Credit Constraints, Technology Choice and Exports - A Firm Level Study for Latin American Countries

Syed Hasan and Ian Sheldon

Ohio State University

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Research Motivation

- Trade liberalization benefits are not fully realized by firms in developing countries
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- Technology lag and imperfect financial markets in developing countries
Trade liberalization benefits are not fully realized by firms in developing countries

Technology lag and imperfect financial markets in developing countries

Quantify Credit constraints faced by manufacturing firms
  - Investment in capital goods
  - Cost of foreign market participation
Theoretical Background

- Within Industry Firm Level Heterogeneity
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- More productive firms - more likely to export Clerides et al. (1998)
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- Assumptions: Identical fixed costs of production, Same production technology, No credit constraints
Within Industry Firm Level Heterogeneity

More productive firms—more likely to export Clerides et al. (1998)

Melitz (2003) model; Monopolistic competition-IRTS-heterogeneous firms—only highly productive firms are engaged in export

Assumptions: Identical fixed costs of production, Same production technology, No credit constraints

Extensions; Schmidt (2010), Monova (2008)
Extensions in Melitz Model

Technology Choice-Schmidt (2010)

\[ TC_T = \eta_T f + \frac{q_T}{\varphi_T} \]

\[ \eta_H > \eta_M > \eta_L = 1 \]

\[ \varphi^H > \varphi^M > \varphi^L \]

\[ \pi_h (\varphi^L_0) = p_h (\varphi^L_0) q_h (\varphi^L_0) - \frac{q_h (\varphi^L_0)}{\varphi^L_0} - f \]

\[ \pi_h (\varphi^M_1) + \pi_f (\varphi^M_1) = \frac{(1+\tau^{1-\sigma})}{\rho} \quad E(P \rho)^{\sigma-1} (\varphi^M_1)^{\sigma-1} \quad - \eta_M f - f_x \]
Fixed Cost Relevance for Export

- Enter the market
- Production cost
- Determines productivity
- Investment in level of technology
Fixed Cost Relevance for Export

- $f$ Enter the market  Production cost-Determines productivity-Investment in level of technology
- $f_x$ Foreign market entry cost- Establishment of foreign market distribution network, information gathering
Fixed Cost Relevance for Export

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  Production cost-Determines productivity-Investment in level of technology

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- Optimal investment decision -solve the profit maximization problem
Model Setup

- Two time periods $t_0$ and $t_1$
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- Introduce technology choice and credit constraints in Melitz (2003) model
Model Setup

- Two time periods $t_0$ and $t_1$
- Introduce technology choice and credit constraints in Melitz (2003) model
- Determine the credit required to upgrade technology

\[
C\left(\varphi_0^L\right) = (E\alpha)^{\frac{1}{\beta}} \left[\frac{\sigma - 1}{\sigma}\right]^{\frac{\sigma}{\beta}} \left[ P\varphi_0^L \right]^{\frac{\sigma - 1}{\beta}} \left[ \frac{\delta}{1 + \tau^{1-\sigma}} \right]^{\frac{1}{\beta}} \left[ \frac{1}{R\left(\varphi_0^L, .\right)} \right]^{\frac{1}{\beta}}
\]
## Data

### Table: Countries and Share in Sample

<table>
<thead>
<tr>
<th>Country</th>
<th>Firms</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>594</td>
<td>29.2</td>
</tr>
<tr>
<td>Bolivia</td>
<td>132</td>
<td>6.49</td>
</tr>
<tr>
<td>Chile</td>
<td>388</td>
<td>19.08</td>
</tr>
<tr>
<td>Colombia</td>
<td>368</td>
<td>18.09</td>
</tr>
<tr>
<td>Mexico</td>
<td>314</td>
<td>15.44</td>
</tr>
<tr>
<td>Peru</td>
<td>238</td>
<td>11.70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2034</td>
<td>100</td>
</tr>
</tbody>
</table>

**Data Source:** Enterprise Survey by World Bank; 2006-2010
Hypotheses

▶ Extensive Margin of Trade: Credit availability increases the likelihood of export by a firm.
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- Intensive Margin of Trade: The volume of exports by a firm is likely to increase with the availability of credit.
- Credit availability and likelihood of Capital investment
- Investment in Capital goods and likelihood of export
Regression Model

\[ y_{it} = \beta_0 + \beta_c Credit_{it} + \gamma Z_i + \mu_{it} \]
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- The dependent variable is export decision, export share in sales and capital investment
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- The dependent variable is export decision, export share in sales and capital investment

\[ Export_{it} = \beta_0 + \beta_c \text{Invest}_{it} + \gamma Z_i + \mu_{it} \]
Robustness Checks

- Endogeneity of Credit
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- Heteroskedasticity
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- Instrumental Variables/2SLS, GMM
Robustness Checks

- Endogeneity of Credit
- Heteroskedasticity
- Instrumental Variables/2SLS,GMM
- Semi-parametric maximum likelihood estimation (Klein Spady, 1993)
### Regression Results for Hypothesis (i)-(iii)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit</td>
<td>0.19*</td>
<td>-0.42</td>
<td>0.68***</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.28)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>Skilled Labor</td>
<td>0.01</td>
<td>-0.001</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.09)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Support Staff</td>
<td>0.01</td>
<td>-0.06</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.161)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>Conglo</td>
<td>0.013</td>
<td>-0.208*</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.070)</td>
<td>(0.059)</td>
</tr>
<tr>
<td>N</td>
<td>1733</td>
<td>591</td>
<td>1933</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.012</td>
<td>0.056</td>
<td>0.16</td>
</tr>
<tr>
<td>Country/Ind FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sargan Stat</td>
<td>0.15</td>
<td>0.464</td>
<td>0.334</td>
</tr>
</tbody>
</table>
### Table: Regression for Export and Investment

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Panel XTIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVEST</td>
<td>0.144**</td>
</tr>
<tr>
<td></td>
<td>(0.0645)</td>
</tr>
<tr>
<td>LABEMP</td>
<td>0.0749</td>
</tr>
<tr>
<td></td>
<td>(0.0664)</td>
</tr>
<tr>
<td>CONGLO</td>
<td>0.0401</td>
</tr>
<tr>
<td></td>
<td>(0.0553)</td>
</tr>
<tr>
<td>Observations</td>
<td>788</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.281</td>
</tr>
<tr>
<td>Sargan Test Stat.</td>
<td>0.152</td>
</tr>
</tbody>
</table>
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> Conclusion and Policy Implications
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Credit is positive and significant for export and investment
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- Prospective exporters can grab foreign market share
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- Prospective exporters can grab foreign market share
- Divert resources from trade subsidies to credit for potential exporters