Following the green trail: Identifying FDI environmental spillovers on Chinese firms

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Abstract

• This study investigates the causal impact of foreign direct investment (FDI) on environmental outcomes of Chinese domestic firms by leveraging the exogenous relaxation of FDI regulations during China’s accession to the WTO.
• Our shock-based IV results reveal the presence of foreign firms has positive intra-industry spillover effects on the environmental performance of domestic firms. Within the same industry, the positive spillovers are attributed to the dominant agglomeration effect over the competition effect of FDI. Our analysis of pollution abatement suggests that domestic firms adopt both production processes and end-of-pipe reduction strategies.
• These findings support the pollution halo hypothesis and provide important policy implications for emerging economies seeking to achieve sustainable development.

Baseline Results

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>COD intensity</th>
<th>SO2 intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>The second stage: dependent variable is Pollutants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDI sector</td>
<td>3.243**</td>
<td>3.490***</td>
</tr>
<tr>
<td>(1.542)</td>
<td>(1.170)</td>
<td>(0.594)</td>
</tr>
<tr>
<td>The first stage: dependent variable is FDI sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TreatmentPost02</td>
<td>0.023***</td>
<td>0.024***</td>
</tr>
<tr>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Firm Controls</td>
<td>Yes Yes Yes Yes</td>
<td></td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes Yes Yes Yes</td>
<td></td>
</tr>
<tr>
<td>FDI determinants + year dummies  No Yes No Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tariff reductions + year dummies  No Yes No Yes</td>
<td></td>
<td></td>
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<tr>
<td>Kleibergen-Paap F statistic: 14.675 17.783 14.675 17.783</td>
<td></td>
<td></td>
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<tr>
<td>Observations 230,856 230,628 230,856 230,628</td>
<td></td>
<td></td>
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<tr>
<td>Adjusted R2 0.376 0.355 0.304 0.317</td>
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</tbody>
</table>

We find that the presence of FDI has a positive spillover effect on the environmental performance of domestic firms within the same industry.

Identification assumptions:
- Parallel trend checks
- Alleviate non-random treatment timing concerns
- Alleviate non-random selection of the treatment group concerns

Robustness checks:
- Exclusion of exports in the construction of the FDI presence variable
- Alternative measurement of firm environmental performance
- Composition of foreign multinationals: include the percentage of wholly-owned multinationals in all foreign multinationals
- Controlling for systematic changes
- Controlling for special economic zones effect

Further Analysis

- Horizontal FDI spillover mechanisms
  - Knowledge spillover effect (support): More significantly positive FDI effect for firms with higher absorptive capacity and those in regions facing more stringent environmental regulations.
  - Competition effect (limited evidence):
  - The effect of horizontal FDI is not contingent on different degrees of market competition across industries.
  - Comparing these two potential mechanisms:
    - Supporting knowledge spillovers, with larger positive effects for FDI located in the same city and from developed countries.
- Vertical FDI environmental spillovers
  - Insignificant spillovers for domestic firms forward or backward linked to FDI.
- Firms’ pollution abatement strategies
  - Reduce pollution through production process control and end-of-pipe treatment.

Data

- Firm-level data
- Production data: Annual Survey of Industrial Firms (ASIF) from 1998 to 2007
- Emission data: the Environmental Survey and Reporting (ESR) database
- FDI deregulation data
- Backward and Forward industry linkage data
- China’s 2002 Input–Output Table

References