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**CORPORATE TAXATION AND THE SIZE OF NEW FIRMS:  
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# Corporate Taxation and the Size of New Firms: Evidence from Europe

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## Abstract

Using a novel country-industry level panel database with information on newly incorporated firms in 17 European countries between 1997 and 2004, we study how taxation of corporate income affects the size of entrants at the country-industry level. Our results, that are robust to changes in several assumptions, suggest that a reduction in the effective corporate income tax rate leads to a significant reduction of the capital size of entrants, and to a decrease in their capital-labor ratio.

JEL CODES: C23, H32, L26, L51, M13.

KEYWORDS: Entrepreneurship. Corporate income taxation. Incorporation. Firm entry. Firm size. Entry regulation. Panel data.

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# 1 Introduction

In virtually all countries, public policy aims at fostering entrepreneurship by encouraging the formation of new companies in order to stimulate innovation, competition, employment, and economic growth. Studies that evaluate such policies abound. In particular, a recent strand of literature exploits the increasing availability of firm-level data to assess how different labor, credit, and product market regulations affect entry and the characteristics of entrants and incumbents.<sup>1</sup> This literature has paid little attention to corporate tax policy. This omission strikes as important, since flexibility and ease of implementation make taxation an appealing policy instrument for encouraging the formation of entrepreneurial companies.<sup>2</sup>

In Da Rin, Di Giacomo and Sembenelli (2009) we analyze how corporate taxation affects entry rates (the “extensive margin”). In the present study we shift the analysis to the initial size of entrants, measured by capital, labor, and their ratio (the “intensive margin”). Both effects are policy-relevant. The effect on the extensive margin reflects an economy’s ability to create growth opportunities through new businesses. The effect on the intensive margin reflects both the quality and the speed of growth (see Kerr and Nanda (2009, 2010)). The contribution of each effect to economic growth is an empirical issue, whose analysis is important for a correct design of economic policies.

The theoretical literature on corporate taxation has identified several possible (countervailing) channels that may link tax policy to the characteristics of entrants (see Section 2). The net sign and size of these effects are however ambiguous, and remain an empirical question.

Our aim is to empirically investigate these channels in a panel data setting, that helps to overcome the weaknesses of purely cross-sectional studies. Our data consist of a novel firm-level dataset covering 17 European countries between 1997 and 2004. The different evolution of tax policies over time in Europe provides a good source of identification for our empirical exercise. Several countries reduced statutory tax rates during the last decade, while at the same time also changing the effective tax base, thus creating a variety of situations which we exploit econometrically. Our analysis recognizes that tax policy is likely to react to business conditions, and therefore cannot be treated as an exogenous policy instrument. To the

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<sup>1</sup>See, among many others, Ardagna and Lusardi (2009, 2010), Alesina et al. (2005), Klapper, Laeven and Rajan (2006).

<sup>2</sup>Djankov et al. (2008) and Klapper, Laeven, and Rajan (2006) are the only exceptions we are aware of.

best of our knowledge, we are the first to take into account the endogeneity of tax policy in this context.

We find that a lower corporate tax rate reduces the capital size of entrants, and also reduces the capital-labor ratio. These effects are statistically significant and economically relevant; they are also non-linear, as their magnitude decreases with the tax rate.

A possible interpretation of our results is that the tax system constitutes a barrier to entry: as found by Klapper, Laeven and Rajan (2006), high entry costs may make entry attractive only for larger firms. Together with the findings on the effects of corporate taxation on the extensive margin (entry rates) that we develop separately in Da Rin, Di Giacomo, and Sembenelli (2009), the results of this paper point to a possible policy trade-off between inducing more entry but of smaller, less capitalized firms, that warrants further investigation.

## 2 Theoretical framework

We base our analysis on the framework built by Cullen and Gordon (2007), which provides a synthesis of previous models of the effects of taxation on the decision of entry (by incorporation), on the scale of the firm, and on its capital-labor ratio. The decision they study is that of an entrepreneur that chooses whether to set up her firm as an incorporated or un-incorporated entity.<sup>3</sup> They identify three channels through which corporate income taxation affects the incorporation decision and the optimal choice of scale.

The first channel (“income shifting”) consists of the possibility to shift income between the personal and the corporate tax bases to take advantage of the (typically positive) difference between personal and corporate tax rates; this encourages entry by incorporation when expected income is sufficiently high, since un-incorporated firms are mostly taxed at (progressive) personal rates. This channel is stronger the larger the firm’s scale.

The second channel (“risk subsidy”) arises from the contrast between (progressive) personal income tax rates and (flat) corporate income tax rates. This makes expected tax liabilities fall as the entrepreneur undertakes riskier projects, providing a tax subsidy to entry by incorporation. The subsidy exists irrespective of risk attitudes, and is greater the larger

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<sup>3</sup>Not all new companies that survive choose incorporation, and studies document that the incorporation decision is a genuine choice. In Da Rin, Di Giacomo and Sembenelli (2009) we survey these studies and show that the average size of incorporated firms in Europe is about 20 times that of unincorporated companies.

the firm’s scale. It depends on the riskiness of the project, the progressiveness of personal income tax rates and the structure of corporate taxation.

The third channel (“risk-sharing”) operates when financial market imperfections prevent full risk-sharing with investors. In this case higher taxation encourages entry, and entry at a higher scale, because it allows entrepreneurs to share entrepreneurial risk with the government. As the corporate tax rate increases, the entrepreneur bears less idiosyncratic risk—being able to share more of it with the collectivity.

To link these three channels to the effects of corporate taxation on the intensive margin of entry, consider the following. A higher corporate income tax leads to a lower capital scale of entrants through the “income shifting” and the “risk subsidy” channels, but it makes risk-taking more attractive via the “risk-sharing” channel, leading to larger capital size of entrants. The net effect depends on the relative sizes of these offsetting channels. The case is slightly different in the case of labor size. Since labor costs are deductible expenses rather than foregone income of the entrepreneur, labor size is affected only by the “risk subsidy” and “risk-sharing” channels. Also in this case the net effect is *a priori* undetermined; it is also likely to be weaker than in the case of capital size. These channels also affect entrants’ capital intensity, defined as the capital-labor ratio. Higher corporate taxation is expected to increase the capital-labor ratio since hiring new workers does not create income-shifting benefits, unlike expanding the firm by increasing its capital size. This effect is clearly larger the stronger are the benefits from income-shifting.

Two implications are relevant for our analysis. First, the sign and size of the effect of a change in corporate income taxation on the size of entrants are not *a priori* clear. Second, as we explain in Da Rin, Di Giacomo, and Sembenelli (2009), the effect is unlikely to be constant across different values of the effective tax rate, and one could expect non-linear effects.

### 3 Data and variables

We take our dependent variables from yearly editions of the Amadeus database, published by Bureau van Dijk Electronic Publishing. We collect data on individual companies from 17 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom). We focus on companies that incorporated between 1997 and 2004 and were active in 39 manufacturing and business-related service industries. Da Rin, Di Giacomo, and Sembenelli (2009) describe in

more detail these data and the construction of our independent variables. We use information from Amadeus to build our two dependent variables.

The initial capital size of entrants (Capital-Size) is given by the median value, at country-industry level, of entrants' (log transformed) total assets in the year after incorporation. The initial labor size of entrants (Labor-Size) is given by the median number, at country-industry level, of entrants' (log transformed) employees in the year after incorporation.

Table 1 reports some figures about the composition of our sample of entrants. We deal with more than 2.5 million firms. About 2 million of them report information on Capital-Size, while data on Labor-Size are available for less than one million companies. Over time, we observe an increasing number of entrants with a decreasing size, especially after 2001.<sup>4</sup>

Our explanatory variables are taxation and business policy. For corporate taxation we build the “effective average tax rate” (Effective Tax Rate) using the methodology proposed by Devereux and Griffith (1998). We compute Effective Tax Rate using information from the *Worldwide Corporate Tax Guide* published by Ernst&Young, a leading multinational tax consulting firm. Effective Tax Rate is a non-linear function of the statutory tax rate, which varies across countries and time, and of the expected rate of return, that varies across industries and time.

Our second dependent variable, Pro-Business Policy Index, is the Index of Economic Freedom published yearly by the Heritage Foundation and the Wall Street Journal. We use this measure to account for a country's policy towards new business creation.

Table 2 presents descriptive statistics for our sample. Figure 1 shows graphically the relationship between Effective Tax Rate and the two measures of entrant firms' size. It suggests a positive relationship in the case of Capital-Size, while no clear pattern is discernible for Labor-Size.

## 4 Empirical analysis

### 4.1 Econometric strategy

We estimate two different specifications of the following relationship:

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

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<sup>4</sup>This may be due to more refined data collection practices, or to complex industry and country dynamics. Since we are unable to disentangle these effects, relying on panel data is reassuring, since it allows us to control for changes in data collection practises both over time and across countries.

where  $y_{ict}$  is one of our two dependent variables: (i) Capital-Size, entrants' (median) capital size at time  $t$ , in industry  $i$  and country  $c$ ; (ii) Labor-Size, entrants' (median) labor size at the end of year  $t$ , in industry  $i$ , country  $c$ . Our main explanatory variable is  $Tax_{ict-1}$ , the lagged value of Effective Tax Rate, that varies across time, industries and countries. The variable  $\alpha_t$  is a time effect that we model introducing a set of year dummies. The vector  $\mathbf{x}_{ct-1}$  is the Pro-Business Policy Index, that proxies for any time-varying, country-specific policies towards firm creation.

The last two terms in Equation (1) are unobservable error components. The term  $\eta_{ic}$  is a time-invariant, country-industry specific effect that captures any unobserved characteristics that are relevant for the entry and the scale decisions. Since our explanatory variables may be correlated with  $\eta_{ic}$ , we use the standard within-group transformation to remove it. The term  $\varepsilon_{ict}$  is an idiosyncratic error term that varies across the three dimensions of our panel dataset. We report standard errors that are robust to heteroskedasticity, serial correlation, and intra-country equi-correlation.

To consistently estimate the parameters  $\gamma$  and  $\beta$ , once the model has been transformed in deviations from country-industry specific means, we need lack of correlation between the regressors and the idiosyncratic error term at all leads and lags. Under this assumption the standard Within-Group (WG) estimator is consistent and asymptotically normally distributed. Since this strong exogeneity assumption is not fully convincing in our setting, we alternatively use a set of instruments to deal with the potential endogeneity of Effective Tax Rate (and also of Pro-Business Policy Index). For this, we borrow from the recent political economy literature four measures of the political process: the ideological orientation of the government (Center-Left Government, a dummy for center-left chief executive party, from the World Bank's *Database of Political Institutions*); the degree of political veto power (Veto-Power Index, a count of the number of political parties in the coalition, from the World Bank's *Database of Political Institutions*); the perceived stability of the government (Government-Stability Index, a survey measure from the *International Country Risk Guide*); and the date of election (Election-Date, a dummy equal to one in election years). This set of instruments has been selected on the basis of appropriate specification tests for instrument validity (Hansen J and C statistics) and relevancy (Cragg-Donald and Kleibergen-Paap tests). The economic rationale for these instruments is that both some structural features of the political process (such as the degree of political veto power or election dates) and the outcomes of the process (such as government stability) are likely to affect the implementation of fiscal reforms without

directly affecting entering entrepreneurs' decisions on the scale of their firms.

## 4.2 Results

Tables 3 and 4 report our empirical results for Capital-Size and Labor-Size, respectively. For each variable we present four estimated equations which are based on different functional form assumptions and/or different estimation methods. Columns (1) and (2) report the baseline linear specification in the tax rate, estimated with WG and with GMM-IV. Columns (3) and (4) report the results of a more general quadratic specification, again estimated with WG and with GMM-IV. Finally, the pseudo-first stage for the corporate tax rate is reported in column (5) of Table 3.<sup>5</sup>

In the linear specification for Capital-Size the coefficient of taxation is positive and significant at conventional levels. This turns out to be the case with both estimation methods, with the GMM-IV coefficient (0.157) being substantially higher than the WG one (0.027). This might suggest a violation of the strict exogeneity assumption or an attenuation bias, both affecting our WG estimates. However, whereas the null of weak identification is rejected according to both the Cragg-Donald and Kleibergen-Paap tests, the Hansen test firmly rejects the null of instruments validity. One candidate explanation for this is the incorrect specification of the functional form.

Based on this hypothesis and on Cullen and Gordon (2007), who identify several reasons for non-linearities in the relationship between the corporate tax rate and entry size, we then estimate a quadratic specification. With both WG and GMM-IV we find that the relationship between capital size and taxation is positive, significant, and (slowly) decreasing in Effective Tax Rate. Also the Pro-Business Policy Index affects positively the size of entrants. Moreover, both the validity of our set of instruments and the exogeneity of the Pro-Business Policy Index variable are not rejected by the data at the 1% level of significance, according to Hansen's J and C statistics. Since the dependent variable is expressed in logs, the estimated coefficients should be interpreted as semi-elasticities. Computed at the median, a one unit increase in the Effective Tax Rate increases Capital-Size by an amount ranging from 3% (WG estimation, column (3)) to as much as 16% (GMM-IV, column (4)). These results, taken together, point clearly to a smaller capital size of entrants as the tax burden lowers.

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<sup>5</sup>We do not report the pseudo-first stage results in Table 4 since they are substantially identical to those in Table 3, except for a different number of observations.

Table 4 replicates the same estimation strategy for Labor-Size. Our results are now more mixed. In fact, in the linear WG specification the coefficient is negative ( $-0.008$ ) and statistically significant, albeit economically negligible. On the contrary the GMM-IV estimate is positive, statistically significant and economically sizeable ( $0.032$ ). A weaker effect than in the case of Capital-Size is what one would expect based on Cullen and Gordon's predictions. Once again, the difference in sign and size between WG and GMM-IV estimates might be originated by the violation of some of the more restrictive assumptions required for the consistency of the WG estimator. Moreover, as for Capital-Size, the Hansen test strongly rejects the null of instruments validity in the linear specification.

When we allow for a more flexible (quadratic) functional form, we cannot reject the validity of our set of instruments and the exogeneity of the Pro-Business Policy Index. Also, the coefficients of the linear and the quadratic terms are respectively positively and negatively signed, regardless of the estimation method we use. However, when computed at the median, a one unit increase in the Effective Tax Rate reduces Labor-Size by 1% with WG estimation (column (3)) but increases it by 8% with GMM-IV estimation (column (4)). Indeed the curvature of the relationships implied by WG estimation is such that the effect turns out to be positive only around the first decile (24%) of the distribution of the effective tax rate. The sign of the effect is therefore—at least partially—sensitive to the chosen estimation method and this precludes us from taking a strong stand on the role of corporate taxation on Labor-Size.

Finally, our results suggest unambiguously that the effect on Labor-Size is smaller in size compared to the effect on Capital-Size. We can conclude therefore that a reduction in corporate taxation is likely to decrease the capital/labor ratio, as suggested by Cullen and Gordon's model.<sup>6</sup>

### 4.3 Robustness

We check the robustness of our results against three sets of assumptions. In all cases the effect of taxation on entry size retains its magnitude and remains significant. First, we experimented with alternative measures of Capital-Size and Labor-Size. We estimate the main specifications when Capital-Size and Labor-Size are computed as the average (instead of median) of the (log transformed) total assets, and number of employees (re-

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<sup>6</sup>To provide additional empirical evidence on this issue we have also run an additional set of equations with the capital/labor ratio as dependent variable. All our results confirm a positive effect of the corporate tax rate on the capital/labor ratio.

spectively), of all firms in the same country-industry-year. Second, we examined the assumptions underlying the computation of Effective Tax Rate. These include alternative composition of the investment in terms of asset type, the way the new company is financed, and a wide range of alternative economic depreciation rates. Finally, we address the exogeneity of Pro-Business Policy Index. Even if our endogeneity tests do not reject the null of exogeneity for Pro-Business Policy Index, we run additional GMM-IV estimates, where Pro-Business Policy Index is treated as endogenous and instrumented with the same variables used for Effective Tax Rate and Effective Tax Rate Squared.

## 5 Concluding remarks

In this paper we empirically investigate the relationship between effective corporate income taxation and the size of newly incorporated companies, using a newly constructed panel dataset that allows us to improve significantly on the existing literature. We find strong evidence that a lower corporate income taxation decreases the capital size of entrants and their capital intensity. This suggests that policy-makers should consider that lowering taxes may enhance entry rates (as we show in Da Rin, Di Giacomo, and Sembenelli (2009)) but at the same time induce the entry of smaller, less capitalized, and therefore more likely weaker firms.

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**Table 1. Descriptive statistics (firm-level)**

Year	Entrants	Capital-Size			Labor-Size		
		Entrants with data	Average value	Median value	Entrants with data	Average value	Median value
1997	131,812	96,765	3,970.08	148.50	63,326	52.79	3.00
1998	244,339	197,286	5,369.80	70.91	75,918	32.77	3.00
1999	281,266	228,353	5,261.95	78.49	88,599	32.60	3.00
2000	305,204	243,244	6,300.46	76.03	90,963	35.64	3.00
2001	301,859	245,815	4,925.00	77.57	90,830	25.39	3.00
2002	369,899	315,862	2,391.11	64.12	100,728	19.14	3.00
2003	437,146	378,027	2,223.85	47.96	102,253	16.08	2.00
2004	446,811	363,761	2,585.50	72.00	110,975	17.48	2.00
Total	2,518,336	2,069,113	3,830.03	70.30	723,592	27.34	3.00

Note: Capital-Size and Labor-Size are the value of total assets and the total number of employees (respectively) of entrants in the year after incorporation. Year is year of incorporation. Figures are in numbers, except for average and median values of Capital-Size (in thousands of euros, deflated using the HCPI index by Eurostat).

**Table 2. Descriptive statistics (industry-country-year level)**

Variable	Average	S.D.	25th perc.	Median	75th perc.	N. Obs.
Capital-Size	5.37	1.06	4.65	5.17	5.97	3,446
Labor-Size	1.50	0.81	1.04	1.39	1.95	3,214
Effective Tax Rate	30.16	4.97	27.70	30.21	33.59	3,446
Pro-Business Policy Index	68.87	5.59	65.40	68.60	72.80	3,446

Note: Capital-Size and Labor-Size are computed as the median (within a specific country-industry-year) of the log transformation of the value of total assets and of the total number of employees (respectively) of entrants in the year after incorporation. The Effective Tax Rate is the “effective average tax rate” as defined by Devereux and Griffith (1998) and it is expressed in percentage. The Pro-Business Policy Index is the Index of Economic Freedom published yearly by the Heritage Foundation and the Wall Street Journal. The index ranges from 0 (minimum economic freedom) to 100 (maximum economic freedom).

**Table 3. Estimation results. Dependent variable: Capital-Size.**

	(1)	(2)	(3)	(4)	(5)
	WG	GMM-IV	WG	GMM-IV	FIRST-STAGE
Effective Tax Rate	0.027*** (0.00)	0.157*** (0.02)	0.009 (0.02)	0.833*** (0.16)	
Effective Tax Rate - Squared			0.000 (0.00)	-0.011*** (0.00)	
Pro-Business Policy Index	0.008 (0.01)	0.048*** (0.01)	0.009* (0.01)	0.048*** (0.01)	-0.362*** (0.04)
Center-Left Government					-2.099*** (0.21)
Veto-Power Index					0.619*** (0.07)
Government-Stability Index					-0.378*** (0.07)
Election-Date					-0.201** (0.09)
Time dummies	Yes	Yes	Yes	Yes	Yes
Hansen J Statistic		30.16		6.97	
degrees of freedom [p-value]		3 [0.00]		2 [0.03]	
Endogeneity Test (Hansen C Statistic)		12.47		1.05	
degrees of freedom [p-value]		1 [0.00]		1 [0.31]	
Cragg-Donald Statistic		93.47		26.65	
Kleibergen-Paap Statistic		55.45		20.44	
Observations	3,446	3,446	3,446	3,446	3,446

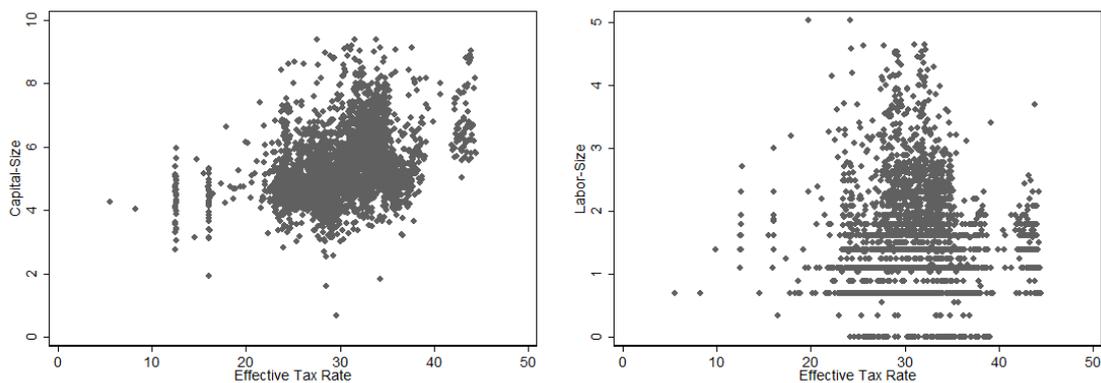
Note: In columns (1) through (4) the dependent variable is Capital-Size, defined as the median (within a country-industry-year) of the log transformation of the value of total assets. The specifications in columns (1), (3) and (5) are within group regressions. Columns (2) and (4) are GMM instrumental variables regressions, where Effective Tax Rate and its square are instrumented. Column (5) shows the first stage regression where the dependent variable is the Effective Tax Rate. Standard errors (in parenthesis) are robust to heteroscedasticity, autocorrelation, and intra-country equi-correlation. \* Significant at 10%. \*\* Significant at 5%. \*\*\* Significant at 1%.

**Table 4. Estimation results. Dependent variable: Labor-Size.**

	(1)	(2)	(3)	(4)
	WG	GMM-IV	WG	GMM-IV
Effective Tax Rate	-0.008*** (0.00)	0.032*** (0.01)	0.046*** (0.01)	0.625*** (0.17)
Effective Tax Rate - Squared			-0.001*** (0.00)	-0.009*** (0.00)
Pro-Business Policy Index	0.002 (0.00)	0.015*** (0.00)	0.001 (0.00)	0.019*** (0.01)
Time dummies	Yes	Yes	Yes	Yes
Hansen J Statistic		14.23		0.15
degrees of freedom [p-value]		3 [0.00]		2 [0.93]
Endogeneity Test (Hansen C Statistic)		8.03		0.12
degrees of freedom [p-value]		1 [0.00]		1 [0.73]
Cragg-Donald Statistic		116.55		11.26
Kleibergen-Paap Statistic		59.06		20.66
Observations	3,214	3,214	3,214	3,214

Note: The dependent variable is Labor-Size, defined as the median (within a country-industry-year) of the log transformation of the number of employees. The specifications in columns (1) and (3) are within group regressions. Columns (2) and (4) are GMM instrumental variables regressions, where Effective Tax Rate and its square are instrumented. Standard errors (in parenthesis) are robust to heteroscedasticity, autocorrelation, and intra-country equi-correlation. \* Significant at 10%. \*\* Significant at 5%. \*\*\* Significant at 1%.

**Figure 1. Capital-Size, Labor-Size, and Effective Tax Rate: a graphical view.**



Note: The figure plots Capital-Size (left panel) and Labor-Size (right panel) against the (lagged) Effective Tax Rate. All observations refer to country-industry-year level data.