

Corporate Income Taxation and Firm Efficiency

Evidence from a large panel of European firms

Joanna Tyrowicz (GRAPE, IAAEU, UW and IZA)

Jakub Mazurek (GRAPE)

Karsten Staehr (TTU and Eestipank)



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Motivation

- Theory: taxes are (almost) neutral
 - if $Q = \operatorname{argmax}\Pi$ then $\forall\tau$ it holds that $Q = \operatorname{argmax}(1 - \tau)\Pi$
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Question

Are CI taxes neutral for firm efficiency?

- Taxes may be a cost \rightarrow reduce capital accumulation & investment
- Taxes may drive away from efficient technologies

Motivating example

Technology 1: immediate gratification

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Technology 2: suffering through the dungeons of depreciation

- Indivisible and large investments
- Long cycle from investment to revenue
- Low liquidity

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Contribution

- Instead of reforms: “business as usual” identification
- Instead of inter-temporal decision: value added (efficiency)
- Generally accessible data

Identification strategy

$$Y_{i,t} = \alpha_i(\text{tax}_{i,t}, \cdot) K_{i,t}^{\beta_k^s} + L_{i,t}^{\beta_l^s} \quad (1)$$

OLS estimation of $\text{tax}_{i,t}$ biased \rightarrow instrument

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- Measure technology specific tax rate (NACE 4 digit)

$$IV_{c,s,t} = \frac{\left(ETR_{s,t} - \frac{\sum_{i \notin (c)} ETR_{s,t}}{\sum_{i \notin (c)} i} \right)}{\sqrt{\frac{1}{\sum_{i \notin (c)} i} \sum_{i \notin (c)} \left(ETR_{s,t} - \frac{\sum_{i \notin (c)} ETR_{s,t}}{\sum_{i \notin (c)} i} \right)^2}} \quad (2)$$

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- Use this as instrument in estimation

$$\log VA_{i,t} = \beta_k^s \log k_{i,t} + \beta_l^s \log l_{i,t} + \alpha_i(\hat{\text{tax}}_{i,t}) + u_t + u_i + \epsilon_{i,t} \quad (3)$$

$$\text{tax}_{i,t} = \delta \cdot IV_{c,s,t} + \eta_t + \epsilon_{i,t} \quad (4)$$

Some stylized facts

Table 1: Sources of variation in taxation measures

Variable	All firms			Firms ineligible to CF		
	Firm	Country	Sector	Firm	Country	Sector
BTD	17.8%	0.1%	0.4%	15.5%	0.1%	0.5%
BTD / Assets	7.3%	0.0%	0.1%	6.9%	0.0%	0.0%
BTD / PTI	65.3%	14.0%	17.1%	69.3%	14.4%	18.4%
BTD/ taxes paid	33.2%	0.7%	0.5%	31.2%	0.8%	0.5%

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BTD/ taxes paid	33.2%	0.7%	0.5%	31.2%	0.8%	0.5%
Taxes paid	73.8%	9.6%	63.9%	76.8%	9.5%	71.9%
Taxes paid / Assets	85.0%	5.2%	11.2%	88.0%	5.4%	6.6%
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Taxes paid / Lagged assets	66.8%	5.7%	9.8%	68.6%	6.5%	10.6%
ETR (1Y)	62.9%	18.0%	20.2%	68.5%	19.7%	21.6%
ETR (2Y)	41.1%	0.3%	45.6%	43.7%	1.3%	3.4%

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ETR (2Y)	41.1%	0.3%	45.6%	43.7%	1.3%	3.4%
CF incidence	69.6%	5.9%	11.1%			

Positive correlation is robust: $\text{corr}(\tau, \pi) > 0$

Table 2: Elasticity of production with respect to taxation (FE OLS)

	Full (1)	Q1 T (2)	Q2 T (3)	Q3 T (4)	Q4 T (5)	P25 T (6)	P50 T (7)	P75 T (8)
tax	0.133 (0.000)	0.107 (0.000)	0.115 (0.000)	0.135 (0.000)	0.167 (0.000)	0.119 (0.000)	0.125 (0.000)	0.147 (0.000)
k	0.255 (0.000)	0.231 (0.000)	0.254 (0.000)	0.273 (0.000)	0.274 (0.000)	0.245 (0.001)	0.263 (0.000)	0.276 (0.000)
l	0.539 (0.000)	0.602 (0.000)	0.570 (0.000)	0.524 (0.000)	0.474 (0.000)	0.577 (0.001)	0.549 (0.000)	0.504 (0.000)
R^2	0.851	0.879	0.872	0.852	0.812	0.873	0.865	0.841
# i	2,625,365	814,839	529,788	634,856	645,882	313,784	509,907	501,467

N (1) \approx 10.2 mln

N (2) – (5) \approx 2.2mln

N (6) – (9) \approx 2 mln

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Table 3: Elasticity of production with respect to taxation (FE OLS)

	Q1 VA (2a)	Q2 VA (3a)	Q3 VA (4a)	Q4 VA (5a)	P25 VA (6a)	P50 VA (7a)	P75 VA (8a)
tax	0.205*** (0.000)	0.146*** (0.000)	0.123*** (0.000)	0.108*** (0.000)	0.167*** (0.000)	0.132*** (0.000)	0.117*** (0.000)
k	0.286*** (0.000)	0.249*** (0.000)	0.232*** (0.000)	0.231*** (0.000)	0.261*** (0.000)	0.240*** (0.000)	0.228*** (0.000)
l	0.483*** (0.000)	0.544*** (0.000)	0.572*** (0.000)	0.564*** (0.000)	0.518*** (0.000)	0.562*** (0.000)	0.573*** (0.000)
R^2	0.861	0.865	0.862	0.828	0.863	0.865	0.853
# N	1,927,477	2,491,774	2,867,614	2,876,870	1,820,682	2,167,947	2,382,326
# i	660,251	652,751	656,461	655,902	526,093	524,682	523,986

Results

$$\begin{aligned}\log VA_{i,t} &= \beta_k^s \log k_{i,t} + \beta_l^s \log l_{i,t} + \alpha_i(\widehat{tax}_{i,t}) + u_t + u_i + \epsilon_{i,t} \\ tax_{i,t} &= \delta \cdot IV_{c,s,t} + \eta_t + \varepsilon_{i,t}\end{aligned}$$

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Table 4: OLS vs IV estimation

	OLS			IV			
	Firms in 'trusted' sectors			Firms in 'trusted' sectors ineligible to CF			
	FE	FE	FD	FE	FD	MI FE	MI FD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
No inputs	0.26 (0.000)	0.29 (0.005)	-0.092 (0.012)	0.35 (0.005)	-0.078 (0.013)	0.32 (0.006)	-0.094 (0.015)
Controlling for inputs	0.133 (0.000)	-0.043 (0.004)	-0.035 (0.008)	-0.056 (0.005)	-0.032 (0.008)	-0.053 (0.006)	-0.039 (0.011)

Table 5: Elasticity of TFP with respect to taxation (IV)

	Sector specific intercept				Sector specific intercept and slopes			
	All FE	No CF	All FD	No CF	All FE	No CF	All FE	No CF
	Second stage							
tax	-0.043 (0.004)	-0.056 (0.005)	-0.035 (0.008)	-0.032 (0.009)	-0.046 (0.004)	-0.060 (0.005)	-0.027 (0.002)	-0.038 (0.003)
k	0.35 (0.002)	0.37 (0.003)	0.31 (0.006)	0.32 (0.006)				
l	0.56 (0.001)	0.54 (0.001)	0.56 (0.001)	0.55 (0.001)				
R^2	0.75	0.71	0.40	0.42	0.92	0.91	0.93	0.92
	First stage							
IV	0.014 (0.000)	.015 (0.000)	.0056 (0.000)	.0063 (0.000)	0.014 (0.000)	0.015 (0.000)	0.045 (0.000)	0.040 (0.000)
R^2	0.12	0.13	0.05	0.06	0.55	0.57	0.55	0.58

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- We test neutrality of taxation
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- We propose a new instrument
- 10% more tax to paid \rightarrow 4% lower VA
- quite robust: for 2digit NACE all negative, or insignificant
- substantial heterogeneity across countries



Thank you and
I am happy to take questions!

w: grape.org.pl

t: grape.org

f: grape.org

e: j.tyrowicz@grape.org.pl