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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, which are robust to changes in several assumptions, suggest that a one-unit reduction in the effective corporate income tax rate leads to a reduction of entrants' capital size that ranges from 2.7% to 14.4%. Results on labor size are more mixed in terms of both sign and size. These findings imply that a reduction in corporate taxation reduces the capital to labor ratio. (JEL: C23, H32, L26, L51, M13)

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, and 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. This literature has paid little attention to corporate tax policy. This omission is striking,

since flexibility and ease of implementation make taxation an appealing policy instrument for encouraging the formation of entrepreneurial companies.[1]

In Da Rin, Di Giacomo, and Sembenelli (2009) we analyze how corporate taxation affects entry rates (the "extensive margin"). In this study we shift the analysis to the 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. The effect on the intensive margin reflects both the quality and the speed of growth (see Ardagna and Lusardi 2009, 2010; 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, which helps to overcome the weaknesses of purely cross-sectional studies. Our data consist of a novel firm-level data set 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 also changing the effective tax base, thus creating a variety of situations which we exploit econometrically.

Our analysis recognizes that taxation is likely to react to business conditions, and therefore cannot be treated as an exogenous policy instrument. For this, we exploit the panel structure by controlling for time, country, and industry fixed effects, and also introduce a set of instruments to help address the endogeneity of taxation. Any instrumental variable can be criticized and needs to rely on convincing economic arguments; for this we offer some rationale (Section 4.1) and a set of tests that support the validity—but less so the relevance—of our instruments (Section 4.2).

Across a range of linear and quadratic specifications, with and without instrumentation, we find that a one-unit reduction in the effective corporate income tax rate leads to a reduction of entrants' capital size that ranges from 2.7% to 14.4%. Its effect on labor size is smaller and even has the opposite sign for a relevant portion of the empirical distribution of tax rates. As a consequence, a reduction of taxation unambiguosly implies a reduction of the capital–labor ratio. These results are consistent with the predictions of the model by Cullen and Gordon (2007).

More generally, a possible interpretation of our results is that the taxation constitutes a barrier to entry: as found by Klapper, Laeven, and Rajan (2006),

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1. Djankov et al. (2008) and Klapper, Laeven, and Rajan (2006) are the only exceptions we are aware of.

high entry costs may make entry attractive only for larger firms. Together with the finding that lower corporate taxation increases entry rates that we develop in Da Rin, Di Giacomo, and Sembenelli (2009), the results of this paper point to a 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 who chooses whether to set up her firm as an incorporated or un-incorporated entity.[2] 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 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 tax rates encourage entry at a higher scale because it allows entrepreneurs to share entrepreneurial risk with the government.

To link these three channels to the effects of corporate taxation on the intensive margin of entry, consider the following. Higher corporate income tax rates lead to a lower capital scale of entrants through the "income shifting" and the "risk subsidy" channels, but make 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. Because labor costs are deductible

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2. Not all new companies that survive choose incorporation, and studies document that the incorporation decision is a genuine choice.

expenses rather than foregone income of the entrepreneur, labor size is instead affected only by the "risk subsidy" and "risk-sharing" channels. Also in this case the net effect is a priori undetermined; it is expected to be weaker than in the case of capital size, and could even become negative. Higher corporate taxation is expected to increase the capital–labor ratio because hiring new workers does not create income-shifting benefits, unlike expanding a firm's capital size.

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 nonlinear 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 include companies that incorporated between 1997 and 2004 and were active in 39 industries. 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 more than 2.5 million entrants. About 2 million of them report information on Capital-Size, and 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.[3]

Da Rin, Di Giacomo, and Sembenelli (2009) describe in more detail these data and the construction of our independent variables: 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) and information from the *Worldwide Corporate Tax Guide* published by Ernst & Young, a multinational tax consulting firm. Effective Tax Rate is a nonlinear

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

TABLE 1. Descriptive statistics (firm-level).

		Capital-Size			Labor-Size		
Year	Entrants	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).

function of the statutory tax rate, that varies across countries and time, and of the expected rate of return, that varies across industries and time. Our second independent 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 toward new business creation.

Table 2 presents descriptive statistics. Figure 1 illustrates the relationship between Effective Tax Rate and entrants' size. It suggests a positive relationship in the case of Capital-Size, but not for Labor-Size.

4. Empirical Analysis

4.1. Econometric Strategy

We estimate two different specifications of the following relationship:

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

TABLE 2. Descriptive statistics (industry-country-year level).

Variable	Average	S.D.	25th perc.	Median	75th perc.	No. 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).
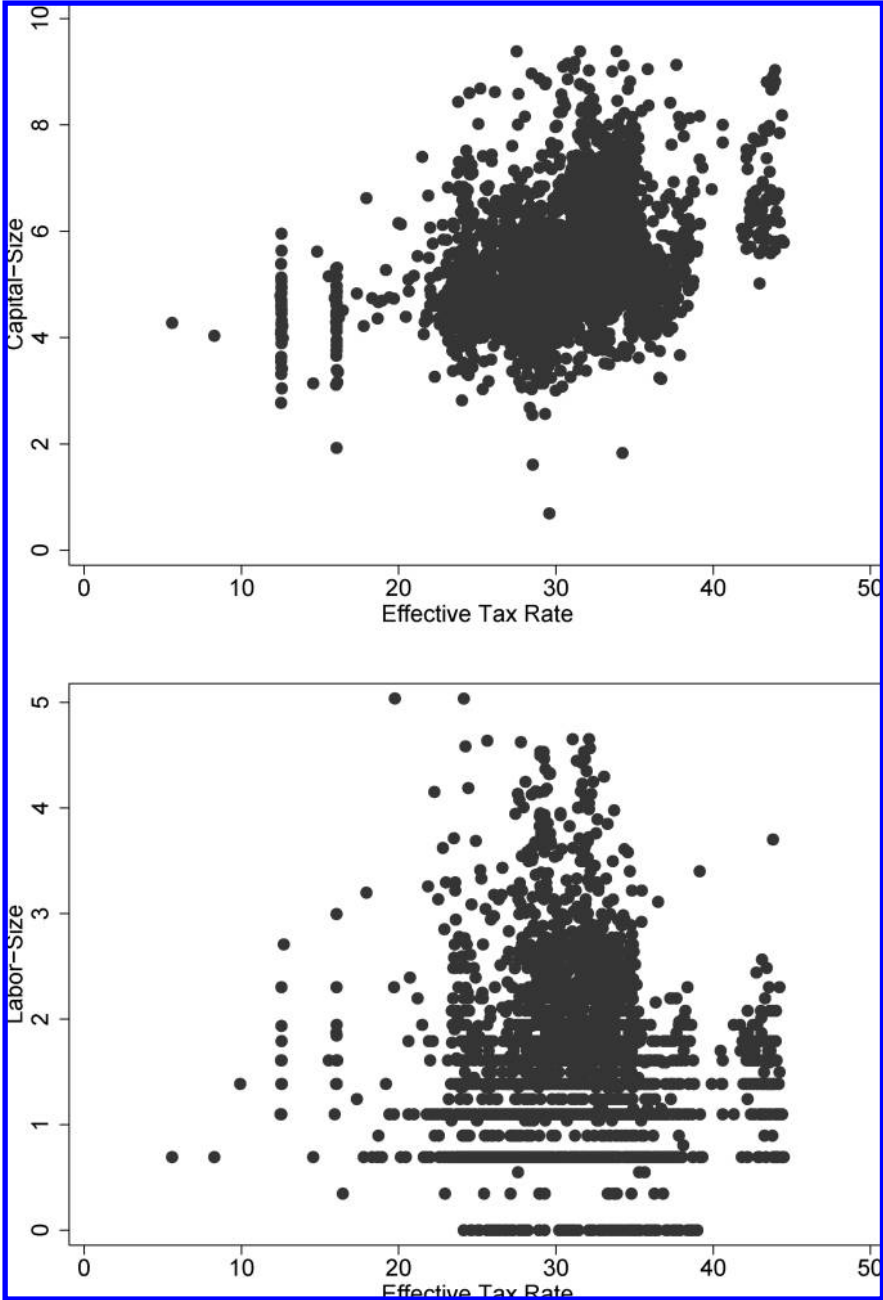
FIGURE 1. Capital-Size, Labor-Size, and Effective Tax Rate: a graphical view.

The figures plot Capital-Size and Labor-Size against the (lagged) Effective Tax Rate. All observations refer to country-industry-year level data.

where y_{ict} is one of our two dependent variables, Capital-Size and Labor-Size, both measured in year t, industry i, and country c. Tax_{ict-1}, the lagged value of Effective Tax Rate, varies across time, industries, and countries. The variable α_t is a time effect that we model with a set of year dummies, and x_{ct-1} is the (lagged) Pro-Business Policy Index, which varies across time and countries.

The last two terms in equation (1) are unobservable error components. The term η_{ic} is a time-invariant, country–industry specific effect that captures any unobserved characteristics that are relevant for the entry and the scale decisions. Because our explanatory variables may be correlated with η_{ic}, we use the standard 'within-group' transformation to remove it. The term ε_{ict} is an idiosyncratic error term that varies across the three dimensions of our panel data set. We report standard errors that are robust to heteroskedasticity and intra-country correlation of unrestricted form.

To consistently estimate γ and β, once the model has been transformed in deviations from country–industry means, we need lack of correlation between the regressors and ε_{ict} at all leads and lags. Under this assumption the standard within-group, or panel fixed effects (FE), estimator is consistent and asymptotically normally distributed. Because 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 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 Election-Date, a dummy equal to one in election years. These instruments are selected on the basis of appropriate specification tests for instrument validity (Hansen J and C statistics) and relevancy (Cragg-Donald and Kleibergen-Paap tests). Their economic rationale 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 both Capital-Size and Labor-Size we present four estimated equations, each based on different functional forms and estimation methods. Columns (1) and (2) report a linear specification in the tax rate, estimated with panel FE and with GMM-IV. Columns (3) and (4) report

TABLE 3.   Estimation results. Dependent variable: Capital-Size.

	(1) FE	(2) GMM-IV	(3) FE	(4) GMM-IV	(5) FIRST-STAGE
Effective Tax Rate	0.027**	0.144**	0.009	0.944*	
	(0.012)	(0.066)	(0.027)	(0.552)	
Effective Tax Rate - Squared			0.000	−0.013	
			(0.000)	(0.009)	
Pro-Business Policy Index	0.008	0.045	0.009	0.051	−0.362***
	(0.013)	(0.029)	(0.013)	(0.031)	(0.134)
Center-Left Government					−2.099***
					(0.763)
Veto-Power Index					0.619**
					(0.287)
Government-Stability Index					−0.378
					(0.324)
Election-Date					−0.201
					(0.472)
Time dummies	Yes	Yes	Yes	Yes	Yes
Wald Test Statistic			5.37	6.20	
degrees of freedom [*p*-value]			2 [0.07]	2 [0.05]	
Hansen J Statistic		2.58		0.51	
degrees of freedom [*p*-value]		3 [0.46]		2 [0.77]	
Endogeneity Test (Hansen C Statistic)		1.14		0.10	
degrees of freedom [*p*-value]		1 [0.29]		1 [0.75]	
Cragg-Donald Statistic		109.64		31.26	
Kleibergen-Paap Statistic		3.67		1.43	
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 panel fixed effects 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. The Wald Test is a test on the joint significance of Effective Tax Rate and Effective Tax Rate–Squared. Standard errors (in parentheses) are robust to heteroskedasticity and intra-country correlation of unrestricted form.
   *Significant at 10%; **significant at 5%; ***significant at 1%.

a more general quadratic specification, also estimated with panel FE and with GMM-IV. Column (5) of Table 3 reports the pseudo first stage for Effective Tax Rate.[4]

In the linear specification for Capital-Size the coefficient of taxation is positive and significant at conventional levels with both estimation methods. The GMM-IV coefficient (0.144) is substantially larger than the panel FE one (0.027). Because the estimates represent semi-elasticities, a one-unit increase in Effective Tax Rate increases Capital-Size by an amount ranging from 2.7% (column (1)) to 14.4% (column (2)). This large difference in magnitude is consistent with a violation of the strict exogeneity assumption or an attenuation bias, both affecting the panel FE estimates. However, it might also reflect a weak instrument problem

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4.   We do not report the pseudo first stage results in Table 4 because they are substantially identical to those in Table 3, except for a different number of observations.

TABLE 4.   Estimation results. Dependent variable: Labor-Size.

	(1) FE	(2) GMM-IV	(3) FE	(4) GMM-IV
Effective Tax Rate	−0.008	0.033	0.046*	0.613
	(0.005)	(0.022)	(0.025)	(0.433)
Effective Tax Rate - Squared			−0.001**	−0.009
			(0.000)	(0.006)
Pro-Business Policy Index	0.002	0.017	0.001	0.019
	(0.008)	(0.012)	(0.008)	(0.014)
Time dummies	Yes	Yes	Yes	Yes
Wald Test Statistic			5.61	3.57
degrees of freedom [p-value]			2 [0.07]	2 [0.17]
Hansen J Statistic		2.01		0.03
degrees of freedom [p-value]		3 [0.57]		2 [0.93]
Endogeneity Test (Hansen C Statistic)		0.59		0.02
degrees of freedom [p-value]		1 [0.44]		1 [0.88]
Cragg-Donald Statistic		135.91		13.13
Kleibergen-Paap Statistic		3.12		2.62
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 panel fixed effects regressions. Columns (2) and (4) are GMM instrumental variables regressions, where Effective Tax Rate and its square are instrumented. The Wald Test is a test on the joint significance of Effective Tax Rate and Effective Tax Rate–Squared. Standard errors (in parentheses) are robust to heteroskedasticity and intra-country correlation of unrestricted form.
   *Significant at 10%; **significant at 5%; ***significant at 1%.

in the GMM-IV estimates, as signalled by the Kleibergen-Paap (but not by the Cragg-Donald) statistic. The large size of the GMM-IV estimates seems to support this latter conjecture. Comfortingly, the validity of our set of instruments is not rejected by the data (Hansen's J statistic), that also support the exogeneity of Pro-Business Policy Index (Hansen's C statistic).

Based 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 panel FE the linear and the quadratic terms are individually insignificant at any conventional significance level, and a Wald joint test on these terms rejects the null hypothesis of joint insignificance, but only at the 10% level. With GMM-IV, the linear term is positive and highly significant, and the quadratic term is negative and only marginally significant (p-value of 0.14). The Wald test rejects the hypothesis of their joint insignificance at the 5% level. Moreover, both the validity of our set of instruments and the exogeneity of Pro-Business Policy Index are not rejected by the data at the 1% level of significance (Hansen's J and C statistics). Computed at the median, a unit increase in Effective Tax Rate increases Capital-Size by 18.3% in the quadratic GMM-IV specification, a value similar to that obtained from the GMM-IV linear specification. Overall, the evidence presented so far points clearly to a smaller capital size of entrants as the tax burden lowers.

Table 4 replicates the same estimation strategy for Labor-Size. In the linear panel FE specification the coefficient is negative, statistically insignificant, and

economically negligible (−0.008). The GMM-IV estimate is instead positive, larger (0.033), but statistically insignificant. A weaker effect than for Capital-Size is what one would expect based on Cullen and Gordon's predictions. As for Capital-Size, the Hansen's C test does not reject the exogeneity of Pro-Business Policy Index.

When we allow for a more flexible (quadratic) functional form, the validity of our set of instruments and the exogeneity of Pro-Business Policy Index are not rejected by the data. The coefficients of the linear and of the quadratic terms are positively and negatively signed, respectively, regardless of the estimation method. When computed at the median, a unit increase in Effective Tax Rate reduces Labor-Size by 0.6% with the panel FE estimation (column (3)); the implied curvature leads to an effect that is positive only up to the first decile of the distribution of Effective Tax Rate (24.8%). Contrary to Capital-Size, therefore, taxation has a negative effect on Labor-Size for a sizeable part of its distribution. In the GMM-IV specification the two terms retain their signs but are insignificant, both individually and jointly. Overall, these results preclude us from taking a strong stand on the role of corporate taxation on Labor-Size.

Finally, our results that the effect of taxation on Labor-Size is smaller than on Capital-Size imply that lower corporate tax rates lead to a lower capital/labor ratio, as suggested by Cullen and Gordon's model.[5]

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. First, we experiment with alternative measures of the dependent variables, computing Capital-Size and Labor-Size as averages instead of medians. Second, we change 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, 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 entrants, using a panel data set that allows

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5.   The estimation of a set of equations with the capital–labor ratio as dependent variable confirms this conclusion.

us to improve significantly on the existing literature. We find consistent evidence that a lower corporate income taxation decreases the capital size of entrants and their capital to labor ratio. This suggests that policymakers should consider that lowering taxes may enhance entry rates (as we show in Da Rin, Di Giacomo, and Sembenelli [2009]) but that also induces the entry of smaller, less capitalized, and therefore weaker firms.

References

Ardagna, Silvia, and Annamaria Lusardi (2009). "Where Does Regulation Hurt? Evidence From New Businesses Across Countries." Working paper, Harvard University.

Ardagna, Silvia, and Annamaria Lusardi (2010). "Heterogeneity in the Effect of Regulation on Entrepreneurship and Entry Size." *Journal of the European Economic Association*, 8(2–3), 594–605.

Cullen, Julie, and Roger Gordon (2007). "Taxes and Entrepreneurial Activity: Theory and Evidence for the U.S." *Journal of Public Economics*, 91, 1479–1505.

Da Rin, Marco, Marina Di Giacomo, and Alessandro Sembenelli (2009). "Entrepreneurship, Firm Entry, and the Taxation of Corporate Income: Evidence from Europe." CentER Discussion Paper No. 2009–61.

Devereux, Michael, and Rachel Griffith (1998). "The Taxation of Discrete Investment Choices." IFS Working Paper No. 98/16, Institute for Fiscal Studies, London.

Djankov, Simeon, Tim Ganser, Caralee McLiesh, Rita Ramalho, and Andrei Shleifer (2008). "The Effect of Corporate Taxes on Investment and Entrepreneurship." NBER Working Paper No. 13756.

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

Kerr, William, and Ramana Nanda (2009). "Democratizing Entry: Banking Deregulations, Financing Constraints and Entrepreneurship." *Journal of Financial Economics*, 94, 124–49.

Kerr, William, and Ramana Nanda (2010). "Banking Deregulations, Financing Constraints and Firm Entry Size," *Journal of the European Economic Association,* 8(2–3), 582–593.

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2. Silvia Ardagna , Annamaria Lusardi . 2010. Heterogeneity in the Effect of Regulation on Entrepreneurship and Entry SizeHeterogeneity in the Effect of Regulation on Entrepreneurship and Entry Size. *Journal of the European Economic Association* **8**:2-3, 594-605. [Abstract] [PDF] [PDF Plus]