Tax Incentives for International Profit Shifting within Multinational Groups

Julian Oliver Dörr

Is profit shifting a serious issue?

Bloomberg Business

Technology

The Tax Haven That's Saving Google Billions

By Jesse Drucker | October 21, 2010

The heart of Google's (GOOG) international operations is a silvery glass office building in central Dublin, a block from the city's Grand Canal. In 2009 the office, which houses roughly 2,000 Google employees, was credited with 88 percent of the search juggernaut's $12.5 billion in sales outside the U.S. Most of the profits, however, went to the tax haven of Bermuda.

To reduce its overseas tax bill, Google uses a complicated legal structure that has saved it $3.1 billion since 2007 and boosted last year's overall earnings by 26 percent. While many multinationals use similar structures, Google has managed to lower its overseas tax rate more than its peers in the technology sector. Its rate since 2007 has been 2.4 percent. According to company disclosures, Apple (AAPL), Oracle (ORCL), Microsoft (MSFT), and IBM (IBM)—which together with Google make up

Is profit shifting a serious issue?

The New York Times

INTERNATIONAL BUSINESS

O.E.C.D. Calls for Coordinated Fight Against Corporate Tax Avoidance

By DAVID JOLLY SEPT. 16, 2014

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Dozens of countries with the most advanced economies have agreed on principles for concrete action to prevent corporations from gaming the international tax system, the Organization for Economic Cooperation and Development said in a report on Tuesday.

In a set of recommendations, the organization said the nations — which include the United States, the biggest countries in Europe and China — had agreed on a series of actions to ensure "the coherence of corporate income taxation at the international level" and to improve transparency for governments.

Why does it matter?

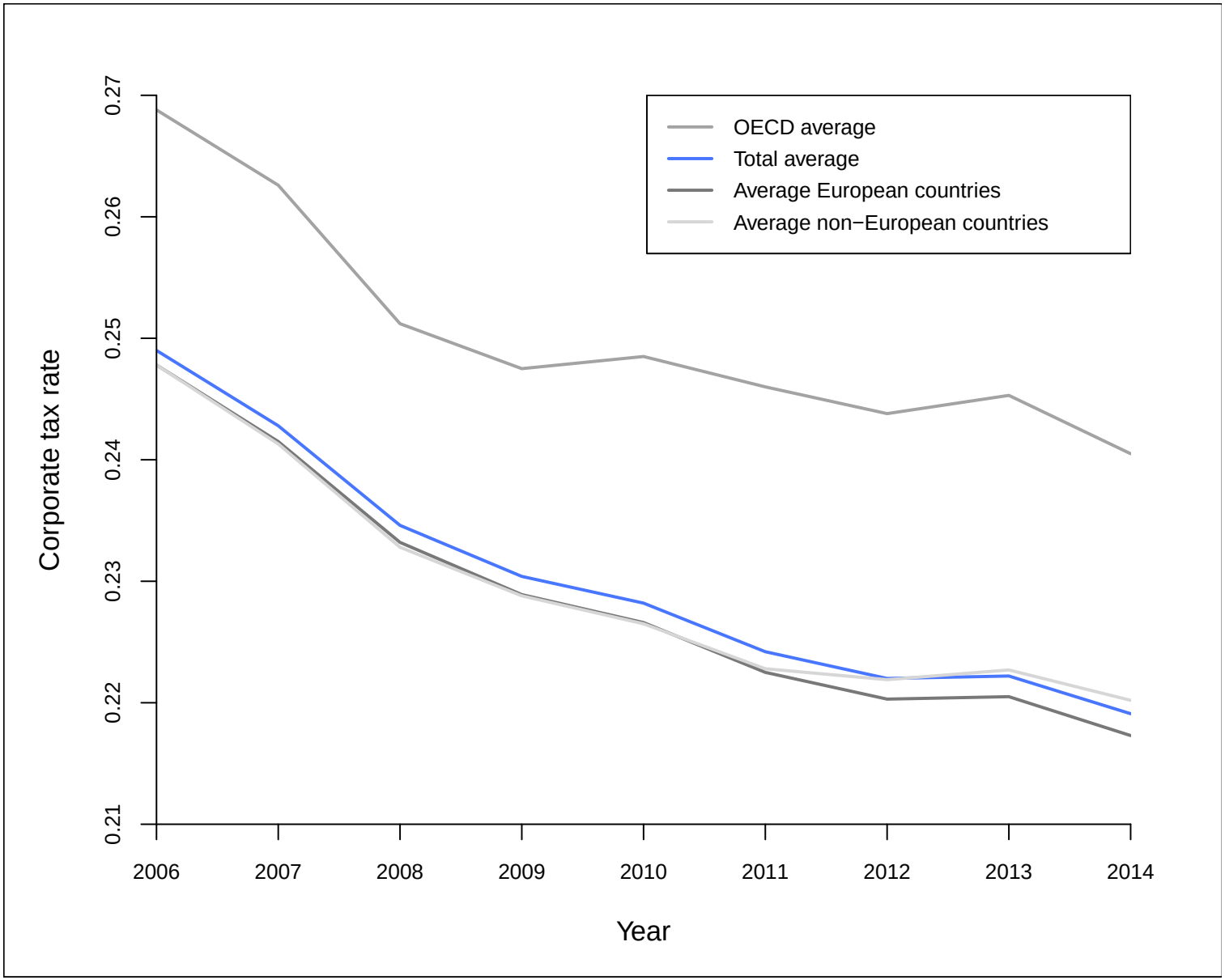
- Distortion between where profits are booked and taxed and where the actual economic activity takes place (and makes use of infrastructure provisions)
- Distortion of competition between multinationals and purely domestic firms
- Deadweight costs of tax planning
- Tax base erosion: Lost in tax revenues leading to underfunding of critical infrastructure
- However, magnitude?

Outline

- Recap - Conclusion of first draft presentation.
- Empirical Results - What does data tell us.
- Summary - Takeaways.

Recap

Magnitude - Race to the bottom



Magnitude - OECD fighting profit shifting

OECD measures against tax havens:

- Report on Harmful Tax Competition (1998)
- Official list of tax havens (2000)
- Action plan on base erosion and profit shifting (2013)

World wide declining tax rates and OECD measures against profit shifting make me presume that tax incentives for income shifting have declined over time.

Model - Profit shifting equation

Regression equation

$$b_i^r = \beta_1 + \beta_2 a_i + \beta_3 l_i + \beta_4 k_i + \tilde{\gamma} C_i + u_i$$

with

- i: country index
- b_i^r: log of reported profits
- a_i: log of productivity factor
- l_i: log of labor input
- k_i: log of capital input
- C_i: Tax variable measuring tax incentives for profit shifting given by international tax differences

Model - C_i as variable of main interest

C_i captures profit shifting incentives:

- If $C_i > 0$ which is the case if $\tau_i > \tau_k$ on average, then the multinational optimally shifts profits out of country i
- If $C_i < 0$ which is the case if $\tau_i < \tau_k$ on average, then the multinational optimally shifts profits into country i

So, in context of a linear model estimation, I expect reported profits to respond negatively to C_i.

Empirical Results

Estimation results

	Estimate	Standard error	p-value
Panel A: Basic estimation results			
Productivity	0.563	0.020	< 0.001
Capital	0.296	0.006	< 0.001
Labor	0.518	0.009	< 0.001
C_i	-0.055	0.016	< 0.001
Industry dummies	✓		
n	$19,232$		
adjusted R^2	0.60		

C_i endogenous?

Infrastructure and C_i:

- Countries which provide good infrastructure have higher public costs (construction, maintenance) than countries with poor infrastructure
- Good infrastructure justifies higher corporate tax rates to cover high public costs
- C_i is higher for companies located in countries with good infrastructure

Infrastructure and reported profits:

- Infrastructure facilitates supply chain management and the access to consumer markets
- Profits are higher for companies located in countries with good infrastructure

C_i endogenous?

Endogeneity:

- Test for C_i not being endogenous is rejected at all conventional levels
- $\hat{\tilde{\gamma}}$ is upward biased
- OLS estimation for the standard profit shifting equation leads to inconsistent results

Solution:

- Introducing a proxy variable for infrastructure qualities, i.e. infrastructure spending

Estimation results

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Panel B: Infrastructure spending as proxy for infrastructure qualities			
Productivity	0.660	0.030	< 0.001
Capital	0.308	0.009	< 0.001
Labor	0.459	0.012	< 0.001
Infrastructure spending	0.063	0.012	< 0.001
C_i	-0.175	0.020	< 0.001
Industry dummies	✓		
n	10,062		
adjusted R^2	0.61		

Country-specific tax base elasticities

Country	Semi-elasticities $\frac{1}{\bar{B}_i^r}\frac{d\bar{B}_i^r}{d\tau_i}$	Elasticities $\frac{\tau_i}{\bar{B}_i^r}\frac{d\bar{B}_i^r}{d\tau_i}$	Country	Semi-elasticities $\frac{1}{\bar{B}_i^r}\frac{d\bar{B}_i^r}{d\tau_i}$	Elasticities $\frac{\tau_i}{\bar{B}_i^r}\frac{d\bar{B}_i^r}{d\tau_i}$
Australia	−0.92	−0.28	Latvia	−1.46	−0.23
Austria	−2.36	−0.73	Liechtenstein	−0.56	−0.08
Belgium	−2.39	−0.84	Lithuania	−0.81	−0.13
Bermuda	−0.56	−0.01	Luxembourg	−1.82	−0.54
Bosnia & Herzegovina	−0.54	−0.06	Macedonia	−0.20	−0.02
Brazil	−0.27	−0.09	Malta	−0.34	−0.12
Bulgaria	−0.88	−0.10	Netherlands	−1.31	−0.34
China	−1.74	−0.45	Norway	−0.79	−0.22
Colombia	−1.38	−0.36	Poland	−1.64	−0.33
Croatia	−1.09	−0.23	Portugal	−3.35	−0.80
Czech Republic	−1.83	−0.37	Romania	−2.07	−0.35
Denmark	−1.55	−0.40	Russia	−1.11	−0.23
Estonia	−1.13	−0.25	Serbia	−0.65	−0.10
Finland	−1.32	−0.28	Slovakia	−1.70	−0.39
France	−2.11	−0.72	Slovenia	−0.93	−0.17
Germany	−1.12	−0.35	South Korea	−1.60	−0.40
Greece	−1.32	−0.36	Spain	−2.41	−0.75
Hungary	−1.09	−0.22	Sweden	−1.60	−0.37
Iceland	−0.48	−0.10	Switzerland	−0.68	−0.13
India	−0.86	−0.30	Taiwan	−0.21	−0.04
Ireland	−0.59	−0.08	Turkey	−0.40	−0.08
Italy	−1.92	−0.62	Ukraine	−1.97	−0.37
Japan	−2.23	−0.83	United Kingdom	−1.02	−0.22
Kazakhstan	−0.47	−0.10	*Average*	−1.25	−0.31

Country-specific tax base elasticities

Bermuda, Ireland, Liechtenstein, Malta and Switzerland:

- All listed as official tax havens
  - Low corporate tax rates (but not necessarily)
  - Preferential tax regime
  - Bank secrecy
- All characterized by relatively low tax base elasticities
- There are more incentives to keep profits in these countries than only low tax rates which is why companies in these countries respond relatively insensitively to an increase in the tax level.

Summary

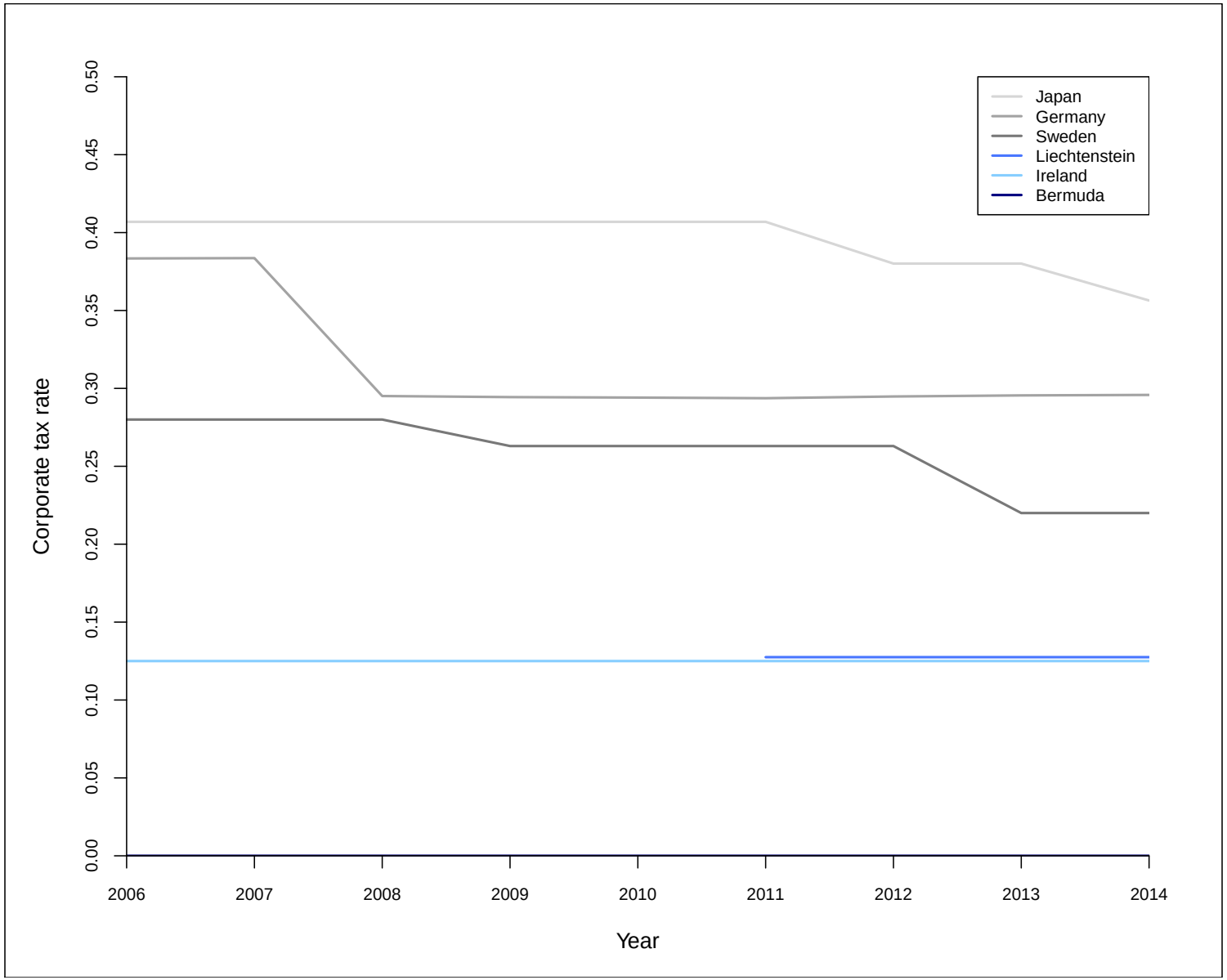
Takeaways

- Multinationals respond negatively to international tax rate differentials by shifting profits out of high tax locations
- On average a 10 percentage point tax rate increase results in
  - *Hines and Rice (1994) using 1982 data:* 22.5%
  - *Huizinga and Laeven (2008) using 1999 data*: 13.1%
  - *My finding using 2014 data*: 12.5%

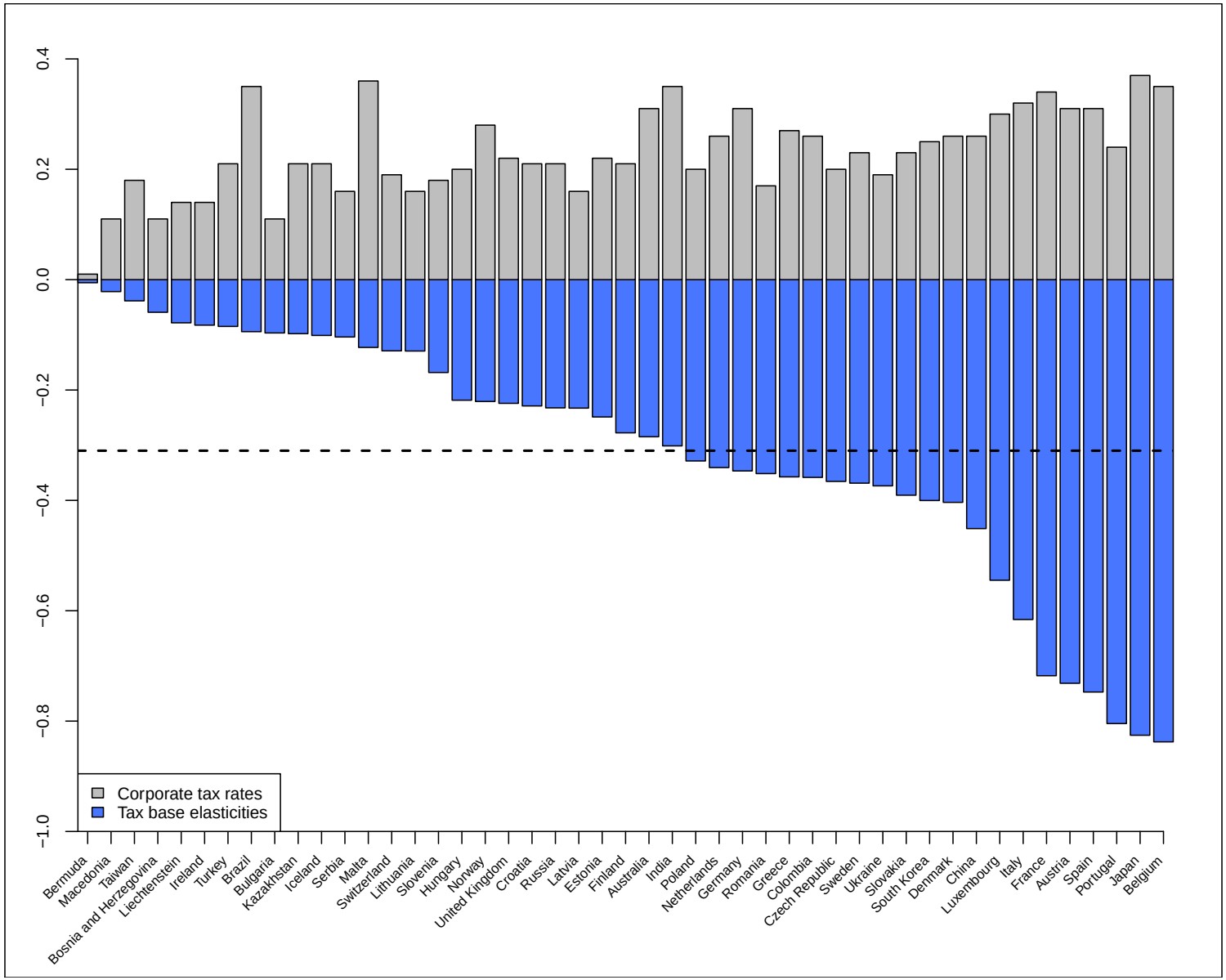
  lower reported profits of multinationals in the corresponding country.

Backup

Magnitude - Race to the bottom



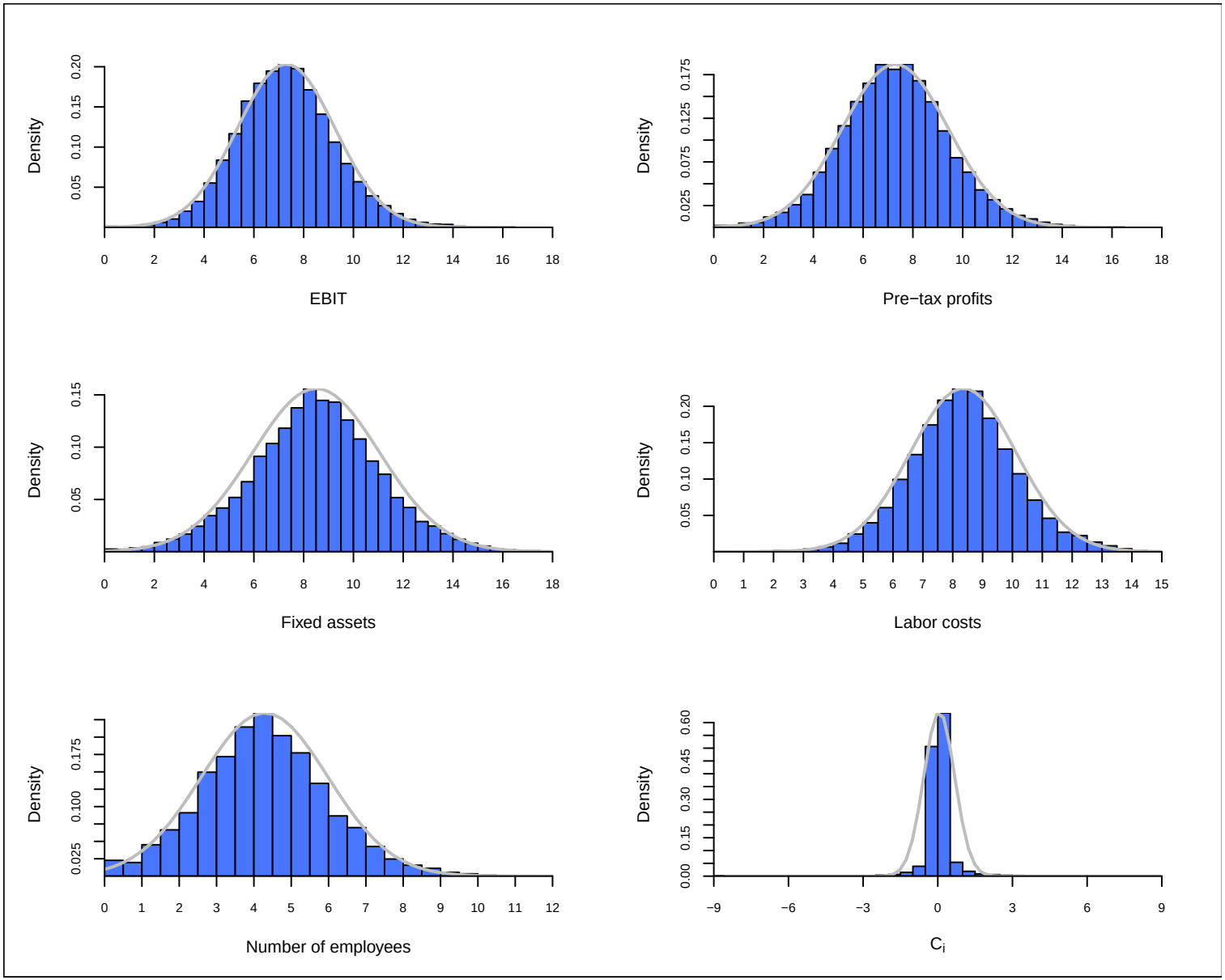
Tax base elasticities



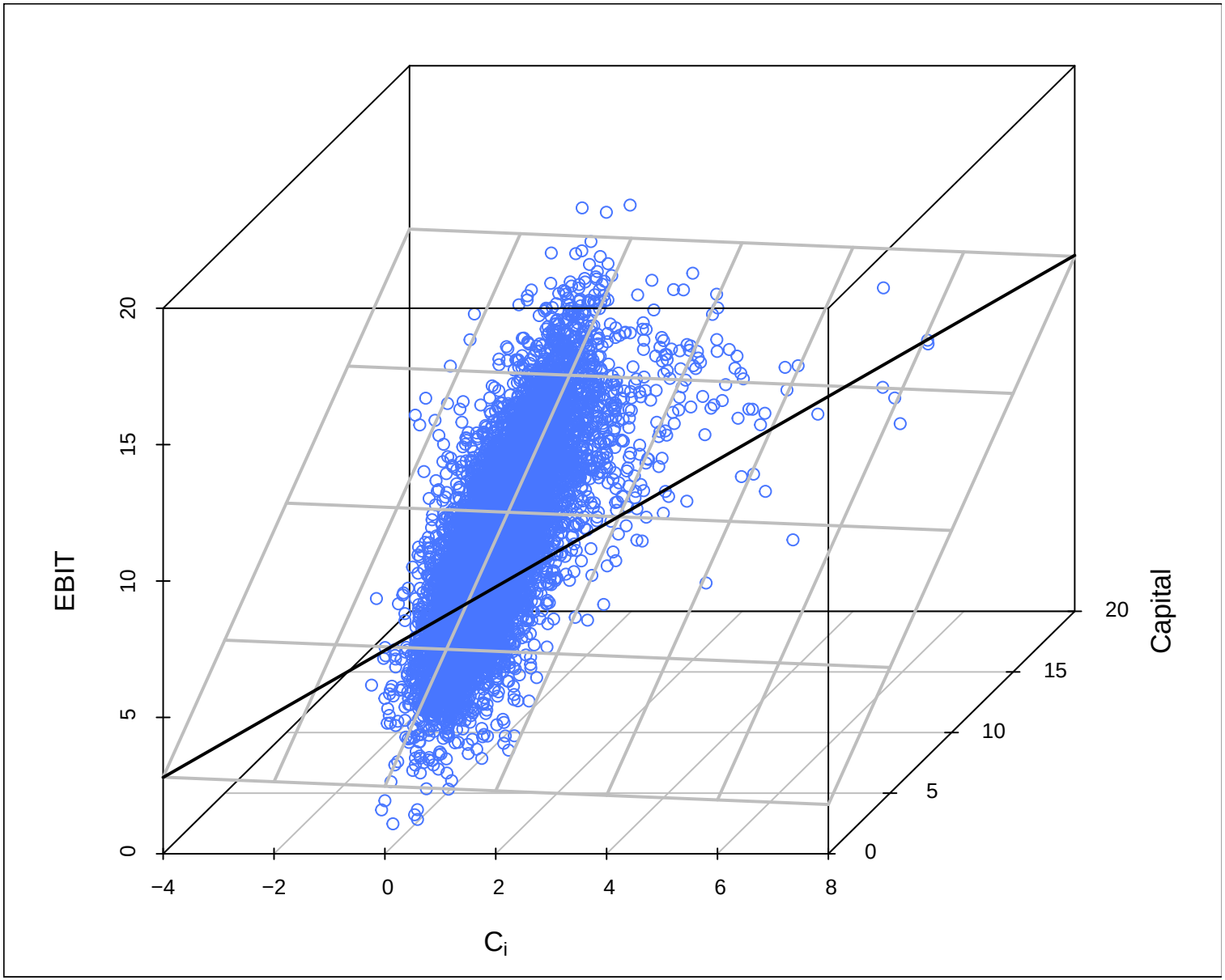
Variable description

Variable	Description	Used as proxy for	Source
Statutory tax rate	Top statutory tax rate on corporate income	Tax rate on corporate income (τ_i)	*Price Waterhouse Coopers Worldwide Tax Summary 2014/15 and KPMG Corporate Tax Table*
C_i	Tax variable (constructed using information on statutory tax rates relevant within the multinational group)	Tax-motivated incentive to shift profits	*Price Waterhouse Coopers Worldwide Tax Summary 2014/15 and KPMG Corporate Tax Table*
EBIT	Earnings before interest and taxes in logs	Reported profits (b_i^r)	*Orbis*
Profit before taxes	Operating profits before taxes but after interest payments in logs	Reported profits (b_i^r)	*Orbis*
Productivity	GDP per capita as country-specific productivity measure in logs	Productivity factor (a_i)	*World Bank Development Indicators*
Number of employees	Number of employees in logs	Labor input (l_i)	*Orbis*
Labor costs	Total labor compensation costs in logs	Labor input (l_i)	*Orbis*
Capital	Total fixed assets in logs	Capital input (k_i)	*Orbis*
Infrastructure spending	Investment and maintenance expenditures for road, rail, inland waterways, maritime ports and airports in logs	Infrastructure qualities (i_i)	*The International Transport Forum of the OECD*
Number of subsidiaries	Total number of recorded subsidiaries owned by the parent firm in logs	Possibilities (number of hosts) for profit shifting (z_i)	*Orbis*

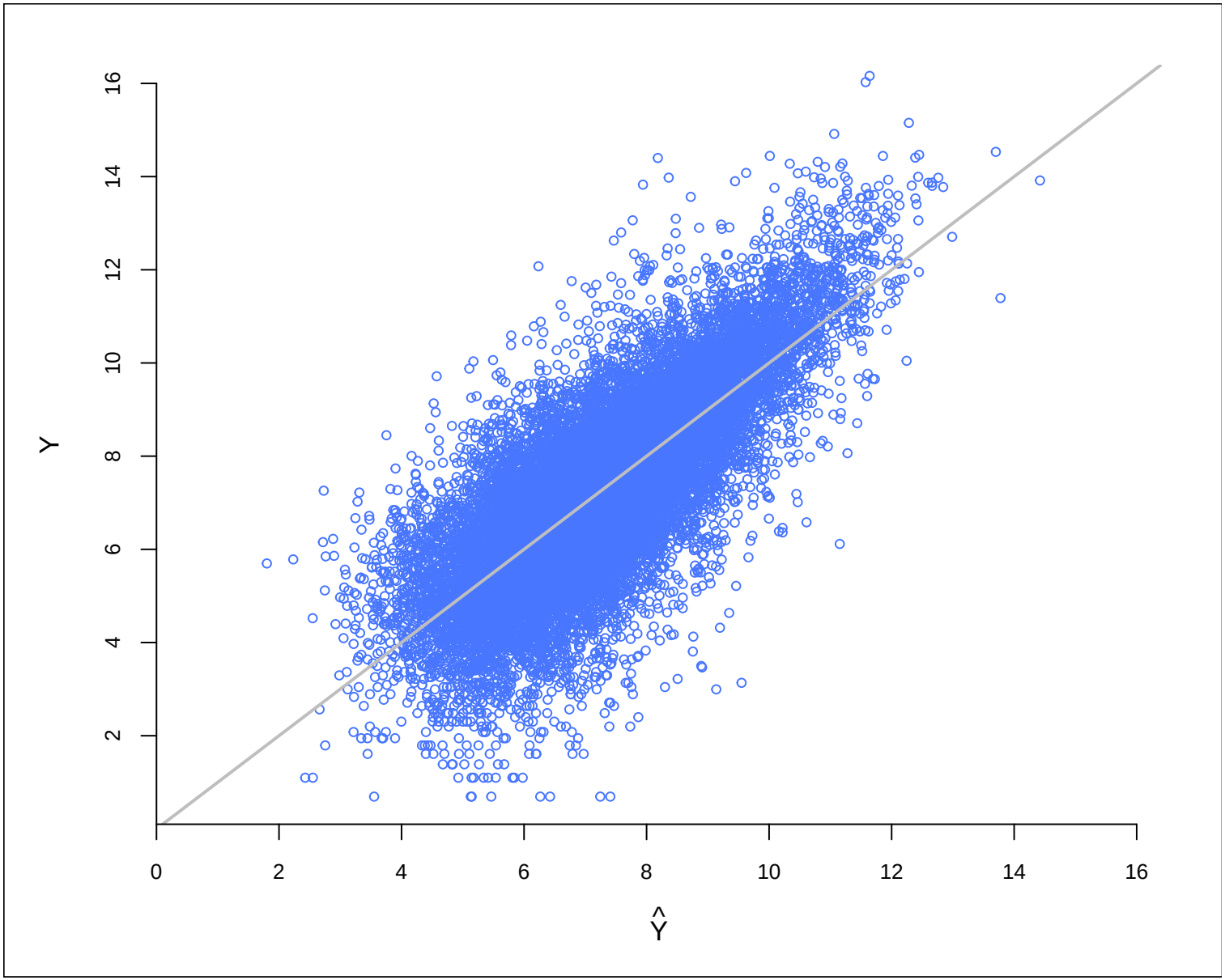
Variable distribution



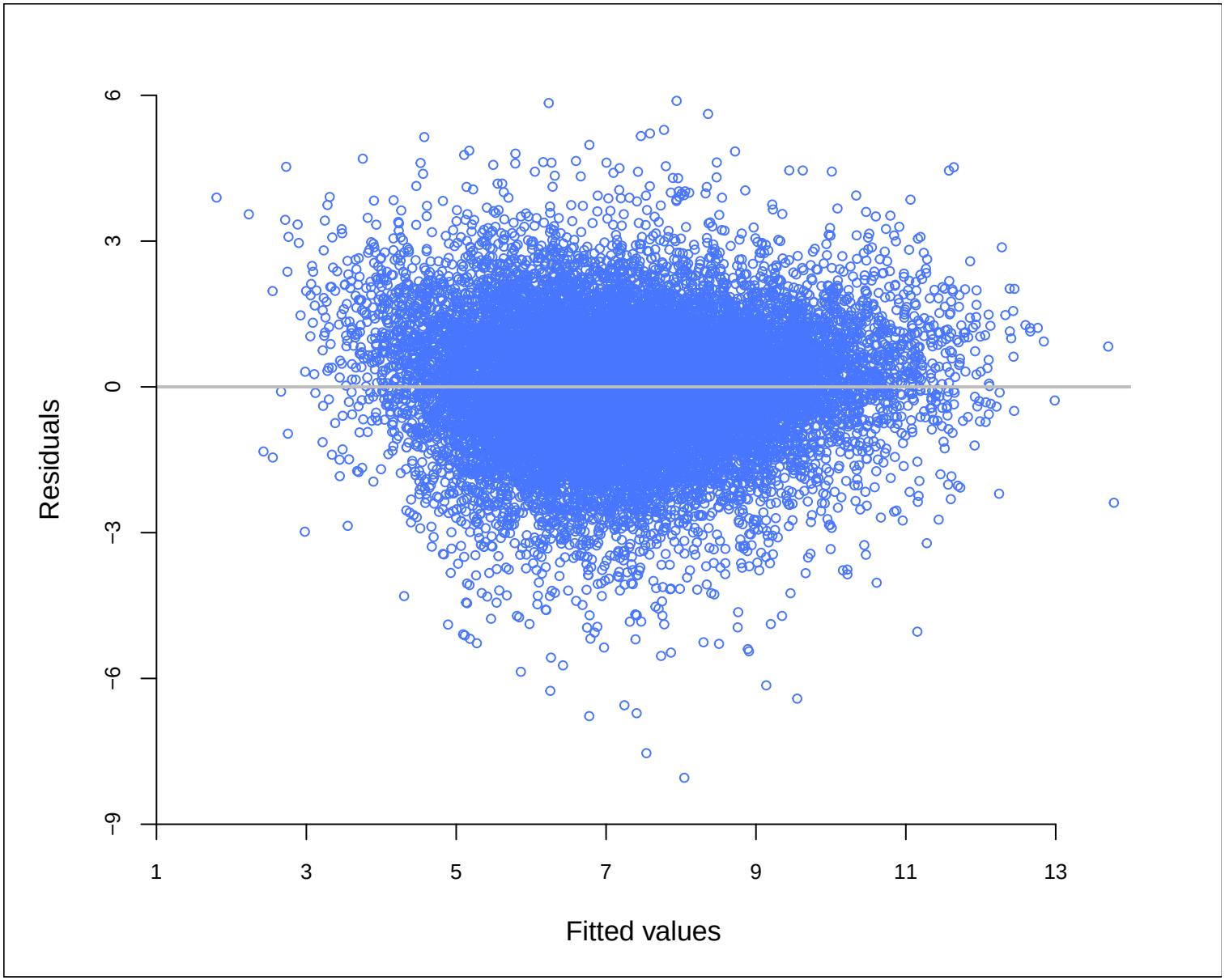
Relation between reported profits and C_i



Goodness-of-fit plot



Diagnostic plot - Heteroskedasticity



Heteroskedasticity tests

Test	F-statistic	p-value
Breusch-Pagan test for heteroskedasticity	55.95	0.00
White test for heteroskedasticity	111.90	0.00

Industry overview

Sector	Number of observations	Manufacturing
Banks	200	-
Chemicals, rubber, plastics, non-metallic products	1,524	✓
Construction	640	✓
Education, Health	93	-
Food, beverages, tobacco	587	✓
Gas, Water, Electricity	105	✓
Hotels & restaurants	108	-
Insurance companies	17	-
Machinery, equipment, furniture, recycling	3,377	✓
Metals & metal products	998	✓
Other industries	5,407	-
Post & telecommunications	154	-
Primary sector	201	✓
Public administration & defense	13	-
Publishing, printing	331	-
Textiles, wearing apparel, leather	532	✓
Transport	778	-
Wholesale & retail trade	3,912	-
Wood, cork, paper	255	✓
Sum	19,232	

Formal bias derivation

According to Wooldridge (2013), one can formally derive the direction of the bias in the following way:
True model:

$$b_i^r = \beta_1 + \beta_2 a_i + \beta_3 l_i + \beta_4 k_i + \beta_5 i_i - \tilde{\gamma} C_i + u_i$$
$$b_i^r = \beta_1 + \boldsymbol{\beta x_i} + \beta_5 i_i - \tilde{\gamma} C_i + u_i$$

with $\boldsymbol{\beta} = (\beta_2, \beta_3, \beta_4)'$ and $\boldsymbol{x_i} = (a_i, l_i, k_i)'$. Underspecified model:

$$\breve{b}_i^r = \breve{\beta}_1 + \breve{\beta}_2 a_i + \breve{\beta}_3 l_i + \breve{\beta}_4 k_i - \breve{\tilde{\gamma}} C_i + \breve{u}_i$$

with $\breve{u}_i = \beta_5 i_i + u_i$. If we assume, for the sake of simplicity, that

$$Corr(C_i, \boldsymbol{x_i}) = 0,$$

then

$$\breve{\tilde{\gamma}} = \hat{\tilde{\gamma}} + \hat{\beta}_5 \tilde{\delta}_1$$

where $\hat{\tilde{\gamma}}$ and $\hat{\beta}_5$ are the slope estimators from the true model and $\tilde{\delta}_1$ is the slope from the simple regression of i_i on C_i.

Bias:

$$\begin{aligned}
\mathbb{E}\left[\breve{\tilde{\gamma}}\right] &= \mathbb{E}\left[\hat{\tilde{\gamma}} + \hat{\beta}_5\tilde{\delta}_1\right] \\
&= \mathbb{E}\left[\hat{\tilde{\gamma}}\right] + \mathbb{E}\left[\hat{\beta}_5\right]\tilde{\delta}_1 \\
&= \tilde{\gamma} + \beta_5\tilde{\delta}_1 \\
Bias(\breve{\tilde{\gamma}}) &= \mathbb{E}\left[\breve{\tilde{\gamma}}\right] - \tilde{\gamma} \\
&= \beta_5\tilde{\delta}_1
\end{aligned}$$

Whether $\breve{\tilde{\gamma}}$ is biased or not as well as the direction of the bias depends on β_5 and $\tilde{\delta}_1$:

- Higher infrastructure expenditures cause governments to charge higher taxes which leads to a higher tax variable for multinationals located in such countries, so $\tilde{\delta}_1 > 0$.
- Infrastructure spending and reported profits are positively correlated as firms which are located in countries with good infrastructure have easier access to consumer markets and improved supply chain management, so $\beta_5 > 0$.

This means that $\beta_5\tilde{\delta}_1$ is positive which implies that $\breve{\tilde{\gamma}}$ in the underspecified model is upward biased.

Test for endogeneity

Following Wooldridge (2013), I run a reduced form regression of C_i on all exogenous independent variables

$$C_i = \pi_0 + \boldsymbol{\pi} \boldsymbol{z_i} + v_i$$

with $\boldsymbol{z_i} = (z_{1,i}, ..., z_{n,i})'$ as vector of exogenous explanatory variables, $\boldsymbol{\pi} = (\pi_1, ..., \pi_n)'$ as vector of the corresponding coefficients and v_i as a random term.

After running OLS, I extract the residuals $\hat{v}_i$. Since all regressors in the reduced form equation are uncorrelated with u_i (they are all assumed to be exogenous), C_i is only uncorrelated with u_i (and thus also exogenous), if and only if v_i is uncorrelated with u_i.

$$u_i = \delta_1 v_i + e_i$$

with e_i as error term.

Consequently, I want to test H_0: $\delta_1 = 0$ against the two-sided alternative by the use of the following equation

$$b_i^r = \beta_1 + \beta_2 a_i + \beta_3 l_i + \beta_4 k_i - \tilde{\gamma} C_i + \delta_1 \hat{v}_i + error.$$

The coefficient estimate on $\hat{v}_i$ is $\hat{\delta}_1 = 0.254$ with a p-value that is zero to twelve decimal places. This is strong evidence for a positive correlation between u_i and v_i and, thus, for C_i being indeed endogenous.

IV approach

Total number of subsidiaries as instrument for the endogenous tax variable:

- Large tax differences depict a necessary but no sufficient condition for profit shifting
- Interaction of domestic tax laws allocating taxing rights between source and residence country are crucial, too
- The more relevant country pairs (proxied by the number of subsidiaries), the higher the possibility for a country pair with gaps in the interaction of tax laws
- Gaps or loopholes in the interaction of domestic tax laws indicate that taxing rights of some sources of income are not clearly allocated between source and residence country
- This often leads to double non-taxation of profits (OECD Action 6: Prevent treaty abuse)
- Both C_i and the number of subsidiaries therefore indicate incentives to shift profits internationally

Estimation results - IV approach

	Estimate	Standard error	p-value
Panel A: Basic estimation results			
Productivity	0.563	0.020	< 0.001
Capital	0.296	0.006	< 0.001
Labor	0.518	0.009	< 0.001
C_i	-0.055	0.016	< 0.001
Industry dummies	✓		
n	19,232		
adjusted R^2	0.60		
Panel B: Infrastructure spending as proxy for infrastructure qualities			
Productivity	0.660	0.030	< 0.001
Capital	0.308	0.009	< 0.001
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C_i	-0.175	0.020	< 0.001
Industry dummies	✓		
n	10,062		
adjusted R^2	0.61		
Panel C: Log of number of affiliates as instrument			
First stage: C_i as dependent variable			
Productivity	0.115	0.009	< 0.001
Capital	0.016	0.002	< 0.001
Labor	0.001	0.003	0.783
Number of subsidiaries	0.085	0.004	< 0.001
Interaction term	-0.173	0.003	< 0.001
Industry dummies	✓		
n	19,232		
adjusted R^2	0.29		
Second stage: b_i^r as dependent variable			
Productivity	0.599	0.019	< 0.001
Capital	0.301	0.005	< 0.001
Labor	0.518	0.007	< 0.001
$\hat{C}_i$	-0.233	0.029	< 0.001
Industry dummies	✓		
n	19,232		
adjusted R^2	0.59		

Simulation of tax base elasticities

$$\frac{1}{B_i^r}\frac{dB_i^r}{d\tau_i} = \underbrace{\frac{1}{B_i^r}\frac{dB_i^r}{dC_i}}_{\hat{\hat{\gamma}}}\frac{dC_i}{d\tau_i}$$

$$\frac{1}{B_i^r}\frac{dB_i^r}{d\tau_i} = \hat{\hat{\gamma}}\frac{dC_i}{d\tau_i}$$

$$dB_i^r = B_i^r\hat{\hat{\gamma}}\frac{dC_i}{d\tau_i}d\tau_i$$

$$\sum_{j=1}^{k} dB_i^{r,j} = d\bar{B}_i^r \qquad \text{with } k \text{ as the number of companies located in country } i$$

$$El_{\tau_i}\bar{B}_i^r = \frac{\tau_i}{\bar{B}_i^r}\frac{d\bar{B}_i^r}{d\tau_i}$$