Capital Income Taxation, New Firm Creation, and the Size Distribution of Firms (Job market paper)

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November 8, 2005

Abstract

This paper empirically explores the impact of corporate and personal taxes on the size distribution of business firms. Based on a stylized model of new firm creation and diversity of an economy, we hypothesize that much of the tax burden of corporate and dividend taxation falls on the creation of new firms and depresses entrepreneurship. Mature firms on the the other hand are unaffected by the dividend tax and increase in size by the reduced diversity of the economy. Using data on the size distribution of firms, we find strong empirical support for the impact of taxes on average firm size. Taxes significantly depress the number of small sized firms while bigger firms seem almost unaffected.

Keywords: capital income taxation, new firm creation, firm size distribution.

JEL Codes: G32, H25, L11.

*This paper was written when I was visiting UC Berkeley. I thank UCB for its hospitality and the Swiss National Science Fund for financial support. Alan Auerbach, Raj Chetty, Roger Gordon, Bronwyn Hall, Kenneth L. Judd, Christian Keuschnigg, and Uwe Walz, as well as seminar participants at UC Berkeley, U Munich, UC San Diego, U St. Gallen, and the World Congress of the Econometric Society provided helpful comments. Any remaining errors are mine. Comments are welcome.

1 Introduction

Corporate income is typically taxed twice. First on the firm level using the corporate tax and second on the personal level using the dividend or the capital gains tax depending on whether profits are distributed or retained. In looking for the distortions caused by the tax system, the literature has focused on the capital accumulation decision. Nowadays, there seems to be a consensus among economists that the corporate tax depresses investments and capital usage.[1]

Less convincing results are presented for personal taxes. The capital gains tax is regularly considered to depress investment as well. However, since the tax is due only when assets are sold, the tax base is stepped up at death, and since there exist various other ways to evade the tax, the effective tax rate is considered to be only a quarter of the statutory one, see Feldstein, Dicks-Mireaux, and Poterba (1983), making the tax burden somehow negligible.[2] Last, economists do not agree upon the economic consequences of the dividend tax. The old view, assuming that new investments are financed with new equity issues, predicts that the dividend tax depresses investment. The new view takes retained earnings as the marginal financial source and develops a neutrality result of the dividend tax versus investments.[3] The empirical literature is largely inconclusive. Auerbach and Hassett (2003) argue that a mixture of both views might adequately describe the real world.

This paper explores a new channel for taxes on corporate profits to affect the macroeconomy by looking closely at firm diversity. In exploring the effects of the tax rates on firm behavior, the existing literature has relied on a homogenous production section with constant returns to scale which eliminates any effect of firm diversity. Taxes are, however, paid by actual firms. This paper

[1]This is easily shown in a theoretical model and was recently supported empirically, see Cummins, Hassett, and Hubbard (1996), Chirinko, Fazzari, and Meyer (1999), or Hassett and Hubbard (2002).

[2]Some authors have given special attention to the capital gains tax in relation to the financing of young firms and especially venture capital activity, see Keuschnigg and Nielsen (2004) for a theory and Gompers and Lerner (1998) for empirical evidence. Poterba (1989), however, argues that this only refers to a minor part of total capital gains.

[3]See Poterba and Summers (1985) for a classical article in support of the old view. The new view was developed by King (1977), Auerbach (1979), and Bradford (1981). Auerbach (2002) summarizes the literature.

shows that it is worthwhile to take account of the institutional setup of the production sector. To do this, we start with a stylized theoretical model of a firm. Its production function makes use of capital, labor, and a fixed factor in line with Lucas, Jr. (1978).[4] Including both corporate and personal taxes into the model, results are roughly summarized as follows: First, labor demand is undistorted since wage payments are deductible from the tax base. Second, and applying the new view, capital accumulation is hindered by the corporate tax and the capital gains tax. Third, returns to the fixed factor are taxed using the corporate tax and the dividend tax. These repayments can be interpreted as the yield to the start-up investment of the entrepreneur. We extend the setup to a macroeconomic model with free entry into entrepreneurship. If corporate tax and dividend tax depress the profits from firm creation then the diversity of firms will be reduced. Labor that is set free by a reduced number of firms will be reallocated so that remaining firms will increase in size.

There is much reason to believe that firm diversity and the rate of new firm entry is important not only for current output but also for the rate of growth of an economy. New firms play an important role in the process of creative destruction, see Schumpeter (1942) and the endogenous growth model of Aghion and Howitt (1992), that is supposed to drive growth. Also, technology intensive firms are more likely to be incorporated giving special importance to corporate taxes. While we will not be able to go deeper into these issues, the important policy implications should be kept in mind.

The impact of taxes on entrepreneurship has recently attracted some attention. As documented by Blanchflower and Oswald (1998), taxes are the second most important concern for potential entrepreneurs after receiving financial sources. A variety of empirical papers has identified tax effects on entrepreneurship using micro data. Most of this research was related to self employed persons. Carroll, Holtz-Eakin, Rider, and Rosen (2000a,b, 2001) find that the personal income

[4]Dietz (2003) develops a similar model with dividend and capital gains taxes using a setup with monopolistic competition.

tax of the self employed significantly changes their employment, investment and expansion decisions. Blau (1987), Bruce (2000), and Schuetze (2000) find that a higher tax burden reduces entry into self-employment.[5] Cullen and Gordon (2002) provide an in depth analysis of incentive effects of the specific tax rules like progression of the personal income tax, loss offset etc. towards entrepreneurship. Quite important for the purpose of this paper, they argue that firms should start noncorporate so that starting losses can be offset against other income classes. Incorporation should follow once the firm generates profits. Obviously, this strategy gives special importance to the corporate tax and the dividend tax as the relevant tax rates for the returns to entrepreneurship.

While the previous literature discussed above uses firm level data, this paper identifies the impact of dividend and corporate taxes on a macroeconomic level. It thereby provides empirical evidence for the importance of corporate and personal taxes for the distribution of firms in an economy. Although the positive relationship of dividend taxation and bigger firm size seems common wisdom among persons doing corporate finance, no prior empirical evidence seems to exist. Davis and Henrekson (1999) analyze the size and industry distribution of employment of Sweden compared to the US and identify higher taxes as a prime reason for the higher firm size of Swedish firms. Their case study is however mostly verbal and although their results seem characteristic, they lack power by comparing only two countries. Kumar, Rajan, and Zingales (2002) study the determinants of the firm size distribution using a former version of our dataset. Their set of explanatory variables does, however, not contain tax variables and the focus of their work is quite different from ours.

This paper proceeds in two steps. We will first lay out a stylized model of firm behavior and new firm creation. Including corporate and personal taxes into our theory, we can identify testable predictions related to the tax impact on the firm size structure. To start with, the corporate as well as the dividend tax should depress initial firm value and new firm creation and thereby reduce

[5]The average tax burden clearly depresses entrepreneurship in all of these articles. Surprisingly, high marginal tax rates seem to spur self-employment, a result sometimes explained by the greater ease of tax evasion for self-employed. See Gentry and Hubbard (2004) for a detailed discussion of tax progression towards entrepreneurship.

the equilibrium number of firms of an economy. If the labor market clears, then existing firms will necessarily increase in size. In addition, it is shown that the tax parameters have an impact on the dispersion of firms. The reduction in initial firm values by both dividend and corporate tax will have a selection effect on new firm creation by first eliminating lower quality and lower size firms.

The second part of the paper empirically tests our theory. We can derive a testable estimation equation right from our model that is related to the total firm number and average firm size, the stock variables associated with entrepreneurship. We use two data sets on the firm size distribution provided by Eurostat and the OECD, respectively. The firm size data are then combined with a comprehensive collection of tax parameters. Our results indicate that corporate and dividend tax induce higher firm size in line with the theoretical predictions. The result is found both in a cross sectional analysis as well as in a dynamic panel estimation and is robust to a variety of controls. We also find that the tax parameters affect the size structure of business firms. Taxes are mostly felt by small firms and are shown to reduce their number significantly. Larger sized firms appear unaffected by the taxes.

2 A stylized model of taxation and firm size structure

Assume, in the spirit of Lucas, Jr. (1978), that a single firm i produces output with inputs capital K_{it} and labor L_{it} using a production function

$$Y_{it} = A_i \, L_{it}^{\alpha} \, K_{it}^{\beta} \tag{1}$$

with $\alpha + \beta < 1$ where t denotes time. Production thus has decreasing returns to scale which can be thought of as a crude way of modeling the agency costs inside a firm. As the firm becomes bigger, the fixed factor, call it control, oversight, corporate governance, or entrepreneurial impact of the founder, is stretched over an increasing labor and capital stock. An individual firm facing a production function with decreasing returns to scale will choose an optimal, finite size. On the macroeconomic level, however, free entry of new firms relaxes the impact of the fixed factor so that aggregate production can be homogeneous in capital and labor reflecting the standard neoclassical case, see Lucas, Jr. (1978). We will now provide a stylized description of firm creation if single firms are subject to corporate taxation and firm owners are taxed on the personal level. We start with the investor perspective.

Given an alternative investment opportunity with return R, an investor requests an identical yield from holding firm value V_{it}. Return comes as dividends D_{it} paying a dividend tax t^D and capital gains that is increases in value not due to new equity V_{it}^{new} paying a capital gains tax t^C. The no arbitrage condition for firm value V_{it} is then given as

$$R \cdot V_{it} = \left(1 - t^D\right) \cdot D_{it} + \left(1 - t^C\right) \cdot \left[V_{it+1} - V_{it} - V_{it}^{new}\right]. \tag{2}$$

Firm profits are output reduced by wage payments and corporate taxes at rate τ. We assume that capital depreciation at rate δ equal to the economic rate is deductible from the tax base.

$$\pi_{it} = Y_{it} - w \cdot L_{it} - \tau \left(Y_{it} - w \cdot L_{it} - \delta \cdot K_{it}\right) \tag{3}$$

The firm accumulates capital $K_{it+1} = (1-\delta) K_{it} + I_{it}$ by making gross investments I_{it}. The cash flow identity writes $D_{it} + I_{it} = \pi_{it} + V_{it}^{new}$. Dividends and new equity issues are restricted to be nonnegative, $D_{it} \geq 0$ and $V_{it}^{new} \geq 0$. We derive the solution to the maximization problem using dynamic programming. The Bellman equation derived from (2) writes as

$$\begin{aligned} \left(1 + \frac{R}{1-t^C}\right) V_{it}(K_{it}) &= \frac{1-t^D}{1-t^C}(\pi_{it} - I_{it}) - \frac{t^D - t^C}{1-t^C} V_{it}^{new} + V_{it+1}(K_{it+1}) \\ &\quad + \mu_{it}^V V_{it}^{new} + \mu_{it}^D (V_{it}^{new} + \pi_t - I_{it}) \\ s.t. \qquad & K_{it+1} = (1-\delta) K_{it} + I_{it}. \end{aligned} \tag{4}$$

Defining $q_{it} \equiv V'_{it+1}(K_{it+1})$, we derive first order conditions

$$
\begin{aligned}
I_{it} &: \quad q_{it} = \frac{1-t^D}{1-t^C} + \mu_{it}^D && (5)\\
V_{it}^{new} &: \quad \mu_{it}^V + \mu_{it}^D = \frac{t^D - t^C}{1-t^C} && (6)\\
L_{it} &: \quad \alpha \cdot A_i L_{it}^{\alpha-1} K_{it}^{\beta} = w && (7)\\
K_{it+1} &: \quad \left(1 + \frac{R}{1-t^C}\right) q_{it} = \left[1 + (1-\tau)\left(\beta A_i L_{it+1}^{\alpha} K_{it+1}^{\beta-1} - \delta\right)\right] q_{it+1} && (8)
\end{aligned}
$$

By (7), labor demand is not distorted by the tax variables. The capital stock of mature firms can be evaluated from (7) and (8) using the steady state condition $q_{it} = q_{it+1}$ as

$$K_i^* = A_i^{\frac{1}{1-\alpha-\beta}} \left(\frac{\alpha}{w}\right)^{\frac{\alpha}{1-\alpha-\beta}} \left(\frac{\beta}{\frac{R}{(1-t^C)(1-\tau)} + \delta}\right)^{\frac{1-\alpha}{1-\alpha-\beta}}. \tag{9}$$

Capital gains and corporate tax rate depress capital accumulation while the dividend tax by usage of the new view is neutral with respect to the investment decision of mature firms.

Let us first consider the case of a mature firm with capital stock K_i^*. We will come back to the additional complications of firm growth in line with Sinn (1991) later on.[6] Gross dividends $D_{it} = \pi_{it} - I_{it}$ can be evaluated using (7) and the steady state version of (8) to $D_{it} = (1-\alpha-\beta) Y_i + \frac{R}{(1-t^C)(1-\tau)} K_i^*$. We find a total firm value as the present value of dividend payments

$$
\begin{aligned}
V_{it} &= \frac{1-t^D}{1-t^C} \sum_{s=t}^{\infty} D_{is} \left(1 + \frac{R}{1-t^C}\right)^{-s} \\
&= (1-t^D)(1-\tau)\frac{(1-\alpha-\beta)\, Y_i}{R} + q_i \cdot K_i^* && (10)
\end{aligned}
$$

Firm value thus consists of two parts. Notice that $q_i = \frac{1-t^D}{1-t^C}$ is the shadow price of capital for

[6] Optimally, firms should start with too low a capital stock in order to first generate lightly taxed capital gains and grow internally to the mature capital stock. See Sinn (1991) for a microeconomic evaluation or Dietz (2003) for macroeconomic consequences. The approximation used here is exact if either dividends and capital gains are taxed at the same rate $\tau = c$ or if the production function does not make use of capital $\beta = 0$.

a mature firm, see (5), so that $q_i \cdot K_i^*$ measures the value of capital invested inside the firm, see Hayashi (1982). The remaining part equals the rents earned by the fixed factor. Notice that this part of the returns is subject both to the corporate tax as well as to the dividend tax. For an entrepreneur, these returns compensate him for the cost associated with having or setting up a firm.

We now move on to the discrete decision to enter entrepreneurship. Setting up a firm and establishing an individual competitive advantage, the fixed effect, be it through previous research investments, through time investments of the entrepreneur etc., is assumed to be costly with a cost function $C(\cdot)$. Given free entry of firms, it must be true that the value of the fixed factor equals the costs of setting it up.

$$(1-t^D)(1-\tau)\frac{(1-\alpha-\beta)\,Y_i}{R} = C(\cdot) \tag{11}$$

Equation (11) will implicitely define the firm number in our model economy. Basically, a higher firm number reduces the profit Y_i of an additional firm by stretching the fixed labor supply across a higher number of firms. Wages increase and profits decline so that the incentives for firm creation are reduced as the number of firms increases.

In order to obtain an estimation equation, we have to specify the cost function. Doing so will connect the microeconomic setup of a single firm to a macroeconomic model of new firm creation. Lucas, Jr. (1978), for example, describes these costs as the forgone wage of the entrepreneur. Starting a new firm (and thereby establishing its fixed factor) requests a significant time investment by the entrepreneur which is valued using his alternative wage w net of labor taxes t^L as an employee.[7] The endogenous growth literature, on the other hand, emphasizes the technological foundation of the fixed factor and consequently describe the costs $C(\cdot)$ as the sum of research and development expenses. There is some heterogeneity in the literature with repect to the underly-

[7] Gordon (1998) and Fuest, Huber, and Nielsen (2003) use such a model of entrepreneurship to theoretically analyze specific interactions of the taxation of corporate income versus wages. For our purpose, occupational choice is just one macroeconomic setup consistent with our model. We will come back to this in the empirical section of the paper.

ing relationship between the costs of product development and macroeconomic measures. Barro and Sala-I-Martin (2003) consider the case of constant costs. It might also be that more developed economies (higher $\frac{Y}{L}$) face higher costs of product developement or that these costs depend on the size of an economy L.[8] Last, there might exist a static set of business ideas with different costs. A fishing-out mechanism will then make $C(\cdot)$ increase in the number of already explored (and thus used up) ideas. Our implementation will be very general to capture the implications of the variety of models described above. Besides the net wage $\left(1-t^L\right)w$, we embed the number of existing firms N, the size L, and productivity $\frac{Y}{L}$. We parameterize

$$C(\cdot) = const. \cdot N^{x_1} L^{x_2} \left(\frac{Y}{L}\right)^{x_3} \left(\left(1-t^L\right)w\right)^{x_4}. \tag{12}$$

In analyzing the firm size structure that evolves from our stylized theoretical model, we take a two step approach. First, we look at average firm size, the first moment of the distribution by assuming that firms are identical. Second we consider the distribution of firms across size classes taking the aggregate number of firms as given.

2.1 Average firm size

Assuming that technology parameters are identical $A_i = A$, aggregate production $Y = \sum_{i=1}^{N} Y_i = N \cdot Y_i$ is just a multiple of individual firm production. Now use $Y_i = \frac{Y}{L}\frac{L}{N}$, plug into the no entry condition (11), take logs and rearrange to obtain the estimation equation[9]

$$\ln\left(\frac{L}{N}\right) = \beta_1 \ln\left(1-t^D\right) + \beta_2 \ln\left(1-\tau\right) + \beta_3 \ln\left(\left(1-t^L\right)w\right) + \beta_4 \ln\left(\frac{Y}{L}\right) + \beta_5 \ln L + \sum_j D_j \tag{13}$$

[8]Such a scale effect is, however, usually rejected in empirical studies.

[9]The coefficients are $\beta_1 = \beta_2 = -\frac{1}{1+x_1}$, $\beta_3 = \frac{x_4}{1+x_1}$, $\beta_4 = \frac{x_3-1}{1+x_1}$, $\beta_5 = \frac{x_1+x_2}{1+x_1}$ and $\eta_j = \frac{\ln(const.)+\ln(R)-\ln(1-\alpha-\beta)}{1+x_1}$. Our industry dummies D_j capture differences in the production function across industries. The free entry condition is well defined as long as $x_1 > -1$ which restricts the external effects from diversity. The previous literature used $x_1 = 0$ or $x_1 > 0$, see Barro and Sala-I-Martin (2003).

Our model thus predicts an impact of both dividend and corporate taxation on the size distribution of firms. Since both taxes are capitalized into firm values, they will obstruct the creation of new firms. Total diversity of the economy will then decrease. In order for the labor market to clear, wages must be lowered until increasing demand by existing firms absorbs the additional labor. While their is no direct connection between taxes and the labor demand decisions of mature firms, the depression of new firm entry will in equilibrium result in an increase in size for existing firms.

An alternative interpretation of equation (13) is obtained by inverting the dependent variable to $\ln\left(\frac{N}{L}\right)$. Our model then explains the aggregate firm number N of an economy where L is a scaling to adjust for different country sizes. Coefficients for both model interpretations only differ by their sign and we regularly switch between both variants when interpreting our results.

2.2 Distribution across firm size classes

Taxes also affect the distribution of firms. While there are clear theoretical predictions for the the impact of taxes on average firm size, there exist (at least) two predictions related to the tax impact on the dispersion of firm size.

The previous section has assumed that firms are initially endowed with their final capital stock and has thus ruled out the case of transitory firm growth. In an environment with differential taxation of dividends and capital gains, it can however be optimal to set up a firm with a reduced capital infusion and allow it to grow to its final capital stock by means of internal profit retentions. On the transition path, the dividend tax is substituted by the capital gains tax. This idea was developed by Sinn (1991).

Firms are set up at a capital stock with shadow price $q = 1$ using external finance. By the tax preference for capital gains, the firm then retains profits to generate lightly taxed capital gains until the shadow price has fallen to $q = \frac{1-t^D}{1-t^C}$, the value dictated by the new view of dividend taxation.

There is no closed form solution to the financing problem of the firm.[10] Instead, we will take the differential $\frac{1-t^D}{1-t^C}$ as an estimate of the tax induced distortion in initial capital endowment, see LaPorta, Lopez-De-Silanes, Shleifer, and Vishny (2000) and Poterba (2004) for a similar approach. A first order approximation thus predicts that the initial size of new firms declines in the tax preference for capital gains versus dividends.

The second effect of taxes on the dispersion of firm sizes follows from interpreting (11) as a selection mechanism. By (10), initial firm value increases in the individual technology parameter A_i. There exists a cut off level that distinguishes between firms with high technology level which are going to be created and others with lower technology level which are not worthwhile being set up. Taxation affects the position of the threshold level. Higher taxes then eliminate lower level firms while firms with high quality are only affected by general equilibrium effects of reallocating labor across firms.

Thus, higher dividend taxes have an incentive effect of depressing initial firm value but also a selection effect of eliminating lower quality firms from the market. The first should increase the variance of firm size while the second one should depress it. The corporate tax only affects the selection margin and should thus eliminate smaller firms and decrease dispersion. The differential effect of the two tax parameters can help us to evaluate the strength of the incentive versus the selection effect for the dividend tax.

A variety of articles predict that dividend taxes interact with agency problems between managers and investors.[11] The resulting response in the payout behavior might be an alternative explanation for the results on average firm size. As opposed to the effect of tax capitalization

[10]Using a setup with monopolistic competition in continuous time and ignoring depreciation, Dietz (2003) evaluates the differential equations and finds results in line with the verbal arguments used here.

[11]Chetty and Saez (2005) find that the firm's response to the 2003 dividend tax cut depends on the incentives of the management. If managers derive private benefits from controlling large companies, they will retain an excessive capital stock and, in general equilibrium, drive the firm size distribution towards larger firms. Notice that our formulation of decreasing returns to scale on the firm level can be interpreted as a result of agency problems *inside* the firm whereas our model implies efficient action on the overall firm level.

which affects the smallest sized firms, the agency problems hypothesis relates to the biggest sized firms where ownership and control are separated. It has thus distinguishable effects given the size classes of our data.

3 Empirical results

3.1 Description of the data

The following estimation exercises are based on two cross-country datasets of firm demographics. The first is extracted from Eurostat's NewCronos database, see Eurostat (2004). Data coverage includes firm number, employment, value added, labor expenses, and investment on a fairly complete level across industries. In terms of country coverage, we eliminated the eastern European countries since it is unclear if they have reached a steady firm structure yet. We also excluded Greece which provides only information for a single industry and Ireland who does not provide information on smaller firms but also, according to the Eurostat documentation, sticks out by extremely high productivity caused by profit shifting by subsidies of international multis. We are left with a total of 16 European countries, see table 1.

The second dataset, set up by the "OECD Firm-Level Data Project", covers eight European countries, Denmark, Finland, France, Germany, Italy, Netherlands, Portugal, and the UK, plus the US and Canada. While the database only provides information on firm number and employment with a varying coverage of different industries, its special strength is the extensive coverage of the time dimension. Endowed with longer time periods, we will be able to use panel data estimation techniques to improve the accuracy and reliability of our results.

Both data sources have one potential drawback, as we can not distinguish between the corporate and non-corporate sector.[12] Given a differential tax treatment of corporate versus personal

[12] An enterprise as the unit of the Eurostat database is defined as an organizational unit which produces products

firms, it might become attractive for some firms to change legal form in order to save taxes. There is clear empirical evidence that such behavior exists. However, it seems to be quite limited in real terms. MacKie-Mason and Gordon (1997) estimate that an increase in the corporate tax of 10 percentage points depresses total assets held by corporate firms by less than .2%. Goolsbee (1998) finds results in line with this. In a cross-section of US states, Goolsbee (2004) estimates a higher, but still modest impact on incorporation. A second potential problem, see Gordon (1998), is that high income individuals might set up corporations and shift profits towards these corporations as a way to evade high personal income taxes. The number of firms might thus be affected by tax rates for tax evasion reasons alone. This problem is recognized by the statistical offices and should, in principle, be corrected in the database we use.[13] We will come back to this issue as part of the empirical analysis.

In fact, there are also several advantages of looking at the total firm number. Cullen and Gordon (2002) argue that all firms should start as noncorporate to be able to offset start-up losses with other income sources. Both legal forms then interact and looking at corporate firms alone would fall short of the true relationship. In addition, tax evasion through change of legal form would only imply that the distortion we estimate understates the true relationship. To the contrary, a dataset covering corporate firms *alone* would clearly overestimate the real effect of taxes on firm creation. In that case, we might not measure efficiency losses but instead capture tax evasion through change of legal form. Using a complete set of firms is thus probably the most powerful strategy.

Since there does not seem to exist a comprehensive collection of (dividend) tax rates across countries, we had to collect data by hand. We used the Price Waterhouse publication "Individual Taxes, a worldwide summary" as a basic reference. Whenever the information provided in this

and services and has a certain degree of autonomy. There are no restrictions in terms of legal form.

[13]We quote from the data appendix of Eurostat (2004) on the definition of an enterprise: "Some legal units [...] can only be explained by administrative factors (e.g. tax reasons), without them being of any economic significance. [...] In many cases, the activities of these legal units should be seen as ancillary activities of the parent legal unit they serve, to which they belong and to which they must be attached to form an enterprise used for economic analysis."

publication was insufficient or unclear, we started an in depth search using a variety of additional resources. Table 1 reports the tax parameters as they enter our estimations.

The dividend tax parameter is constructed to estimate the *additional* tax burden related to the payout decision of a corporate firm. Thus, whenever a dividend carries a tax credit as in the imputation system of Germany or the ACT system in the UK, the tax burden is reduced and the net burden is included in the data set.[14]

Tax credits are widely used in our selection of countries. In addition, the Nordic countries Denmark, Finland, Norway and Sweden apply a dual income tax which taxes capital and labor at different rates. Austria, Blegium, and Italy have reduced rates on dividends as well. Luxembourg applies a half-rate system. As a consequence, table 1 shows that the effective dividend tax rate is quite different from the typical personal tax rate. Both rates coincide only for the classical double-taxation systems which was also used in the US before the 2003 tax cut. In our sample this refers to Malta, the Netherlands, and Switzerland. Thus, the dividend tax series is rather unique and any effect we measure is likely to be caused by the taxation of dividends and not by other aspects of personal income taxes.

The corporate tax rates are taken from Devereux, Griffith, and Klemm (2002). While the tax basis for the dividend tax is pretty standard across countries, the underlying corporate tax base, the taxable profit, varies significantly across countries mainly because of different depreciation rules. In addition, the impact of accelerated depreciation rules for the corporate tax base changes with the profitability of the investment project. A standard measure for the aggregate corporate tax burden is the Effective Average Tax Rate (EATR) described in Devereux and Griffith (2003). The EATR is typically applied to evaluate the tax burden on (highly) profitable and discrete investment projects as the international location decision of multinational firms. It will also cover

[14]For example in 1990, the UK dividend tax in the top bracket was about 40%, but dividends carried a tax credit of 25%. A dividend payment of .75 is grossed up to $.75 + .25$ and resulted in a total dividend tax of $.4 \cdot (.75 + .25) = .4$ reduced by the tax credit resulting in an after tax payment of $.75 - (.4 - .25) = .6$. The effective dividend tax is then calculated as $\frac{.75-.6}{.75} = .2$.

Table 1: Tax parameter

	Personal income	Dividend tax rates			Capital gains tax	Effective Average Tax Rate (EATR)
		Statutory	Tax credit	Effective		
Austria	50%	25%		25%	0%	21%
Belgium	50%	25%		25%	0%	31%
Denmark	59%	40%		40%	40%	23%
Finland	38%	28%		28%	28%	23%
France	64%	64%	50%	28%	26%	27%
Germany	56%	56%	32%	36%	0%	37%
Italy	46%	13%		13%	13%	22%
Luxembourg	47%	24%		24%	0%	27%
Malta	35%	35%		35%	35%	32%
The Netherlands	60%	60%		60%	0%	28%
Norway	42%	0%		0%	28%	24%
Portugal	30%	30%	20%	12%	10%	26%
Spain	48%	48%	40%	13%	20%	26%
Sweden	56%	30%		30%	30%	21%
Switzerland	43%	43%		43%	0%	25%
UK	33%	33%	10%	25%	10%	24%

Dividend and capital gains tax rates are extracted from Price Waterhouse, "Individual Taxes, a world-wide summary 1999/2000". Effective Average Tax Rates (EATR) are taken from an updated version of Devereux, Griffith, and Klemm (2002), their base case.

nicely our idea of a (highly) profitable and discrete decision of entry into entrepreneurship. Since the coverage of the EATR data series does not include Denmark, Malta, and Switzerland, values for these countries are based on our own calculations.

We also collected a series of controls from a variety of other sources. All variables are readily available and most of them are regularly embedded in cross country estimations. Table 7 gives summary statistics and describes the data sources in more detail.

3.2 Average firm size

3.2.1 Empirical strategy

Estimation follows from equation (13). Due to the availability of detailed data on firm number and firm size, the country number is limited to the 16 countries presented before. We will expand the dataset to the industry dimension. This will allow as to, first, include the control variables without losing degrees of freedom in the country dimension and, second, correct for potential distortions in the industry structure. This is important if low taxes on corporate income attract capital intensive industries. Except for the tax rates which are identical across countries, all variables vary both across the country j and the industry k dimension.

Motivated by the results derived in (13), there is much reason to believe that there are distinct differences among industries, e.g. by differences in their production function making $1 - \alpha_k - \beta_k$ an industry dependent variable. These structural differences across industries ask for the inclusion of industry dummies.[15] Countries, on the other hand, should behave in the same way if we condition on a set of explanatory variables (including the tax rates). However, if we omit some of these control variables and if these variables are correlated within countries, we will introduce random differences among countries. The error terms might be clustered across countries. To solve this problem, we model them as the sum of an individual ε_{jk} and a country specific component u_j. The explanatory variables X_{jk} include tax rates, industry dummies, and additional variables rationalized by (13).

$$y_{jk} = X_{jk}\beta + u_j + \varepsilon_{jk}, \quad E\left[u_j + \varepsilon_{jk}\,|X\right] = 0. \tag{14}$$

Wooldridge (2003) discusses several estimation strategies for a model with clustered errors like ours. First, standard OLS estimation gives consistent estimates. However, Moulton (1986) has shown that we can not use standard interference but have to apply a variance estimator that is robust to the cluster structure of the error terms. Second, a GLS estimator, the random effects approach in panel data, can in principle use the specific error structure to construct asymptotic efficient point estimates. GLS does so by applying different weights to the within- and between-

[15] This will also eliminate shifts in the importance of industries within a country. Capital- and labor-intensive sectors might react differently to changes in tax rates. The resulting specialization of countries is beyond the focus of this paper.

cluster dimension of the estimation. In principle, a comparison within a country is not affected by the country effect. Putting additional weight on this within dimension should then increase the precision. We are primarily interested in the impact of the tax coefficients which do not vary within countries. The tax effects are not identified within clusters and GLS has inferior performance for our purpose.[16] Our basic results are thus based on the OLS estimation and correct the standard errors for the cluster structure of the observations.

Third, using a large number of observations in the industry dimension, we can apply a two-step estimation strategy, see Loeb and Bound (1996), similar to a between cluster estimator. To do this, we first regress the dependent variable on a full set of country and industry dummies and a series of controls excluding the tax rates.[17] The country dummies will provide us with the country specific effect on firm size not explained by the controls. Given a large number of industries, the country effect should be estimated precisely and only contain noise due to the hidden country specific error u_j. The second step is to regress the country effect on the tax rates. An efficient estimation uses the standard errors on the country effects from the first stage regression as weights.

Last, we can make use of the additional time dimension offered by the OECD database and thereby use the variation of tax rates over time to identify their effect on firm diversity and average firm size. Following the dynamic panel data approach of Arellano and Bond (1991), we difference the data set once to eliminate the impact of any unobserved variables including industry dummies or country-specific variables. A GMM estimator using lagged values as instruments can then identify the effect of a change in tax rates on diversity. While the OLS and between estimation are somehow related, including evidence from the time dimension of taxation should add significant credibility to our results.

[16]Consistent with this, random effects GLS estimation produces virtually unchanged point estimates for all variables, higher standard errors for the tax variables and lower standard errors for other variables.

[17]At the first stage regression, we can include control variables that vary both across industry and country without losing degrees of freedom in the country dimension. This is the important advantage of this approach compared to a pure cross-country regression which would request us to embed the control variables in the second stage.

3.2.2 Basic results

The first set of regressions is based on the Eurostat dataset and explores the cross sectional information. We capture data on the one digit NACE level and eliminate category "E - Electricity, gas and water supply" which is highly regulated and unlikely to be characterized by free entry of new market participants. We are left with at most six industries per country.

The estimation follows closely our theoretical model, see equation (13). In addition to the variables rationalized by our model, we also embed two additional control variable which are motivated outside the stylized model. First, we include a variable for the employment growth of an industry, the log of one plus the growth rate in employment. Growing industries are typically dominated by smaller, younger firms while established industries mostly see larger, mature firms. Second, we use the employment share of an industry in the total population $\frac{L_{jk}}{L_j}$ to measure the impact of national clusters in specific industries. Together with the industry dummies, the coefficient captures the effect of a country specific *deviation* from the standard industry structure. National clusters might be the result of a few highly productive firms that increase both the importance of an industry and the average firm size.

Table 2 gives results. In the four columns, we first embed the dividend tax (I) and the corporate tax parameter (II) separately, then include both taxes (III) and finally calculate their joint impact (IV). Both tax parameters are significant when entering the regression separately. Jointly entering the variables as in column III reduces the level of significance. However, a joint F-test of both variables gives a F-statistic of 8.04 and probability level of 0.06%. The negative sign of the point estimates shows that the tax rate increases average firm size and depresses diversity or new firm creation.[18] These basic results give strong support for the theoretical framework that we have presented previously.

In the regressions just discussed, but also in other regressions, the point estimate of the div-

[18]Notice that $ln(1-x)$ declines in x.

Table 2: Cross sectional evidence on taxes and firm size

	I	II	III	IV
Dividend tax	$-.89224^{***}$		$-.66160^{**}$	
$\ln(1-t_j^D)$	(-3.10)		(-1.99)	
Corporate tax		-2.66945^{**}	-1.85933	
$\ln(1-\tau_j)$		(-2.41)	(-1.58)	
Aggregate tax				$-.86162^{***}$
$\ln\left[(1-t_j^D)(1-\tau_j)\right]$				(-3.88)
Wage rate	$.70728^{***}$	$.68783^{***}$	$.73059^{***}$	$.72527^{***}$
$\ln\left(\left(1-t_j^L\right)w_{jk}\right)$	(3.00)	(3.42)	(3.33)	(3.15)
Productivity	$-.06197$	.12256	.01032	$-.03945$
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(-0.44)	(0.76)	(0.07)	(-0.31)
Size	.06624	.04752	.05802	.06337
$\ln(L_{jk})$	(1.36)	(1.30)	(1.42)	(1.45)
Share	$.40817^{***}$	$.50868^{***}$	$.46046^{***}$	$.42894^{***}$
$\ln(\frac{L_{jk}}{L_j})$	(2.72)	(3.88)	(3.24)	(3.02)
Growth	-1.48114^{***}	$-.55576$	$-.87602$	-1.20842^{**}
$\Delta\ln(L_{jk})$	(-2.92)	(-1.04)	(-1.41)	(-2.56)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	16	16	16	16
# obs.	98	98	98	98
$\mathbf{R}^2$	73.49%	73.09%	75.09%	74.60%

Legend: Dependent variable is the natural logarithm of average firm size $\ln\left(\frac{L_{jk}}{N_{jk}}\right)$. All estimations report robust standard errors, corrected for clustering on the country-level. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level.

idend tax lies below the one of the corporate tax. Intuitively, this is explained if some investors are not subject to the full dividend tax, be it that they are tax exempt in general, since they are foreigners, or are not taxed in the top bracket of the underlying personal income schedule. In fact, the personal taxation of the marginal investor in a corporation is a highly debated issue when it comes to corporate debt policy, see Miller (1977). On a macroeconomic level it is hardly possible to correct for this problem and find something like the average dividend tax, so that we can only rely on using top marginal tax rates.

Results for the non-tax variables are very interesting as well. First, the wage rate is probably the most important determinant of firm size. In a setup with occupational choice, a higher wage makes employment more attractive compared to new firm creation and thereby increases average firm size, see Lucas, Jr. (1978). The positive and highly significant coefficient confirms this reasoning. The wage rate thereby clearly dominates the closely related total wage productivity $\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$. Second, the pure size of a sector or economy, $\ln(L_{jk})$, does not seem to be important. A deviation from the standard industry structure, on the other hand, has high explanatory power. Third, the growth variable is highly significant, confirming the prior belief that highly growing industries are characterized by smaller firms. Last, the industry dummies which are not reported in table 2 explain 49% of the total variation in firm size and are responsible for the high value of R^2.

We can now give a first intuition for the magnitude of our results. Taking the coefficient of the dividend tax variable to be roughly $-.8$, we can evaluate the elasticity of firm size with respect to the dividend tax as $\epsilon = \beta_2 \frac{t^D}{1-t^D}$, see (13). If a country now increases its dividend tax from 27%, the mean of our data set, to 28%, our results indicate an increase in average firm size of 1.1% and therefore a decline in the diversity of firms of 1.1%.

3.2.3 Testing alternative models of tax evasion

Before we go on to robustness checks using a set of alternative explanatory variables and before applying other estimation techniques, we want to check alternatives to the model estimated above. Although they should in principle not apply given the database we use, they were often braught up when presenting this paper and thus seem to justify an additional analysis.

First, there is considerable evidence for international tax competition and the flexibility of multinational firms to explore tax saving opportunities, see Gordon and Hines (2002). Low corporate taxes might attract international firms that are free to set the location of their production units or their headquater. High taxes might induce the opposite effect and chase away firms. This effect may have "real" effects through additional production taking place in the country or simply imply profit shifting towards pure holding companies located in the low tax region. For special countries, the ”tax havens”, multinationals can become very important issues.[19] As an explanation for the empirical results of this paper, international tax shifting is, however, not sufficient. While foreign investors are typically subject to the corporate tax, they will not be subject to the dividend tax which is only paid by domestic tax payers. The international location decision of firms thus adds to the various explanations for the lower point estimates of the dividend tax. It provides no explanation for the effect of dividend taxes and, therefore, does not seem to be a sufficient explanation for the full pattern.

We then turn to arguments considering tax evasion within a country. Gordon (1998) argues that high income individuals can set up corporate firms and shift some of their profits towards these entities to save the difference between the corporate and the personal income tax. A low tax on corporations then results in a higher number of firms although this has nothing to do with actual corporate activity. As argued before, the statistical offices claim that such entreprises have been eliminated from the database. MacKie-Mason and Gordon (1997) as well as Goolsbee (1998, 2004) found that a differential taxation of corporate and non-corporate sector induces some firms to change their legal form. It might now be possible that our database contains all corporate activity but misses some fraction of non-corporate firms. While corporate firms as separate legal entities are easy to count, other legal forms might be harder to identify and some self-employed activity might escape the data collection completely. If this would be true, then the tax effects we found might just be further evidence of the switching between corporate and non-corporate firm in response to tax incentives.[20] Again, this theory is not backed by the documentation of the Eurostat database who claims to give a complete picture of the number and activities of entreprises.

Last, our standard model allows for occupational choice as one of several determinants of the costs of setting up a firm, see Lucas, Jr. (1978) and Fuest, Huber, and Nielsen (2003). In this case

[19]Ireland, currently charging the lowest corporate tax rate in the European Union, was excluded due to data limitations. Switzerland, another low tax country, is discussed intensively at a later point of this paper.

[20]If, quite to the opposite, the number of firms is correct, then our results will greatly underestimate the impact of taxes on the corporate sector since any change in legal form does not show up in our data.

as in the alternative models above, individuals care about the *differences in corporate and personal tax* if they plan to set up a corporate firm. Setting up a non-corporate firm is not affected by personal taxes at all since the tax applies both to wages and the return to entrepreneurship. For our empirical model, it follows that the personal income tax should have the same predictive power as the corporate tax, the point estimate should have the opposite sign and the same magnitude as the corporate tax.

Table 3 repeats our standard estimation but includes the wage rate and the personal tax as separate regressors in all estimations.[21] As predicted, the personal income tax has a coefficient of opposite sign than the other tax rates. However, the variable is much less significant and the point estimate is lower than it is for other tax rates. In column II for example, the corporate tax has a point estimate of about -2.5 in tables 2 and 3 with a p-value of 1.8% and 4.4%, respectively. The wage tax on the other side has a coefficient of only one tenth of this (about .27) and is largely insignificant with a p-value of 55.3%.[22] A formal test for the coefficients being of equal height but different sign rejects the null at a p-value of 7.93%. Only the high standard error of the personal tax variable impedes a stronger result.

The estimation gives only limited support for the theories developed above. Most importantly, it seems that neither of them is sufficient to explain the full magnitude of our results. Even the sum of the three effects rationalized before can not explain a significant share of the measured effect. In addition, the basis for the tax evasion explanations is vague since the database should be corrected for their impact. Thus, we interpret the coefficient on the wage tax as support for the occupational choice model. Also, we conlude that other cost of setting up a firm, see (11), must be significant. The main result of this discussion is that pure tax evasion by high-tax individuals or shifting between the legal forms do not seem to drive the results. Occupational choice remains

[21] Table 8 in the appendix provides a robustness check with respect to exclusion of the wage rate and the personal tax. We find a reduction in the fit of the general model which decreases the signal to noise ratio and reduces significance of the tax variables. The point estimates are not affected.

[22] Notice that the wage rate varies both across industries and countries. Thus, it is not surprising that its level of significance is much higher than the one of the tax on wages.

one potential explanation and, in line with the theoretical model, we continue to embed the net wage as a control in the remaining estimations.

Table 3: Testing occupational choice: Importance of the tax on wages

	I	II	III	IV
Dividend tax	$-.74240^{**}$		$-.55620$	
$\ln(1-t_i^D)$	(-2.00)		(-1.41)	
Corporate tax		-2.26237^{**}	-1.76045	
$\ln(1-\tau_i)$		(-2.05)	(-1.53)	
Aggregate tax				$-.75828^{**}$
$\ln\left[(1-t_i^D)(1-\tau_i)\right]$				(-2.49)
Wage tax	.40546	.27452	.49235	.48921
$\ln\left(1-t_i^L\right)$	(0.77)	(0.59)	(0.97)	(0.95)
Wage rate	$.74482^{***}$	$.75042^{***}$	$.75882^{***}$	$.75322^{***}$
$\ln\left(w_{ij}\right)$	(3.48)	(3.96)	(3.68)	(3.52)
Productivity	$-.10428$	.02443	$-.02675$	$-.07644$
$\ln\left(\frac{Y_{ij}}{L_{ij}}\right)$	(-0.75)	(0.14)	(-0.17)	(-0.58)
Size	.05419	.03438	.04899	.05446
$\ln(L_{ij})$	(0.97)	(0.74)	(0.99)	(1.06)
Share	$.42416^{***}$	$.51242^{***}$	$.47023^{***}$	$.43846^{***}$
$\ln(\frac{L_{ij}}{L_i})$	(2.69)	(3.70)	(3.25)	(2.93)
Growth	-1.59026^{***}	$-.85737$	$-.99388$	-1.32698^{**}
$\Delta\ln(L_{ij})$	(-3.03)	(-1.36)	(-1.47)	(-2.45)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	16	16	16	16
# obs.	98	98	98	98
$\mathbf{R}^2$	73.97%	74.18%	75.39%	74.89%

Legend: Dependent variable is the natural logarithm of average firm size $\ln\left(\frac{L_{ij}}{N_{ij}}\right)$. All estimations report robust standard errors, corrected for clustering on the country-level. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level.

3.2.4 Robustness check

We also check our results for robustness to alternative explanations of the firm size. Thereby, we control for some of the additional variables that proved to be robust predictors of firm size in Kumar, Rajan, and Zingales (2002). First, new firm creation and diversity might largely depend on the regulatory environment of an economy. The OECD provides two summary statistics to describe the overall institutional setup of a country, see Nicoletti, Scarpetta, and Boylaud (2000). The ”Employment Protection Legislation” (EPL) coefficient measures the flexibility of the labor market. Although entrepreneurship and labor markets are clearly related, there is maybe no clear prediction for the variable. Rigidities in the labor market could induce entrepreneurship as a measure to avoid the regulation of employed positions. In this case higher EPL should spur new firm creation and reduce average firm size. Alternatively, firms might accumulate employees hired in the past since layoffs are hardly possible even in bad times. In this case, EPL would increase firm size. The second coefficient for the institutional environment, ”Regulation of Product Markets” (RPM), mainly indicates the ease of firms to make independent decisions and measures the amount of paperwork that officials request. Arguably, bigger firms with a specialized administration find it easier to fulfill such requirements. Entrepreneurs, on the other side, might be detered by this. In this case, regulation should depress diversity and increase firm size. On the other hand, the regulatory efforts might indeed by targeted to prevent monopolistic tendencies in which case regulation should allow new firm creation and reduce firm size.

Next, we expect that entrepreneurship depends on the development of financial market. While established firms finance marginal investments using profit retention, new firms need funds from external sources to overcome cash constraints, see Rajan and Zingales (1998). According to this argument, a liquid capital market facilitates new firm creation, increases diversity and reduces average firm size. Levine, Loayza, and Beck (2000) argue that the ratio of private credit over GDP covers best the ease at which potential entrepreneurs receive necessary financial sources.

Columns I to IV in table 4, labeled ”Institutions” include all three variables to check the robustness of our estimates to the controls just discussed. Obviously, and comparing to the standard model in table 2, the results do not change. Notice that the OECD indicators are not available for both Luxembourg and Malta. The changing country sample might also explain that the level of significance of the tax parameter even increases slightly. In general, and this will hold for all robustness checks, the alternative explanatory variables perform very poorly.

We move on to macroeconomic controls. First, we reconsider the impact of size. Possibly, firm size depends on the size of the sales market instead of the specific economy and includes export markets. We thus include openness, regularly defined as imports plus exports over GDP, in our regression. Then, in line with Kumar, Rajan, and Zingales (2002), we check the impact of education, measured by the average years of schooling, on the size of firms. If education increases technology A in (11), then entrepreneurs can manage bigger firms and the variable should go in line with higher average firm size.[23]

Last, we include the investment intensity which is measured by the ratio of gros investment I_{jk} over employment L_{jk}. Notice that in a steady state, capital and investment intensity should be perfectly correlated. In Kumar, Rajan, and Zingales (2002), investment intensity is one of the few variables that help predict the variation of firm sizes *across industries*. We want to point out that, strictly spoken, investment is not a valid variable in this setup. In our model, capital intensity should not have an impact on the organizational structure of production. Usage of capital depends mainly on its production share β_k and should already be eliminated through the industry dummies. In addition and according to (9), capital accumulation is depressed by the corporate tax and is therefore correlated with the tax rate.

Results of this second line of robustness checks can be found in columns V to VIII of table 4. Our dataset is reduced since information on schooling is not available for Luxembourg and investment data is missing for Luxembourg and Switzerland. Again, the predictive power of the newly introduced variables is poor. The tax variables are, in general, as significant as before. However, in column VI, the corporate tax variable becomes less significant. This is quite surprising since no control is close to significant. Therefore, we interpret this as a spurious result. At the same

[23]Education might affect the costs $C(\cdot)$ as well. In this case, the impact of education might be reduced or canceled out.

Table 4: Cross sectional evidence on taxes and firm size: Robustness check

	Institutions				Macroeconomics			
	I	II	III	IV	V	VI	VII	VIII
Dividend tax	$-.63200^{**}$		$-.41768$		-1.17465^{***}		-1.11928^{***}	
$\ln(1-t_j^D)$	(-2.31)		(-1.44)		(-3.96)		(-3.87)	
Corporate tax		-2.19887^{***}	-1.65670^{*}			-1.66557	$-.92567^{**}$	
$\ln(1-\tau_j)$		(-2.92)	(-1.78)			(-1.21)	(-0.82)	
Aggregate tax				$-.62658^{***}$				-1.09524^{***}
$\ln\left[(1-t_j^D)(1-\tau_j)\right]$				(-3.01)				(-4.46)
Employment protect.	.11050	.08554	.10486	.11217				
EPL_j	(0.82)	(0.63)	(0.85)	(0.88)				
Product market reg.	$-.33289$	$-.42208^{**}$	$-.38455^{*}$	$-.34794$				
PMR_j	(-1.40)	(-2.22)	(-1.84)	(-1.58)				
Private credit	$.35507^{*}$	$.35028^{*}$	.30874	.32521				
$\ln\left(\frac{B_j}{Y_j}\right)$	(1.76)	(1.74)	(1.51)	(1.58)				
Openness					.00288	.00349	.00188	.00173
$\ln\left(\frac{EXP_j+IMP_j}{Y_j}\right)$					(1.34)	(0.93)	(0.67)	(0.70)
Schooling					$-.05714$	$-.00910$	$-.06239^{*}$	$-.06261^{**}$
YOS_j					(-1.48)	(-0.24)	(-1.94)	(-2.01)
Investment intensity					$-.01007$	.03551	.01479	.01935
$\ln\left(\frac{I_{jk}}{L_{jk}}\right)$					(-0.08)	(0.24)	(0.12)	(0.15)
Wage rate	$.65746^{***}$	$.56753^{***}$	$.62134^{***}$	$.65293^{***}$	1.08161^{***}	$.85279^{***}$	1.10653^{***}	1.10756^{***}
$\ln\left(\left(1-t_j^L\right)w_{jk}\right)$	(2.68)	(2.90)	(2.82)	(2.86)	(5.00)	(3.73)	(5.09)	(5.07)
Productivity	.02443	.13685	.07053	.03071	$-.09814$	.05078	$-.08587$	$-.08199$
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(0.16)	(0.82)	(0.45)	(0.21)	(-0.50)	(0.21)	(-0.45)	(0.45)
Size	.06042	.00021	.02205	.04793	$.13507^{**}$	.12739	.10698	.10239
$\ln(L_{jk})$	(1.24)	(0.00)	(0.56)	(1.10)	(2.10)	(1.53)	(1.42)	(1.50)
Share	.20131	$.30265^{**}$	$.28053^{*}$	.23210	$.39028^{***}$	$.47197^{***}$	$.43151^{***}$	$.43916^{***}$
$\ln(\frac{L_{jk}}{L_j})$	(1.22)	(2.04)	(1.94)	(1.43)	(3.45)	(3.24)	(3.73)	(3.92)
Growth	$-.75850$	$-.01561$	$-.26689$	$-.59224$	-1.93810^{***}	-1.24124^{*}	-1.59706^{*}	-1.53351^{**}
$\Delta\ln(L_{jk})$	(-1.35)	(-0.03)	(-0.43)	(-1.03)	(-3.02)	(-1.67)	(-1.87)	(-2.26)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	14	14	14	14	14	14	14	14
# obs.	88	88	88	88	86	86	86	86
R^2	79.40%	79.79%	80.48%	80.03%	81.47%	77.17%	81.75%	81.74%

Legend: Dependent variable is the natural logarithm of average firm size $\ln\left(\frac{L_{jk}}{N_{jk}}\right)$. All estimations report robust standard errors, corrected for clustering on the country-level. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level.

time, the point estimate is still similar to previous estimates.[24]

Taken together, the evidence in table 4 indicates that the results are stable across the specifications. The predictive power of our control variables turns out to be quite poor. As the discussion before has shown, it seems difficult to come up with new variables that promise to be robust determinants of the diversity of firms on the country level.

3.2.5 Two-step estimation

The second line of evidence is based on a two-step estimation which regresses the country effects from a stage estimation on the tax rates, see Loeb and Bound (1996). Again, we use the Eurostat database. Increasing the number of industries will now improve the first stage estimation and should allow us to estimate the country effects with a rather high precision.[25]

The first stage estimation filters the data using our standard set of explanatory variables. We have to remove the size of an industry $\ln(L_{jk})$ since it results in a collinearity when combined with the share variable $\ln\left(\frac{L_{jk}}{L_j}\right)$ and the newly introduced country dummies D_j. It was however far from significant in the previous estimations. Given 296 observations, we estimate the first stage regression as

$$\ln\left(\frac{L_{jk}}{N_{jk}}\right) = 1.46 \cdot \ln\left(\left(1 - t_j^L\right) w_{jk}\right) - 0.07 \cdot \ln\left(\frac{Y_{jk}}{L_{jk}}\right) + 0.38 \cdot \ln\left(\frac{L_{jk}}{L_j}\right) + 0.44 \cdot \Delta \ln L_{jk} + \sum_j D_j + \sum_k D_k$$

In addition to the previous regression, we thus include a set of country dummies D_j which are then used in the second stage to analyze the tax impact. We also obtain the standard errors for the

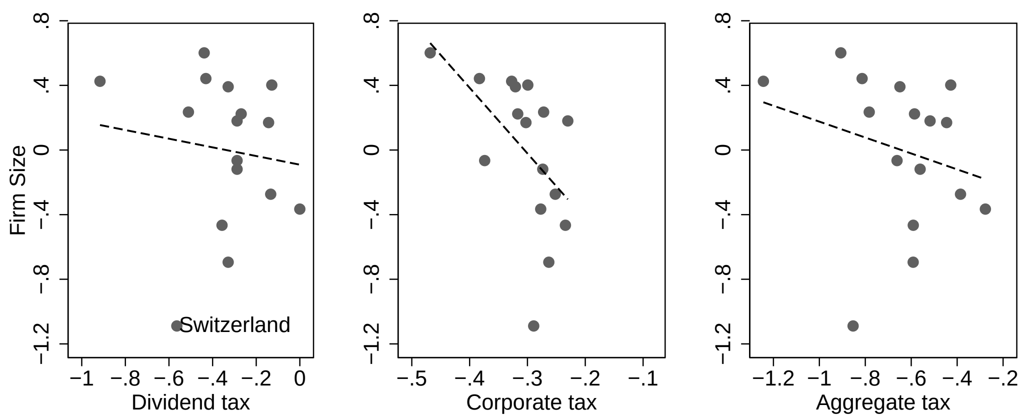
[24]The decline in significance is not induced by the slight change in the estimation sample. Using the reduced sample but excluding the controls gives a point estimate of -2.50087^{**} and t-statistic of -2.51.

[25]The industry number thus becomes 21 so that the individual error is neglicable and the country effects are only disturbed by the random country terms. A further increase in the industry detail faces problems since the number of firms per industry becomes rather small for small countries.

country variables which serve as weights to derive efficient estimates.

Figure 1 plots the country effects against the tax rates on corporate income, dividends and the aggregate tax burden of both taxes. We find a clear trend for firm size to increase in higher tax rates for all three plots. One country, Switzerland, appears to experience especially low firm sizes. It is hard to give an ad hoc explanation for this. One possibility might be its position as a tax haven. Figure 1 reports the standard tax rates while the low tax rates for foreign corporations are based on special legal constructions. For example, very low tax rates (typically less than 10%) apply for holding companies and attracted a significant number of them to Switzerland. To qualify for the special tax treatment, these entities must not have significant business activities in Switzerland and therefore have very low firm sizes. It is possible that the significant tax evasion channeled through Switzerland drives up the firm number significantly and thereby reduces average firm size. With or without Switzerland, we notice a clear negative slope of the relationship in all three parts of figure 1.

Figure 1: Plot of unexplained differences in firm size across countries versus tax rates



Legend: Abscissa is natural log $\ln(1 - tax)$ of the dividend tax, the corporate tax and the aggregate tax burden. Ordinate is the country dummy D_j from a first stage regression on average firm size $\ln\left(\frac{L_{jk}}{N_{jk}}\right)$. The line is a linear predictor using the full set of observations.

Table 5 reports the results of a regression of the country effects on the tax rates. We provide two series of estimations. First, we use the full sample of countries and, second, we exclude Switzerland. Results confirm the visual impression from figure 1 and the previous estimations. Taxes have a significant effect on diversity and average firm size controlling for a variety of alternative factors. As is also obvious from figure 1, the tax coefficient become much more significant once we remove Switzerland from the sample. In this case, the coefficients are also very similar to the previous results.

Table 5: Between country estimation

	I	II	III	IV
Dividend tax	$-.49921$		$-.20845$	
$\ln(1-t_j^D)$	(-1.39)		(-0.52)	
Corporate tax		-3.72117^{***}	-3.57189^{***}	
$\ln(1-\tau_j)$		(-3.78)	(-3.21)	
Tax				$-.72297^{**}$
$\ln\left[(1-t_j^D)(1-\tau_j)\right]$				(-2.24)
# countries	16	16	16	16
$\mathbf{R}^2$	5.28%	33.32%	34.18%	14.11%
Dividend tax	$-.72894^{**}$		$-.44023$	
$\ln(1-t_j^D)$	(-2.89)		(-1.77)	
Corporate tax		-3.60795^{***}	-3.28117^{**}	
$\ln(1-\tau_j)$		(-3.57)	(-2.94)	
Tax				$-.89347^{***}$
$\ln\left[(1-t_j^D)(1-\tau_j)\right]$				(-3.22)
# countries	15	15	15	15
$\mathbf{R}^2$	13.49%	39.19%	43.79%	26.25%

Legend: Dependent variable is the country specific effect D_j of the natural logarithm of average firm size $\ln\left(\frac{L_{jk}}{N_{jk}}\right)$ from a first stage regression. The upper series includes all countries, the lower one excludes Switzerland. See the text for further details. All estimations report robust standard errors. $^*/^{**}/^{***}$ significant on the 10%/5%/1% level.

3.2.6 Time series evidence

We will now turn to the time dimension of the OECD dataset as our third stream of evidence. We suppose that changes in the industry structure and firm size are subject to significant lags due to adjustment costs. Our theory shows that the burden of both taxes falls on new firm creation while established firms will not be affected. Only the turnover of firms over time initiated by depreciation of firms then results in an adjustment towards the new steady state firm structure. The current size structure then not only depends on today's taxes but partly reflects the history of the tax system.[26]

The OECD database only provides information on the firm number and the employment across industries and countries. Therefore, the set of explanatory variables is greatly reduced. On the other hand, the time dimension of this data set allows us to take a first difference of the data, which should rigorously eliminate the problem of omitted variables. While equation (13) describes the impact of taxes on the steady state allocation of labor, it seems inappropriate for the time dimension. Changes to the firm size structure happen through entrance of new firms or failure of existing firms and are in general likely to be long run developments. A realistic model of the time domain thus has to take into account a partial adjustment towards the steady state and adjust for significant autocorrelation. Assuming the functional form $(\ln\left(\frac{L_t}{N_t}\right) - \ln\left(\frac{L_{t-1}}{N_{t-1}}\right)) = \zeta \cdot (\ln\left(\frac{L_t}{N_t}\right)^* - \ln\left(\frac{L_{t-1}}{N_{t-1}}\right))$, the firm size moves at speed ζ gradually towards its optimal value $\ln\left(\frac{L_t}{N_t}\right)^*$ which is defined as in (13) but has a smaller set of explanatory variables. This shortcoming is counterbalanced by the difference GMM approach and by the different country selection. We newly introduce a series of time dummies to filter any sort of time trend or comovement. The

[26]In this section, we will focus attention to the intertemporal *changes* of the firm size structure. The previous results, looking at the absolute levels, will be affected by the gradual adjustment to a much lesser extend. In a previous version of this paper we reported an additional estimation which used lagged tax rates as instrument for the current tax to extract the long-run tax structure. Results are very similar to the standard case in table 2.

associated regression equation will thus write as[27]

$$\ln\left(\frac{L_t}{N_t}\right) = \gamma_1 \ln\left(1 - t_t^D\right) + \gamma_2 \ln\left(1 - \tau_t\right) + \gamma_3 \ln\left(\frac{L_{t-1}}{N_{t-1}}\right) + \gamma_2 \ln L_t + const. + \varepsilon \tag{15}$$

Table 6: Time series evidence on taxes and firm size

		I	II	III	IV
Dividend tax		$-.11476^{**}$		$-.09461^{*\dagger}$	
	$\ln(1-t_t^D)$	(-2.50)		(-1.88)	
Corporate tax			$-.27952^{***}$	$-.10928^{\dagger}$	
	$\ln(1-\tau_t)$		(-3.04)	(-1.27)	
Total tax burden					$-.09743^{***}$
	$\ln[(1-t_t^D)(1-\tau_{t-1})]$				(-2.72)
Convergence		$.53199^{***}$	$.54052^{***}$	$.51269^{***}$	$.51443^{***}$
	$\ln\left(\frac{L_{t-1}}{N_{t-1}}\right)$	(3.54)	(3.55)	(3.32)	(3.42))
Size		$.45666^{***}$	$.41102^{***}$	$.45053^{***}$	$.45201^{***}$
	$\ln(L_t)$	(3.55)	(3.49)	(3.48)	(3.53)
Time dummies		*YES*	*YES*	*YES*	*YES*
# series		73	73	73	73
# obs.		561	578	561	561

Legend: Dependent variable is the natural logarithm of average firm size $\ln\left(\frac{L_t}{N_t}\right)$. All estimations report robust standard errors. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level. † Joint F-test results $\chi^2_2 = 9.52$ and p-value of 0.86%.

Arellano and Bond (1991) propose a GMM estimator which takes differences of the above equation (15) and uses lagged values as instruments. Table 6 reports results. All tax parameters are significant and have the proposed sign. Notice in column III that although the single parameters are not significant, their joint inclusion proves valuable as shown by a joint F-test. Quite likely, tax reforms jointly affect both variables at a time so that the information content does not suffice to extract the individual impact of dividend and corporate tax.

Coefficients of the panel data and cross sectional estimation are by construction not directly comparable. To derive comparative results, we first determine the speed of converge as $\zeta =$

[27] Rearranging the adjustment model gives $\ln\left(\frac{L_t}{N_t}\right) = \zeta \cdot \ln\left(\frac{L_t}{N_t}\right)^* + (1-\zeta) \cdot \ln\left(\frac{L_{t-1}}{N_{t-1}}\right)$. The coefficients γ are thus scaled down by ζ compared to their equivalent β-values in the standard case.

$1-\gamma_3$. Now, we could, in principle, divide the coefficients of the tax parameters by ζ to transform them into the cross sectional one. Unfortunately, including $\ln\left(\frac{L_{t-1}}{N_{t-1}}\right)$ in our estimation serves two purposes at once. First, it measures the speed of convergence as suggested by the adjustment model. Second, it picks up high frequency variation and eliminates serial correlation in error terms. Thus, the point estimate does not provide us with a reasonable value for the speed of convergence, see Barro and Sala-I-Martin (2003, p. 495) for a related discussion on convergence in growth regressions. This problem does however not affect the estimation of the tax coefficients. Estimates of cross-sectional and time series estimation roughly coincide for a reasonable yearly adjustment rate between 10% and 15% while the estimated value of almost 50%, suggesting an almost instantaneous adjustment process, seems far too high.

The size coefficient enters significant as well. Putting the estimated value in relation to the cross-sectional evidence shown before is not easily possible. In the time series setup with differencing, we can not distinguish between the ”Size” and the ”Share” parameters of the previous tables.

Taken together, panel data results add to the evidence of the cross sectional regressions. Both dividend and corporate tax significantly reduce entrepreneurship and increase average firm size of an economy.

3.3 Dispersion of firm size

The Eurostat database provides us with data on firm number and employment for a variety of size classes.[28] We receive information on the size classes 1-9, 10-49, 50-249, and 250 and more employees. There are some limitations to data coverage which typically apply to the top of the

[28] The OECD database provides the same type of information. However, the country coverage is significantly reduced compared to the previous exercises. In addition, looking at the time dimension of the firm size structure seems problematic. According to Cabral and Mata (2003), the distribution of firms is a function of the age of firms. But then, distributional results will be overlayed by changes in new firm creation as estimated in the previous part so that there are no clear a priori predictions.

distribution when data is censored for privacy reasons. This is however a rare event and, in general, the data set is fairly complete.

Our model implies a clear prediction for the corporate tax. A higher tax should make firm creation less attractive for projects of lower expected size. Increasing the tax should then depress the number of firms in lower size classes and reinforce the size of the remaining firms. We have two basic hypothesis for the dividend tax. The dividend tax $\ln(1 - t^D)$ might be a measure of capitalization of the tax. The dividend preference $\ln\left(\frac{1-t^D}{1-t^C}\right)$ should measure the tax evasion effect. The two coefficients differ by the inclusion of the capital gains tax. It is common practise to set the effective capital gains tax rate to 50% or only 25% of the statutory rate to take account of the various ways to evade the tax, see Feldstein, Dicks-Mireaux, and Poterba (1983). Since the importance of the tax is greatly reduced by this, dividend parameter and dividend preference turn out to be closely related. In fact, the correlation coefficient turns out to be as high as .98(.94) when using the 25%(50%) reduction for the effective capital gains tax. Both coefficients are then almost identical. We decided to use the dividend tax only. Results do not change if we embed the dividend preference instead.

As the dependent variable, we calculated the share of a size class in the total firm number. The distribution of firms is then approximated by the weight given to the four size classes that we are able to identify. To analyze the impact of taxes on the distribution of firm sizes, we then regress the frequency of firms in each size bins on the tax parameters and the same set of explanatory variables as before, including the industry dummies.

In principle, the estimation should consider two issues. First, our dependent variable is a fraction term. By definition, the firm shares in different size classes have to add up to one. Thus, if taxes depress firm share in one bin they have to increase firm share in at least one other bin. This condition will naturally be fulfilled for a complete data set containing information on all four size classes. In our case, some countries censor information for specific industries. This results in a changing number of observations across size classes and an unbalanced data coverage. The estimated coefficients might thus (slightly) deviate form the general rule. Second, if we want to test a hypothesis related to different size classes (e.g. are *all* coefficients of the dividend tax equal to zero), then we would need to do a joint estimation of all equations using a multinomial regression. This would clarify the impact of the interactions in firm bins as described before. The multinomial regression only uses complete data sets so that the single equation estimation that we report has the advantage of using the maximum amount of data. In addition, the single equation approach provides us with cluster corrected, robust errors. Last, when using the multinomial approach, we found no significant changes but a strong *decline in the standard errors* induced by the missing cluster correction.

Tables 9 and 10 in the appendix reports the results of our estimation. The upper panel of table 9 considers the dividend tax as the only tax rate. The lower half reports results for the corporate tax. In table 10 we estimate the impact of a joint inclusion of both taxes and of the usage of the aggregate tax rate.

Our basic hypothesis was that both tax parameters should depress the creation of small firms since their impact is felt at the discrete decision whether to set up a firm at all. All other firms should then increase in size by absorbing labor otherwise employed in small firms. Looking at tables 9 and 10, we find surprisingly clear support. The pattern of the coefficients clearly follows the theoretical reasoning. Both tax rates depress firms in the lowest bin with less than 10 employees and increase the share of firms in higher size classes. While this is seen in all combinations that we consider which, by itself, is a very supportive result, the level of significance is reasonably high as well. We derive especially strong results for the aggregate effect of both tax parameters in the second panel of table 10.

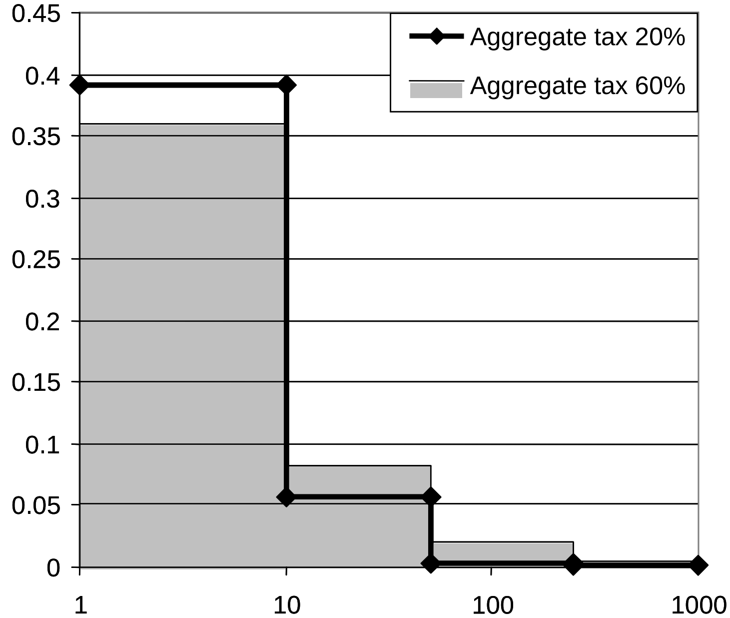
Same as before, the point estimates for the dividend tax are a magnitude lower than for the corporate. This might indicate that the effective tax on dividends is lower than the statutory one that we use, possibly since the tax is easy to evade or since some investors are tax exempt. Lacking specific information, we can only apply our single dividend tax rate for all size brackets. In addition and in line with Sinn (1991), we have already emphasized that entrepreneurs might prefer to start their firm at low size in order to first generate capital gains and evade the dividend tax. This effect might dampen the pure selection effect and reduce the effect of the dividend tax on the size distribution as well.

Last, we find no support for the hypothesis of managerial empire building raised by Chetty and Saez (2005). An implication of such an interaction of dividend taxes and management would be that higher dividend taxes increase the size (and share of employment) of the very biggest firms. According to our estimations however, increases in the highest size class in response to higher dividend taxes do not tend to be especially significant. In table 9, the impact of the dividend tax in the class of more than 250 employees is $-.009$ and only half as strong as the one of the corporate tax of about $-.016$. It might be, however, that the data set we use does not allow for a sufficiently high differentiation across big firms. The theory of Chetty and Saez (2005) might mainly refer to a small selection of quoted firms. Still, we conclude that the main impact of tax rates on the size distribution of firms comes through a change in the number of small firms.

Figure 2 presents a graphical intuition of our results. We calculated the predicted values for the size distribution of firms implied by our empirical estimates. A first impression shows the overwhelming importance of small firms with less than 10 employees. In our sample of countries, these firms form a fraction of about 85% of all firms.[29] The log distribution is highly positively skewed with a long right tail. The same distribution is also found in studies based on individual firm data, see Cabral and Mata (2003). We consider the effect of the aggregate tax estimated in table 10 and use hypothetical tax rates of 20% and 60% which roughly confirm to the variance of aggregate tax rates in our sample. Increasing the tax by an, admittedly high, 40 percentage points

[29]The share of a firm size in the total distribution is represented by its area in figure 2. Integrate the hazard rate 0.37 over the interval $\ln(1)$ to $\ln(10)$ and find the value .86.

Figure 2: Histogram of firm size distribution for different corporate tax rates



Legend: Abscissa is the natural log of firm size with intervals as in tables 9 and 10. Ordinate is the predicted hazard rate of a firm size class based on the hypothetical aggregate tax rates of 20% and 60% and using the tax effects estimated in the lower panel of table 10.

from an initial 20% to 60% reduces the share of small firms with less than 10 employees by almost 10 percent. As an equilibrium effect, bigger firms gain in importance. It is important to notice that this change in the distribution of firms is overlayed by a general reduction in the firm number.

Again, we looked into the robustness of our results[30] and applied the same set of controls as in table 4. In general, there seems to be very few prior evidence of determinants for the size structure of firms. As an exception, Cabral and Mata (2003) develop and test a theory on the impact of liquid financial markets. They argue that available funds induce entrepreneurs to raise sufficient capital right from the start and decrease the importance of small firms. Otherwise, young firms are started small and move towards bigger size once internal funds are available to finance expansion.

[30]To save space, we only report the results of the robustness checks. Actual regression output is available form the author upon request.

Our results support Cabral and Mata (2003). In countries with liquid financial markets, small firms are less important. Besides the credit variable, none of our controls seems to have any predictive power. In addition, the characteristic pattern for the tax variables stays indicating that the taxes depress small sized firms. The only disturbing result is the spurious interaction of the macroeconomic variables on the effect of the corporate tax. As in table 4 the control variables are insignificant but still disturb the tax coefficient.

Summing up, we found evidence for a selection effect of taxes on the diversity of firms. Higher taxes are mostly felt by small firms and will prevent them from being created. As a general equilibrium effect, labor is reallocated towards remaining firm which increase in size and in importance.

4 Discussion

In this paper, we present and test a model of corporate taxation that emphasizes the institutional structure of production. The theory clarifies the role of corporate, dividend and capital gains for macroeconomic activity. By the new view of dividend taxation, marginal investments of established mature firms are financed using retained earnings. Since capital is stuck inside a corporation, the dividend tax does not influence the marginal investment behavior. However, the dividend tax burden is likely to be anticipated at the discrete firm creation decision. If there are costs related to the built up of a new firm, then anticipated dividend taxes will discourage new firm creation and reduce aggregate diversity. The corporate tax, as in the previous literature, depresses capital accumulation. In addition, the corporate tax as well reduces the repayments to the entrepreneurs start-up costs and thereby discourage firm creation.

The main part of this paper then tests the impact of tax rates on the diversity of firms and the firm size distribution. We thereby add a new point to the scarce and sometimes controversial evidence of the economic impact of dividend taxation. The empirical part of this paper indicates that higher tax burden, both through the dividend and corporate tax, increase average firm size by depressing diversity of an economy. Our paper is silent to the origin of the firms attracted or distracted by taxes. A variety of tax evasion stractegies is partially consistent with our results, but fail to explain the full magnitude of the observed effect. Results are stable to a variety of robustness checks. The estimated change in average firm size is also economically significant. An increase in the dividend tax by one percentage point from 26% to 27% causes an increase in average firm size of 1.08%. Still, compared to the corporate tax, the dividend tax has a fairly limited real impact. Potential explanations for this are (a) the progressive structure of the tax which might decrease the average tax rate below the top rate that we apply, (b) tax evasion strategies, potentially involving equity buybacks, and (c) tax exempt foreign investors.

Both taxes affect the size distribution of firms. Again, the effect of the corporate tax seems higher than for the dividend tax. The depression of firm value at the discrete decision stage of setting up a firm removes a significant part of lower sized firms. An equilibrium effect then induces the remaining firms to increase in size and importance. Capital income taxes thus seem to be an important determinant of the size distribution of firms.

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Appendix

Table 7: Cross country estimation: Data description and statistics

Variable	Abbr.	Mean	Std.Dev.	Min	Max
Average firm size[1]	$\ln\left(\frac{L_{jk}}{N_{jk}}\right)$	2.123	.745	.78	4.19
Wage rate[2]	$\ln\left(w_{jk}\right)$	-3.745	.536	-5.14	-2.86
Productivity[3]	$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	-2.303	.706	-3.66	.68
Size[4]	$\ln\left(L_{jk}\right)$	12.468	2.092	5.68	15.84
Share[5]	$\ln\left(\frac{L_{jk}}{L_j}\right)$	3.098	1.484	-1.04	4.54
Growth[6]	$\Delta \ln\left(L_{jk}\right)$	.013	.070	$-.29$	.18
Employment protection legislation†[7]	EPL_j	2.45	.853	.5	3.7
Product market legislation†[8]	PML_j	1.613	.449	.5	2.3
Private credit†[9]	$\ln\left(\frac{B_j}{Y_j}\right)$	$-.134$	.341	$-.89$	.48
Openness†[10]	$\ln\left(\frac{EXP_j+IMP_j}{Y_j}\right)$	97.505	56.455	55.59	285.59
Schooling†[11]	EDU_j	8.890	1.767	4.91	11.86
Investment intensity[12]	$\ln\left(\frac{I_{jk}}{L_{jk}}\right)$	-4.825	.911	-6.888	-1.529

Legend: † Variable has no industry variation.
Data sources:
(1) Eurostat (2004): Number of persons employed L_{jk} and Number of enterprises N_{jk}.
(2) Eurostat (2004): Personnel costs divided by Number of persons employed.
(3) Eurostat (2004): Production value Y_{jk} divided by Number of persons employed L_{jk}.
(4) Eurostat (2004): Number of persons employed L_{jk}.
(5) Eurostat (2004): Number of persons employed L_{jk}. Penn world tables: Population L_j.
(6) Eurostat (2004): Growth rate of employment ΔL_{jk}.
(7) Nicoletti, Scarpetta, and Boylaud (2000): OECD summary index, see Table A3.11.
(8) Nicoletti, Scarpetta, and Boylaud (2000): OECD summary index, see Table A3.7.
(9) Worldbank database on "Financial Development and Structure".
(10) Penn world tables.
(11) Average years of schooling for the total population over 25 from Barro/Lee.
(12) Eurostat (2004): Gross investment in tangible goods I_{jk} divided by Number of persons employed L_{jk}.

Table 8: Robustness check to the exclusion of the net wage

	I	II	III	IV
Dividend tax	$-.69120^{**}$		$-.49470$	
$\ln(1-t_j^D)$	(-2.11)		(-1.64)	
Corporate tax		-2.16881	-1.53979	
$\ln(1-\tau_j)$		(-1.38)	(-0.94)	
Aggregate tax				$-.67046^{**}$
$\ln\left[(1-t_j^D)(1-\tau_j)\right]$				(-2.17)
Productivity	$.32128^{*}$	$.45985^{**}$	$.39160^{**}$	$.34572^{**}$
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(2.02)	(2.90)	(2.27)	(2.20)
Size	.05889	.04419	.05189	.05660
$\ln(L_{jk})$	(0.83)	(0.69)	(0.76)	(0.82)
Share	$.58547^{***}$	$.66252^{***}$	$.63361^{***}$	$.60498^{***}$
$\ln(\frac{L_{jk}}{L_j})$	(3.14)	(3.65)	(3.41)	(3.30)
Growth	-1.45652^{**}	$-.70816$	$-.95472$	-1.24452^{**}
$\Delta\ln(L_{jk})$	(-2.48)	(-1.07)	(-1.35)	(-2.34)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	16	16	16	16
# obs.	98	98	98	98
$\mathbf{R}^2$	65.35%	65.32%	66.46%	66.08%

Legend: Dependent variable is the natural logarithm of average firm size $\ln\left(\frac{L_{jk}}{N_{jk}}\right)$. All estimations report robust standard errors, corrected for clustering on the country-level. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level.

Table 9: Taxes and firm number by size class

	Intervals of firm size distribution			
	$0 < L < 10$	$10 \leq L < 50$	$50 \leq L < 250$	$L \geq 250$
Dividend tax	$.10930^{***}$	$-.05870^{**}$	$-.04397^{***}$	$-.00887^{*}$
$\ln(1-t_j^D)$	(2.78)	(−2.42)	(−3.03)	(−1.98)
Wage rate	$-.09142^{**}$	$.07165^{**}$	$.01766^{**}$	$.00590^{**}$
$\ln\left[(1-t_j^L)w_{jk}\right]$	(2.45)	(2.45)	(2.29)	(2.30)
Productivity	.01353	−.02146	.00182	.00028
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(0.76)	(−1.38)	(0.32)	(0.08)
Size	$-.01153^{*}$	$.01001^{*}$	.00146	$.00075^{*}$
$\ln(L_{jk})$	(−1.67)	(1.81)	(1.19)	(1.88)
Share	−.03616	.01225	−.00248	.00170
$\ln\left(\frac{L_{jk}}{L_j}\right)$	(−1.25)	(0.52)	(−0.27)	(0.51)
Growth	$.47238^{*}$	−.25142	$-.17935^{**}$	−.02444
$\Delta\ln(L_{jk})$	(1.90)	(−1.59)	(−2.44)	(−1.60)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	14	14	14	14
# obs.	84	87	83	82
$\mathbf{R}^2$	68.41%	61.58%	69.89%	60.78%
Corporate tax	.25381	−.19744	$-.06874^{*}$	$-.01615^{*}$
$\ln(1-\tau_j)$	(1.28)	(−1.24)	(−1.68)	(−1.77)
Wage rate	$-.09387^{***}$	$.07449^{***}$	$.01658^{***}$	$.00572^{**}$
$\ln\left[(1-t_j^L)w_{jk}\right]$	(2.95)	(2.45)	(2.65)	(2.50)
Productivity	−.00038	−.01317	.00692	.00136
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(−0.02)	(−0.82)	(1.42)	(0.40)
Size	−.00718	.00777	.00004	.00043
$\ln(L_{jk})$	(−1.31)	(1.60)	(0.04)	(1.32)
Share	−.04567	.01843	.00091	.00246
$\ln\left(\frac{L_{jk}}{L_j}\right)$	(−1.33)	(0.76)	(0.09)	(0.76)
Growth	$.35586^{*}$	−.17846	$-.13136^{**}$	−.01493
$\Delta\ln(L_{jk})$	(1.67)	(−1.25)	(−2.38)	(−1.47)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	14	14	14	14
# obs.	84	87	83	82
$\mathbf{R}^2$	66.87%	61.74%	62.75%	57.02%

Legend: Estimation by single equation regression. Dependent variable is the frequency of a size class of the total firm number. Industry dummies are included in all regressions. All estimations report robust standard errors. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level.

Table 10: Taxes and firm number by size class

	Intervals of firm size distribution			
	$0 < L < 10$	$10 \leq L < 50$	$50 \leq L < 250$	$L \geq 250$
Dividend tax	$.09351^{*}$	$-.04349$	$-.04148^{**}$	$-.00814$
$\ln(1 - t_j^D)$	(1.92)	(-1.45)	(-2.45)	(-1.56)
Corporate tax	$.15492$	$-.15303$	$-.02578$	$-.00775$
$\ln(1 - \tau_j)$	(0.71)	(-0.85)	(-0.59)	(-0.75)
Wage rate	$-.09665^{***}$	$.07677^{***}$	$.01843^{***}$	$.00608^{**}$
$\ln\left[(1 - t_j^L)w_{jk}\right]$	(-2.89)	(3.01)	(2.63)	(2.46)
Productivity	$.01017$	$-.01832$	$.00234$	$.00046$
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(0.52)	(-1.10)	(0.38)	(0.12)
Size	$-.01019^{*}$	$.00904^{**}$	$.00123$	$.00066^{*}$
$\ln(L_{jk})$	(-1.86)	(1.90)	(1.12)	(1.68)
Share	$-.03903$	$.01486$	$-.00236$	$.00183$
$\ln\left(\frac{L_{jk}}{L_j}\right)$	(-1.35)	(0.67)	(-0.25)	(0.54)
Growth	$.45121^{*}$	$-.22400$	$-.17514^{**}$	$-.02358$
$\Delta\ln(L_{jk})$	(1.80)	(-1.49)	(-2.28)	(-1.49)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	14	14	14	14
# obs.	84	87	83	82
R^2	68.96%	62.50%	70.16%	61.12%
Tax	$.10288^{***}$	$-.06012^{***}$	$-.03916^{***}$	$-.00809^{**}$
$\ln\left[(1 - t_j^D)(1 - \tau_j)\right]$	(3.08)	(-2.66)	(-3.04)	(-2.14)
Wage rate	$-.09519^{***}$	$.07438^{***}$	$.01874^{**}$	$.00609^{**}$
$\ln\left[(1 - t_j^L)w_{jk}\right]$	(-2.66)	(2.66)	(2.47)	(2.38)
Productivity	$.01171$	$-.02103$	$.00271$	$.00047$
$\ln\left(\frac{Y_{jk}}{L_{jk}}\right)$	(0.67)	(-1.37)	(0.51)	(0.13)
Size	$-.01075$	$.00982^{*}$	$.00109$	$.00066^{*}$
$\ln(L_{jk})$	(-1.61)	(1.79)	(0.92)	(1.72)
Share	$-.03783$	$.01274$	$-.00222$	$.00184$
$\ln\left(\frac{L_{jk}}{L_j}\right)$	(-1.28)	(0.53)	(-0.24)	(0.57)
Growth	$.46231^{*}$	$-.24776$	$-.17195^{**}$	$-.02352$
$\Delta\ln(L_{jk})$	(1.93)	(-1.61)	(-2.45)	(-1.60)
Industry dum.	$YES(7)$	$YES(7)$	$YES(7)$	$YES(7)$
# countries	14	14	14	14
# obs.	84	87	83	82
R^2	68.89%	62.14%	70.08%	61.12%

Legend: Estimation by single equation regression. Dependent variable is the frequency of a size class of the total firm number. Industry dummies are included in all regressions. All estimations report robust standard errors. $^{*}/^{**}/^{***}$ significant on the 10%/5%/1% level.