How Low Business Tax Rates Attract Multinational Headquarters: Municipality-Level Evidence from Germany

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- Countries use other tax instruments as well as trade policy to attract investors. (Public finance)
- Countries/regions exhibit agglomeration forces (maybe given by ‘nature’) which prevent a race to the bottom in profit taxes. (New Economic Geography)
Motivation

Empirical work at various levels of aggregation documents the responsiveness to tax rates of MNE location across countries (Review and meta analysis in de Mooij and Ederveen, 2003, 2006)

1. Applications tend to ignore the issue of zero investments. (Much more important than zero trade flows!) → Selection bias.
2. Cross-country studies may be affected by omitted variables (e.g., other aspects of the tax system or institutions). → Omitted variables bias.
3. Applications tend to ignore that some countries do not tax profits uniformly across regions within their realm (e.g., Germany, Switzerland, United States). → Regional aggregation bias.
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- Uses panel data about the universe of German inward FDI over the period 2001-2005.
- Entertains variation across +11,000 German municipalities which may levy business tax rates autonomously (matching municipality-level data with firm-level from different sources).
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Hopefully provides a suitable estimate of the responsiveness of firm
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Advantage 4: the method of data collection is identical across cross-sectional units (not for aggregate data from OECD/UNCTAD).
An example of competition for headquarters location in Germany

- In 2005 Holzkirchen lowered its business tax rate to appeal to Sandoz, a big pharmaceutical firm.

"For a municipality like Holzkirchen it is a stroke of luck to host an international enterprise like Sandoz. We benefit not only because of the jobs but also through the many positive impulses for the future growth of our municipality."

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→ Attracting regional headquarters of a foreign MNE promises jobs and local business tax income.
Panel of number of foreign MNEs (regional headquarters in Germany) per municipality
Source: Deutsche Bundesbank (MiDi)
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Panel of demographic, geographical, and public finance data for 11,094 municipalities over 2001-2005
Sources: German Federal Labor Agency; Statistical Offices of the Länder
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Table 1: Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. dev</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business tax rate</td>
<td>0.14</td>
<td>0.01</td>
<td>0.09</td>
<td>0.31</td>
</tr>
<tr>
<td>General expenditures</td>
<td>16198.13</td>
<td>248476</td>
<td>15.57</td>
<td>21800000</td>
</tr>
<tr>
<td>Investment expenditure</td>
<td>1449.84</td>
<td>9160.54</td>
<td>0</td>
<td>519200</td>
</tr>
<tr>
<td>Population</td>
<td>7.03</td>
<td>45.45</td>
<td>0.005</td>
<td>3395.18</td>
</tr>
<tr>
<td>Skilled labor share</td>
<td>0.06</td>
<td>0.03</td>
<td>0.003</td>
<td>0.59</td>
</tr>
<tr>
<td>Area buildings</td>
<td>3.79</td>
<td>10.68</td>
<td>0.01</td>
<td>619.28</td>
</tr>
<tr>
<td>Area total</td>
<td>28.27</td>
<td>35.08</td>
<td>0.4</td>
<td>891.82</td>
</tr>
</tbody>
</table>

Statistics refer to 11,208 German municipalities in 2005.
Expenditures in 1000 Euros. Population in 1000. Area in km².
Variation in municipal business tax rates is large
Geographical distribution of regional headquarters is skewed
Number of zero headquarters is large

86% Zero Observations
Mean = 0.8
Std. Dev. = 11.08
Max = 615

Number of Multinational Headquarters in a Municipality
Simple correlation between number of MNE headquarters and tax rates looks odd.
First conclusions

- The median municipality is unable to attract foreign headquarters.
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Not surprising: business tax rates are not the only thing MNEs care about.

Calls for a multivariate regression approach for inference.
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## Included covariates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAX</td>
<td>ln (tax rate)</td>
</tr>
<tr>
<td>SKILL</td>
<td>ln (share of employees with tertiary education)</td>
</tr>
<tr>
<td>POPDEN</td>
<td>ln (total population / total area)</td>
</tr>
<tr>
<td>AREA</td>
<td>ln (total area)</td>
</tr>
<tr>
<td>IDEPRAT</td>
<td>ln (population aged 15-65 / total population)</td>
</tr>
<tr>
<td>BUILT</td>
<td>ln (built area / total area)</td>
</tr>
<tr>
<td>INV</td>
<td>ln (investment expenditure / total expenditure)</td>
</tr>
<tr>
<td>EAST</td>
<td>Dummy for East Germany</td>
</tr>
</tbody>
</table>
Numerous zeros and small numbers of headquarters call for a count data approach.
Estimation issues

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- Specific attention should be paid to zeros (overdispersion: variance differs from the mean).
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  - Neighboring (within 25-50 km) municipalities’ characteristics are suitable instruments:
    - Independency ratio; Skilled labor share; Area; Share of area dedicated to agriculture; Share of area dedicated to buildings.
    - (Corresponds to a reduced-form spatial econometric approach.) available).
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  - Endogeneity of the regressors in the between dimension may be eliminated by quasi-differencing (Chamberlain 1992; Windmeijer 2006).
### Cross Section Model Results for 2005 – Exogenous Taxes

**Table 3: Cross-Section, Year 2005**

<table>
<thead>
<tr>
<th>Indep. variables</th>
<th>Negative binomial</th>
<th>Zero-inflated negative binomial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dep. var MNE</td>
<td>Dep. var NEWMNE</td>
</tr>
<tr>
<td><strong>TAX</strong></td>
<td>$-2.514^{***}$</td>
<td>$-2.594^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.332)$</td>
<td>$(0.894)$</td>
</tr>
<tr>
<td><strong>SKILL</strong></td>
<td>$0.612^{***}$</td>
<td>$1.296^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.069)$</td>
<td>$(0.179)$</td>
</tr>
<tr>
<td><strong>POPDEN</strong></td>
<td>$1.115^{***}$</td>
<td>$0.873^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.099)$</td>
<td>$(0.279)$</td>
</tr>
<tr>
<td><strong>AREA</strong></td>
<td>$1.198^{***}$</td>
<td>$1.024^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.032)$</td>
<td>$(0.079)$</td>
</tr>
<tr>
<td><strong>IDEPRAT</strong></td>
<td>$1.727^{**}$</td>
<td>$3.936$</td>
</tr>
<tr>
<td></td>
<td>$(0.873)$</td>
<td>$(2.73)$</td>
</tr>
<tr>
<td><strong>BUILT</strong></td>
<td>$0.762^{***}$</td>
<td>$0.932^*$</td>
</tr>
<tr>
<td></td>
<td>$(0.167)$</td>
<td>$(0.480)$</td>
</tr>
<tr>
<td><strong>INV</strong></td>
<td>$-0.002$</td>
<td>$0.02$</td>
</tr>
<tr>
<td></td>
<td>$(0.042)$</td>
<td>$(0.133)$</td>
</tr>
<tr>
<td><strong>EAST</strong></td>
<td>$-0.789^{***}$</td>
<td>$-1.033^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.124)$</td>
<td>$(0.327)$</td>
</tr>
<tr>
<td><strong>constant</strong></td>
<td>$-12.24^{***}$</td>
<td>$-10.65^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(1.061)$</td>
<td>$(2.723)$</td>
</tr>
</tbody>
</table>

| Observations     | 11208             | 11208                          | 11208          | 11208            |
| Nonzero obs.     | 1631              | 229                            | 1631           | 229              |
| Marginal effect  |                  |                                |                |                  |
| of **TAX**       | $-0.17^{***}$     | $-0.008^{***}$                 | $-0.22^{***}$  | $-0.05^*$        |
|                  | $(0.02)$          | $(0.003)$                      | $(0.06)$       | $(0.02)$         |
### Cross section and panel model results for endogenous taxes

<table>
<thead>
<tr>
<th>Dependent variable: MNE</th>
<th>TAX Instrumented</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indep. variables</strong></td>
<td>Cross section 2005</td>
</tr>
<tr>
<td><code>TAX</code></td>
<td>$-5.34^{**}$</td>
</tr>
<tr>
<td></td>
<td>$(2.21)$</td>
</tr>
<tr>
<td><code>SKILL</code></td>
<td>$0.46^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.16)$</td>
</tr>
<tr>
<td><code>POPDEN</code></td>
<td>$0.66^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.17)$</td>
</tr>
<tr>
<td><code>AREA</code></td>
<td>$1.63^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.10)$</td>
</tr>
<tr>
<td><code>IDEPRAT</code></td>
<td>$0.32$</td>
</tr>
<tr>
<td></td>
<td>$(2.67)$</td>
</tr>
<tr>
<td><code>BUILT</code></td>
<td>$2.00^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(0.29)$</td>
</tr>
<tr>
<td><code>INV</code></td>
<td>$0.05$</td>
</tr>
<tr>
<td></td>
<td>$(0.15)$</td>
</tr>
<tr>
<td><code>EAST</code></td>
<td>$-0.05$</td>
</tr>
<tr>
<td></td>
<td>$(0.38)$</td>
</tr>
<tr>
<td><strong>constant</strong></td>
<td>$-19.36^{***}$</td>
</tr>
<tr>
<td></td>
<td>$(4.82)$</td>
</tr>
<tr>
<td><strong>Sargan test</strong></td>
<td>4.95</td>
</tr>
<tr>
<td></td>
<td>dof 5</td>
</tr>
<tr>
<td></td>
<td>p-value 0.42</td>
</tr>
</tbody>
</table>

| Observations | 10878 N | 11094 NT | 39348 |

Valeria Merlo (University of Munich)  Headquarters Location & Local Tax Rates  NASM 2009
Main findings

- Municipal business tax rate has a negative impact on the number of MNE headquarters a municipality can attract, irrespective of whether we assume that business tax rates are endogenous or not.
  → Conditioning on important determinants of location decisions beyond taxes is important for inference.

On average, a 1%-reduction of the municipal business tax rate leads to an increase in the number of headquarters by about 0.05.

→ The average municipality would need to lower its business tax rate by at least 20% (or 2.8 percentage points) to attract only 1 foreign headquarters.

→ A marginal reduction of business tax rates in the average municipality is not enough to attract foreign MNEs.

Consistent with descriptive evidence: the average municipality is unable to attract foreign headquarters.

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