Import and Productivity of Multi-Product Firms

Richard Braeuer, Matthias Mertens, Viktor Slavtchev

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(Import) Competition

- Erodes profits
- Pushes firms out of comfort zone
- Might even threaten existence
- Firms try to improve efficiency
Prior Research

- Trade liberalization (in general) and firm productivity
  - U.S. manufacturing (Bernard, Jensen and Schott 2006)
  - Indonesian firms (Amiti and Konings 2007)
  - Belgian textile industry firms (De Locker 2011)
  - Chilean manufacturers (Pavcnik 2002)
  - Indian firms (Topalova and Khandelwal 2011)
- Import competition
  - Employment, wages (Autor, Dorn and Hanson 2013; Dauth, Findeisen and Suedekum 2014, 2016)
  - Innovation (Autor et al. 2016; Bloom, Draca and Van Reenen 2015)
  - Survival, growth (Bernard, Jensen and Schott 2006)
  - Political radicalization (Autor et al. 2016; Dippel, Gold and Heblich 2015)
- However
  - Fairly rough measures (tariff reductions, industry level)
  - Exact mechanisms unclear
**This Paper**

- Analyzes the effects of IC on firm productivity
  - Focus on the competition channel among other impact channels of trade liberalization (exports, price/quality of inputs)
  - Focus on within firm effects; role of competition not limited to the mechanisms of sorting and selection of firms and (more) efficient (re-)allocation of factors of production between firms (Melitz 2003)

- Considers that firms are multiproduct and heterogeneous to
  - Account for unobserved heterogeneity that might be a source of measurement error and/or bias TFP
  - Assess firm-specific import competition

- Differential effects
  - Import country of origin
  - Core vs non-core products
  - Single-product vs multiproduct firms
IC in different product categories
IC from different countries

IC middle-/low-income countries

TFP

IC high-income countries
Data and Approach

• Administrative data on multi-product manufacturing firms in Germany
  – Prices (factory gate) and quantities of products 8-digit PRODCOM 2002 by firm
  – 2001-2014
  – 15,000 firms (here)
  – 3,500 products

• UN Comtrade (bilateral trade flows PRODCOM 2002 8-digit product level)

• 3 step approach
  – Estimate firm TFP
  – Measure firm-specific strenght of import competition
  – Causal impact of import competition in TFP
Estimating TFP

• CD production technology (in logs)

\[ r_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + h \left( \frac{M^{-1}(l_{it-1}, k_{it-1}, m_{it-1}^{\text{flex}}, z_{it-1})}{\omega_{it-1}} \right) + \gamma p_{it} + \xi_{it} + \epsilon_{it} \]

• Firm-specific price index to account for firm heterogeneity: firm-specific demand shocks/markups, and output-price bias
  – Eslava et al. 2004; Foster, Haltiwanger and Syverson 2008; De Locker 2011

• \( z \) further variables to account for firm-specific factors/shocks to productivity
  – EX, # products, R&D, location, IC (De Loecker and Warzynski 2012)

• \( p \) Firm-specific price for the composite output to account for input-price/quality differences (De Loecker et al. 2016)
Estimating TFP

- LP/Wooldridge estimator / Identifying moment conditions
  - Separate estimations for 2-digit NACE Rev 1.1 sectors

\[
E(\xi_{it} + \varepsilon_{it} | l_{it}, k_{it}, m_{it-1}, l_{it-1}, k_{it-1}, m_{it-1}^{\text{flex}}, z_{it-1}, \Gamma_{it-1}, p_{it-1}) = 0
\]

- TFP

\[
\hat{\omega}_{it} = r_{it} - (\hat{\beta}_l l_{it} + \hat{\beta}_k k_{it} + \hat{\beta}_m m_{it} + \hat{\rho} p_{it})
\]
Measuring firm-specific import competition

- Sum of market shares of country(-group) $n$ on the domestic markets for products $g$ available in firm’s $i$ portfolio, each weighted with the share of the respective product in firm’s total revenue

$$IC^n_{it} = \sum_g \left[ \frac{Y_{igt}}{\sum_g Y_{igt}} \right] \left[ \frac{M^n_{gt}}{\sum_n M^n_{gt} + \sum_i Y_{igt}} \right] * 100$$
Identifying the Effect of Import Competition on Productivity

\[ \omega_{ijt} = \beta^n \text{IC}^{n}_{it-1} + \mu_i + \mu_{jt} + X'_{it-1} * \gamma + \varepsilon_{ijt} \]

- OLS likely to underestimate
  - reverse causality (e.g. IC strong where domestic firms weak)
  - OV bias (e.g. industrial policy to increase TFP weaken IC)
  - measurement error

- 2SLS
  - Instrument: IC from country(-group) \( n \) in \textit{third} countries, not related to Germany and \( n \) to avoid common shocks

\[ \text{IC}^{n \rightarrow \text{third}}_{it-1} = \sum_g \left[ \frac{Y_{igt-1}}{\sum_g Y_{igt-1}} \right] \left[ \frac{M^{n \rightarrow \text{third}}_{gt-1}}{\sum M^{n \rightarrow \text{third}}_{gt-1}} \right] \]

  - past product portfolio
## Effects of IC on Firm TFP (log) - Main Results

<table>
<thead>
<tr>
<th></th>
<th>All firms</th>
<th>Single-prod firms</th>
<th>Multi-product firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>total</td>
<td>country</td>
<td>total</td>
</tr>
<tr>
<td></td>
<td>imports</td>
<td>of import origin</td>
<td>imports</td>
</tr>
<tr>
<td>IC_All_Countries</td>
<td>0.0019*</td>
<td>(0.0010)</td>
<td>0.0047**</td>
</tr>
<tr>
<td>IC_High_Income</td>
<td>0.0112***</td>
<td>(0.0043)</td>
<td>0.0242*</td>
</tr>
<tr>
<td>IC_Low_Income</td>
<td>-0.0002</td>
<td>(0.0011)</td>
<td>0.0017</td>
</tr>
<tr>
<td>IC_Core_Prod_High_Income</td>
<td></td>
<td></td>
<td>0.0065***</td>
</tr>
<tr>
<td>IC_non_Core_Prod_High_Income</td>
<td></td>
<td></td>
<td>0.0007</td>
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<tr>
<td>IC_Core_Prod_Low_Income</td>
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<td>-0.0017</td>
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<tr>
<td>IC_non_Core_Prod_Low_Income</td>
<td></td>
<td></td>
<td>-0.0025</td>
</tr>
<tr>
<td>Obs. / No. firms</td>
<td>69,588 / 14,772</td>
<td>20,346 / 4,778</td>
<td>53,217 / 10,202</td>
</tr>
<tr>
<td>R2</td>
<td>0.991</td>
<td>0.992</td>
<td>0.992</td>
</tr>
<tr>
<td>Wald-F</td>
<td>131.5</td>
<td>29.07</td>
<td>41.02</td>
</tr>
</tbody>
</table>

2SLS. Standard errors clustered at firm-level (in parentheses). *** p<0.01, ** p<0.05, * p<0.1. Included controls: revenue share with exports, number of products, time FE, firm*industry FE.
Summary and Conclusions

- Apply recent methods to more accurately assess firm TFP
- Use firm-specific measure for IC

- Sorting, selection, exit, reallocation not the only channel
- IC stimulates productivity improvements within firms
- Import origin matters
  - Distance to frontier, embodied technology, quality, price
- Different effects for different firms -> differentiated policy

- Interesting for further research
  - Effects stronger for exporters than for non-exporters: international ‘experience’ matters?
  - Effects stronger for radical product switchers: product portfolio adjustment important mechanism behind productivity?
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viktor.slavtchev@iwh-halle.de