131*** |
| | *(0.04)* | *(0.05)* | *(0.03)* | *(0.04)* | *(0.07)* | *(0.03)* | *(0.04)* | *(0.16)* | *(0.05)* |
| GOV–CENTER–LEFT | | | -3.580*** | | | -2.135*** | | | -3.291*** |
| | | | *(0.26)* | | | *(0.25)* | | | *(0.36)* |
| VETO–POWER | | | 0.508*** | | | 0.539*** | | | |
| | | | *(0.07)* | | | *(0.09)* | | | |
| GOV–STABILITY | | | -0.380*** | | | -0.292*** | | | -1.166*** |
| | | | *(0.08)* | | | *(0.09)* | | | *(0.16)* |
| ELECTION–DATE | | | -0.223** | | | -0.687*** | | | |
| | | | *(0.09)* | | | *(0.11)* | | | |
| GOV–FRAGMENTATION | | | | | | | | | -24.996*** |
| | | | | | | | | | *(4.00)* |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Wald test on regressors | 119.46 | 78.96 | 338.93 | 59.58 | 35.80 | 271.43 | 59.32 | 34.64 | 524.05 |
| degrees of freedom [p-value] | 10 [0.00] | 10 [0.00] | 12 [0.00] | 10 [0.00] | 10 [0.00] | 12 [0.00] | 10 [0.00] | 10 [0.00] | 11 [0.00] |
| Wald test on time dummies | 30.69 | 46.38 | 176.30 | 29.41 | 24.39 | 135.38 | 34.24 | 27.21 | 164.38 |
| degrees of freedom [p-value] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] | 7 [0.00] |
| Hansen J Statistic | | 3.26 | | | 0.17 | | | 15.59 | |
| degrees of freedom [p-value] | | 2 [0.20] | | | 2 [0.92] | | | 1 [0.00] | |
| Endogeneity Test (Hansen C Statistic) | | 1.24 | | | 0.00 | | | 15.59 | |
| degrees of freedom [p-value] | | 1 [0.27] | | | 1 [0.95] | | | 1 [0.00] | |
| Cragg-Donald Statistic | | 30.28 | | | 4.31 | | | 3.12 | |
| Kleibergen-Paap Statistic | | 18.71 | | | 4.69 | | | 3.13 | |
| Observations | 4,805 | 4,805 | 4,805 | 4,805 | 4,805 | 4,805 | 4,805 | 4,805 | 4,805 |

# Table 8. Robustness: Estimation results for taxation perception

This table presents results for an alternative qualitative tax measure. The dependent variable is ENTRY–COUNTRY–INDUSTRY in columns (1) and (2), and PERCEPTION–TAX in column (3). The independent variables are defined in Table 1. Column (1) reports results from the within-group regression, column (2) reports results for the GMM within-group regression where PERCEPTION–TAX is instrumented, while column (3) presents the pseudo first stage regression corresponding to column (2). Time dummies are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroscedasticity and autocorrelation. All the reported tests are discussed in Section 5.2. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and ***. Estimates are performed using the command `xtivreg2` for Stata 10 by Baum, Schaffer and Stillman (2007) and Schaffer (2007).

| | (1) WG | (2) GMM-IV | (3) FIRST-STAGE |
|---|---|---|---|
| PERCEPTION–TAX | -0.353*** | -1.335*** | |
| | *(0.13)* | *(0.33)* | |
| PRO-BUSINESS–POLICY | 0.102** | 0.011 | -0.068*** |
| | *(0.04)* | *(0.04)* | *(0.00)* |
| GOV–CENTER–LEFT | | | 0.082*** |
| | | | *(0.03)* |
| VETO–POWER | | | 0.184*** |
| | | | *(0.01)* |
| GOV–STABILITY | | | -0.200*** |
| | | | *(0.01)* |
| ELECTION–DATE | | | 0.005 |
| | | | *(0.02)* |
| Time dummies | Yes | Yes | Yes |
| Wald test on regressors | 40.33 | 39.47 | 5071.99 |
| degrees of freedom [p-value] | 7 [0.00] | 7 [0.00] | 10 [0.00] |
| Wald test on time dummies | 28.50 | 31.56 | 1582.20 |
| degrees of freedom [p-value] | 5 [0.00] | 5 [0.00] | 5 [0.00] |
| Hansen J Statistic | | 47.94 | |
| degrees of freedom [p-value] | | 3 [0.00] | |
| Endogeneity Test (Hansen C Statistic) | | 0.75 | |
| degrees of freedom [p-value] | | 1 [0.39] | |
| Cragg-Donald Statistic | | 158.25 | |
| Kleibergen-Paap Statistic | | 190.07 | |
| Observations | 3,727 | 3,727 | 3,727 |

## Table 9. Robustness: Estimation results when both TAX–EATR and PRO-BUSINESS–POLICY are endogenous.

This table presents results where both the tax measures and the PRO-BUSINESS–POLICY index are instrumented. The dependent variable is ENTRY–COUNTRY–INDUSTRY in column (1), TAX–EATR in column (2), and PRO-BUSINESS–POLICY in column (3). The independent variables are defined in Table 1. Column (1) reports results for the GMM within-group regression where TAX–EATR, TAX–EATR–SQ, and PRO-BUSINESS–POLICY are instrumented, while columns (2) and (3) present the pseudo first stage regressions corresponding to column (2). Time dummies are included but not displayed. Standard errors (shown in parenthesis) are robust to heteroscedasticity and autocorrelation. All the reported tests are discussed in Section 5.2. Coefficients significant at the 10%, 5% and 1% level are marked with *, **, and ***. Estimates are performed using the command `xtivreg2` for Stata 10 by Baum, Schaffer and Stillman (2007) and Schaffer (2007).

| | (1) GMM-IV | (2) FIRST-STAGE *TAX–EATR* | (3) FIRST-STAGE *PRO-BUSIN.-POLICY* |
|---|---|---|---|
| TAX–EATR | -2.987*** | | |
| | *(0.81)* | | |
| TAX–EATR–SQ | 0.046*** | | |
| | *(0.01)* | | |
| PRO-BUSINESS–POLICY | 0.231 | | |
| | *(0.25)* | | |
| GOV–CENTER–LEFT | | -2.420*** | -0.444*** |
| | | *(0.22)* | *(0.12)* |
| VETO–POWER | | 0.512*** | 0.278*** |
| | | *(0.06)* | *(0.05)* |
| GOV–STABILITY | | -0.518*** | 0.457*** |
| | | *(0.08)* | *(0.05)* |
| ELECTION–DATE | | -0.370*** | -0.432*** |
| | | *(0.08)* | *(0.06)* |
| Time dummies | Yes | Yes | Yes |
| Wald test on regressors | 77.10 | 228.64 | 972.48 |
| degrees of freedom [p-value] | 10 [0.00] | 11 [0.00] | 11 [0.00] |
| Wald test on time dummies | 50.90 | 122.17 | 782.41 |
| degrees of freedom [p-value] | 7 [0.00] | 7 [0.31] | 7 [0.08] |
| Hansen J Statistic | 2.83 | | |
| degrees of freedom [p-value] | 2 [0.00] | | |
| Endogeneity Test (Hansen C Statistic) | 0.50 | | |
| degrees of freedom [p-value] | 1 [0.48] | | |
| Cragg-Donald Statistic | 9.03 | | |
| Kleibergen-Paap Statistic | 12.76 | | |
| Observations | 4,805 | 4,805 | 4,805 |

Figure 1a. Entry rates by country

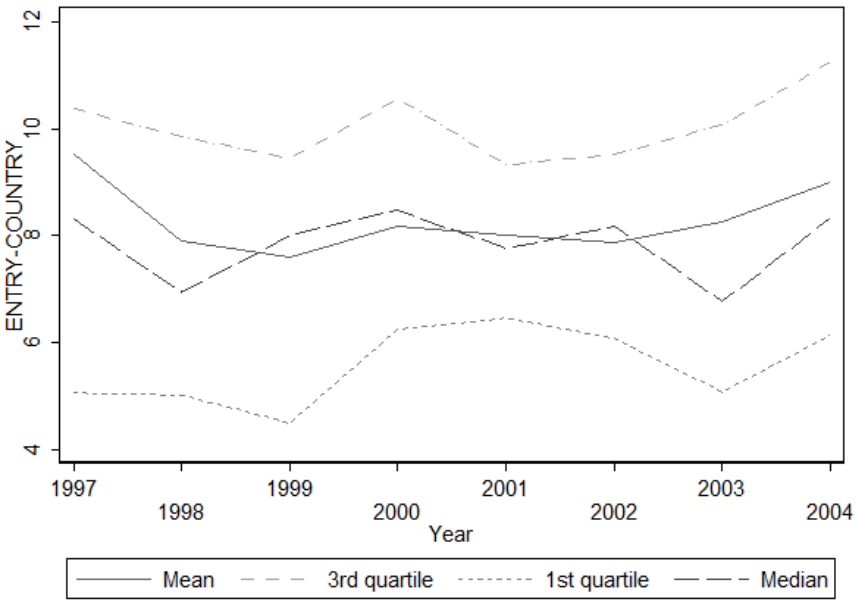


Figure 1b. Entry rates by country–industry

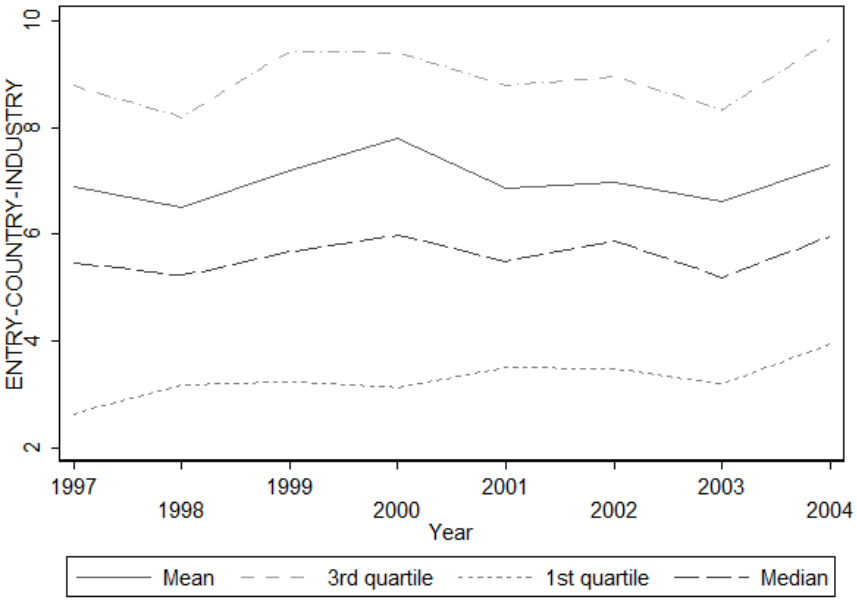


Figure 1: Entry rates by country and by country–industry (averaged over countries)

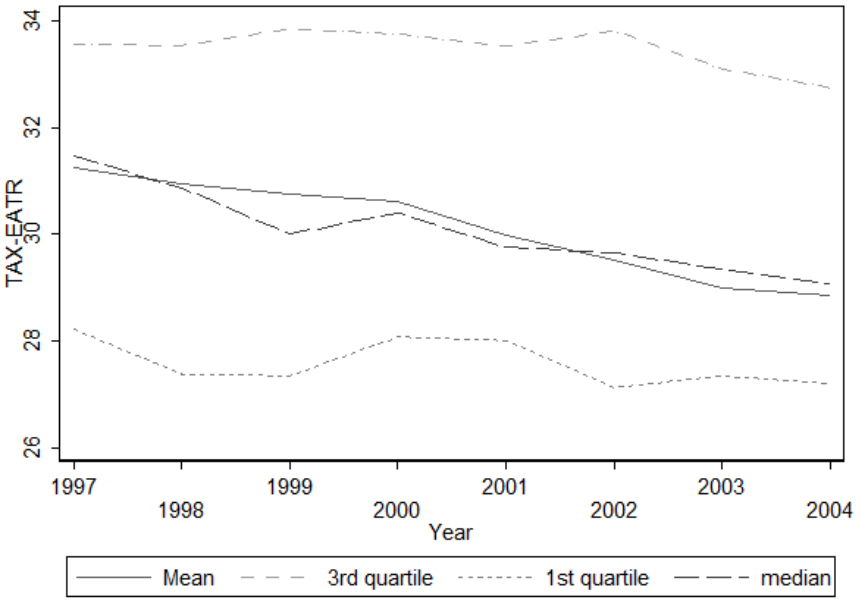


Figure 2: Effective tax rates (averaged over countries)

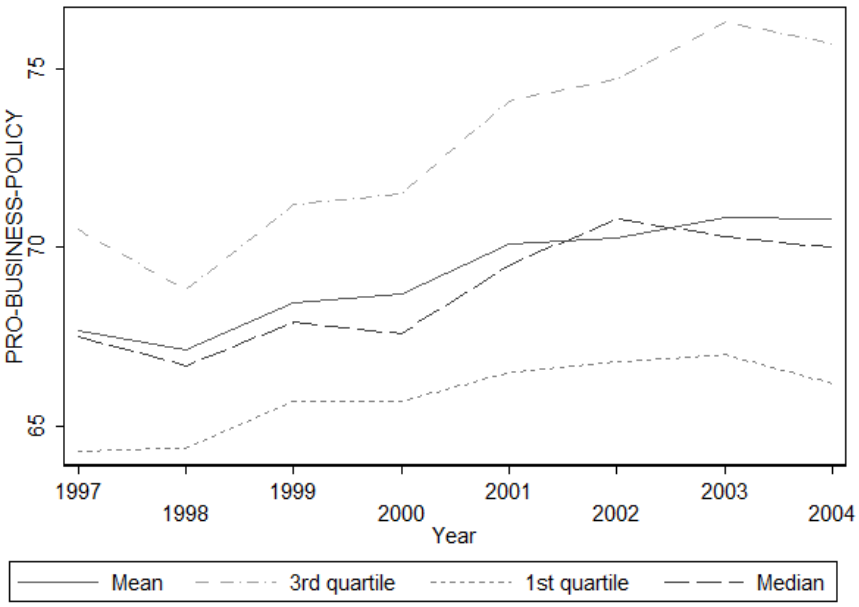


Figure 3: PRO-BUSINESS–POLICY scores (averaged over countries)

# Appendix

## Table A1. Entry Dataset Construction

This Table reports the criteria used in the construction of the entry dataset, which follows those of Klapper, Laeven, and Rajan (2006).

| | |
|---|---|
| | COUNTRIES |
| Included | Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom. |
| | 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: sole proprietorships, cooperatives, partnerships. |
| | INDUSTRIES (2-DIGIT NACE CODE LEVEL) |
| | Included: |
| Manufacturing | D: 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36 |
| Electricity, gas, water supply | E: 40, 41 |
| Construction | F: 45 |
| Wholesale and retail trade | G: 50, 51, 52 |
| Hotels and restaurants | H: 55 |
| Transport, storage, telecom | I: 60, 61, 62, 63, 64 |
| Real estate, rental, bus. serv. | K: 70, 71, 72, 73, 74 |
| | Excluded: |
| Agriculture | A: 01, 02 |
| Fishing | B: 05 |
| Mining | C: 10, 11, 12, 13, 14 |
| Manufacturing | D: 37 |
| Financial intermediation | J: 65, 66, 67 |
| Public Administration | L: 75 |
| Education | M: 80 |
| Health and social work | N: 85 |
| Other social and pers. serv. | O: 90, 91, 92, 93) |
| Activities of households | P: 95, 97 |
| Extra-territorial organiz. | Q: 99 |
| | CONSOLIDATION 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 |

## Computation of the effective average tax rate

The most general formula for EATR is (see Table A2 for variables' definitions):

$$EATR = \frac{R^* - R}{R^*} \tag{1}$$

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

$$EATR = \frac{R^* - R}{\frac{p}{1+r}} \tag{2}$$

where:

$$R^* = \frac{p - r}{1 + r} \tag{3}$$

$$R = \frac{\gamma}{(1+\rho)}\{(p+\delta)(1+\pi)(1-\tau) - [(1+\rho) - (1-\delta)(1+\pi)](1-A)\} + F \tag{4}$$

$$\rho = \frac{(1 - m^i)i}{(1 - z)} \tag{5}$$

$$\gamma = \frac{(1 - m^d)(1 - c)}{(1 - s)(1 - z)} \tag{6}$$

$$A = \begin{cases} \phi\tau\dfrac{(1+\rho)}{\rho}\Big[1 - \dfrac{1}{(1+\rho)^{T+1}}\Big] & \text{with straight line depreciation, for } T = 1/\phi \\ \\ \dfrac{\phi\tau(1+\rho)}{\rho+\phi} & \text{with depreciation on a declining balance basis} \end{cases} \tag{7}$$

and

$$F = \begin{cases} F^{RE} = 0 & \text{if the project is financed by retained earnings} \\ \\ F^{NE} = \dfrac{-\rho(1-\gamma)}{1+\rho}(1-\phi\tau) & \text{if the project is financed by new equity} \\ \\ F^{DE} = \dfrac{\gamma(1-\phi\tau)}{1+\rho}[\rho - i(1-\tau)] & \text{if the project is financed by debt} \end{cases} \tag{8}$$

The TAX–EATR measures we employ in the paper are then obtained as follows:

- TAX–EATR is obtained assuming that all personal tax rates equal zero ($m^i = m^d = c = s = z = 0$) and that the project is financed by retained earnings ($F = F^{RE}$);
- TAX–EATR–LOCAL is obtained employing a measure of corporate taxation ($\tau$) 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 that the project is financed by retained earnings ($F = F^{RE}$);
- TAX–EATR–DEBT is obtained assuming that all personal tax rates equal zero ($m^i = m^d = c = s = z = 0$) and that the project is financed by debt ($F = F^{DE}$);
- TAX–EATR-PERSONAL: is obtained from TAX–EATR including all personal tax rates, and assuming that the project is financed by retained earnings ($F = F^{RE}$).

## Table A2. Variables used to compute effective average tax rates

This Table reports the definitions and sources for the variables used for the computation of TAX–EATR, following Chennells and Griffith (1997), Devereux and Griffith (1998b), and European Commission (2001).

| VARIABLE | DEFINITION AND SOURCES |
|---|---|
| $\tau$ | *Definition:* The statutory corporate income tax rate. In the baseline specification it does not include local or municipal taxes.<br>*Source:* "Worldwide Corporate Tax Guide" by Ernst & Young. |
| $m^i$ | *Definition:* 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.<br>*Source:* "The Global Executive" tax guide by Ernst & Young. |
| $m^d$ | *Definition:* The personal tax rate on dividend income is the final maximum tax rate on dividends. We consider the final maximum tax rate for a resident qualified shareholder. The definition of a qualified or substantial participation differs across the national jurisdictions and over time.<br>*Source:* "The Global Executive" tax guide by Ernst & Young. |
| $s$ | *Definition:* 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.<br>*Source:* "The Global Executive" tax guide by Ernst & Young. |
| $c$ | *Definition:* The rate of withholding tax on dividends paid by the firm to the shareholder.<br>*Source:* "Worldwide Corporate Tax Guide" by Ernst & Young. |
| $z$ | *Definition:* Shareholder's marginal personal capital gains tax rate is the tax rate on capital gains from the disposal of shares. We consider the marginal tax rate for a shareholder with a qualified participation in the corporation. The definition of a qualified participation differs across the national jurisdictions and over time. We use the maximum marginal tax rate for a domestic resident.<br>*Source:* "The Global Executive" tax guide by Ernst & Young. |
| $i$ | *Definition:* The nominal interest rate, equal to the rate on one-year government bonds.<br>*Source:* European Central Bank Monthly Bulletin. |

| | |
|---|---|
| $\phi$ | *Definition:* The rate at which capital expenditure can be offset against taxes. In the baseline specification we use the maximum allowed fiscal depreciation rate for plant and machinery.<br>*Source:* "Worldwide Corporate Tax Guide" by Ernst & Young. |
| $\pi$ | *Definition:* The inflation rate, common to output and capital, given by the nominal increase in prices between periods $t$ and $t+1$.<br>*Source:* Harmonized Indices of Consumer Prices (HICPs) by Eurostat. |
| $p$ | *Definition:* The financial rate of return on the investment. This profitability rate is computed for each industry-year pair in the US as ((Total Value Added - Total Labor Cost)/Total Value Added).<br>*Source:* OECD STAN database for Industrial Analysis. |
| $r$ | *Definition:* The real interest rate, $(1+r)(1+\pi) = (1+i)$<br>*Source:* Authors' computation. |
| $\delta$ | *Definition:* One period cost of depreciation. It is assumed equal to 12.5%.<br>*Source:* Devereux, Griffith and Klemme (2002) and Yoo (2003). |
| $A$ | *Definition:* The net present value of tax allowances per unit of investment. The cost of one unit of physical investment in period $t$ is therefore $(1-A)$.<br>*Source:* Authors' computation (see equation (7) above). |
| $\rho$ | *Definition:* Shareholders' nominal discount rate.<br>*Source:* Authors' computation (see equation (5) above). |
| $\gamma$ | *Definition:* This parameter measures the tax discrimination between new equity and distributions. It can be interpreted as the net income received by the shareholder as a result of a marginal increase in dividends.<br>*Source:* Authors' computation (see equation (6) above). |
| $R$ | *Definition:* The after-tax net present value of the investment. It equals the net present value of net earnings, $R_t = (1+\rho)dV_t = dD_t - dN_t + dV_{t+1}$, where $dD_t$ and $dN_t$ are the changes in dividends and new equity, respectively, in period $t$. $V_t$ is the value of the firm in period $t$, that equals the net present value of after-tax earnings, given by: $V_t = [\gamma D_t - N_t + V_{t+1}]/(1+\rho)$. $R_t$ consists of two parts: $R_t = R_t^{RE} + F_t$; where $R_t^{RE}$ is the income attributable to the investment financed by retained earnings, while $F_t$ is the additional cost of raising external finance<br>*Source:* Authors' computation (see equation (4) above). |

| | |
|---|---|
| $R^*$ | *Definition:* The pre-tax value of the investment. It is equal to $R_t^* = R_t^{*RE} + F_t^*$; where $F_t^* = 0$, because the net present value of the additional costs due to financing by new equity or debt is zero, while $R_t^{*RE}$ can be simplified to $R_t^{*RE} = (p - r)/(1 + r)$, since in absence of taxes $\tau = A = 0$ and $\gamma = 1; \rho = i$<br>*Source:* Authors' computation (see equation (3) above). |
| $F$ | *Definition:* The cost of raising external finance.<br>*Source:* Authors' computation (see equation (8) above). |
| $\tilde{p}$ | *Definition:* The internal rate of return to the project, obtained setting $R = 0$ and solving for $p$ equation (4).<br>*Source:* Authors' computation (see equation (4) above). |
| $EATR$ | *Definition:* It is the proportional difference between $R_t^*$ and $R_t$. It is defined for $p \geq \tilde{p}$.<br>*Source:* Authors' computation (see equation (2) above). |

## Table A3. Descriptive statistics for the variables used to compute TAX–EATR

This Table reports summary statistics for the 17 EU countries observed over the 1997–2004 time period. Variables are defined in Table A2, and are expressed in percentage terms.

| Variable | Mean | S.D. | 25th perc. | Median | 75th perc. | N. obs. |
|---|---|---|---|---|---|---|
| $\tau$ | 31.77 | 5.08 | 28.00 | 33.00 | 35.00 | 134 |
| $m^i$ | 35.86 | 14.13 | 25.00 | 32.50 | 48.00 | 134 |
| $m^d$ | 31.99 | 15.65 | 25.00 | 30.00 | 45.00 | 134 |
| $s$ | 11.65 | 15.81 | 0.00 | 0.00 | 29.00 | 134 |
| $c$ | 26.88 | 13.60 | 20.00 | 27.00 | 35.00 | 134 |
| $z$ | 21.91 | 9.67 | 20.00 | 25.00 | 28.00 | 134 |
| $i$ | 3.69 | 1.63 | 2.36 | 3.45 | 4.26 | 134 |
| $\phi$ | 18.84 | 6.62 | 15.00 | 20.00 | 20.00 | 134 |
| $\pi$ | 2.05 | 1.07 | 1.30 | 2.00 | 2.60 | 134 |
| $p$ | 41.33 | 19.46 | 30.15 | 36.00 | 47.10 | 320 |