Modes of Exports by Sub-Saharan African Firms: Intensive Margins and Interdependencies

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- A survey conducted by World Bank (2002-09) for 151 countries revealed that 25% of exporting firms export indirectly.
- The Middle East and the North Africa region has the largest proportion of indirect exporters (46%) and the Sub-Saharan Africa has 35%.
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- And almost never, policy makers made these distinctions when formulating policies that affect exporters.
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- The roles of intermediaries are explored by Rauch and Watson (2004) and Petropoulou (2007) by developing a model that bridges the networking gap between producers and consumers.
- Bernard et al. (2010a) conduct an empirical investigation on the role of intermediaries and examine how they differ from manufacturing firms, using cross-border transactions data for Italy.
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A third category of firms chooses to export indirectly through intermediaries.
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- We formulate a theoretical framework and support its predictions with data from Sub-Saharan countries.
- We try to answer questions such as how does change in efficiency level by one mode exporter affects the production decision of the other mode exporter in the same industry?
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- We find that the socially optimal policy is to tax direct exporters.
- Competition among direct exporters has a negative effect on export production for both direct and indirect exporters.
Theoretical Analysis

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- \( X \) is the total demand in the export market, i.e., \( X = nx^d + x^{id} + g \), with \( x^d \): output of each direct exporter, \( x^{id} \): the output the indirect-exporting firms, and \( g \): exogenous output from other suppliers in other countries than the country in consideration here.
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- Profits of the representative indirect-exporting firm (producer) and the intermediary firm (seller) are given, respectively, by
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Assuming Cournot competition, the profit-maximizing condition for each direct exporting firms is
\[ \frac{\partial \pi_d^i}{\partial x_i^d} = (\alpha - \beta X) - \beta x_i^d - 2\delta x_i^d + s = 0, \]
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- The welfare of the country is defined as
  \[W = n\pi^d + \pi^{id} + \pi^m - nsx^d.\] consumer surplus being absent as all outputs are exported.
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where for stability of the Nash equilibrium we must have $\Delta = 2\beta^2 + 4\beta \gamma + 8\delta \gamma + n\beta^2 + 4\beta \delta + 4n\beta \gamma > 0$. The results are as one would expect an increase in inefficiency of one type of firm decreases its own output and increases the output of the other type.
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An increase in the number of direct-exporting firms, increases the level of competition in the industry and reduces the output of each and every firm in the industry: direct-exporting firms and indirect-exporting firms.
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- That is, for both the direct-exporting and the indirect exporting firms, the indirect effect can sometime dominate; however, under the stated sufficient condition the direct effects dominate.
Empirical Analysis

From the theoretical model in last section, we derive two sets of hypotheses to test.
Empirical Analysis

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- Following the first set of results for the case of exogenous subsidy, we test the hypothesis that a positive relationship exists between exporter’s own efficiency and subsidy levels and its level of exports and negative cross effects.
Empirical Analysis

- From the theoretical model in last section, we derive two sets of hypotheses to test.
- The first set is when subsidy is exogenous and the second set is when it is endogenous.
- Following the first set of results for the case of exogenous subsidy, we test the hypothesis that a positive relationship exists between exporter’s own efficiency and subsidy levels and its level of exports and negative cross effects.
- The theory also predicts that the effects of competition on export levels of both direct and indirect mode exporters are negative.
We test the predictions for the case of exogenous subsidy by estimating Ordinary Least Square (OLS) regressions.
Empirical Analysis

- We test the predictions for the case of exogenous subsidy by estimating Ordinary Least Square (OLS) regressions.
- We regress log net sales from export for both direct and indirect exporters against a number of explanatory variables such as representing levels of efficiency, level of cross efficiency, competition, and subsidy.
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The estimated equations for $d$ (direct) and $id$ (indirect):

$$\log(\text{Export}_{i,j,k}^d) = \theta_0 + \theta_1 \text{Efficiency}_{ijk}^d + \theta_2 \text{Cefficiency}_{j,k}^d + \theta_3 \text{Competition}_{j,k} + \theta_4 \text{mtax}_{j,k} + \sum \vartheta_h Z_{i,j,k} + \mu_{i,j,k}$$

$$\log(\text{Export}_{i,j,k}^{id}) = \psi_0 + \psi_1 \text{Efficiency}_{ijk}^{id} + \psi_2 \text{Cefficiency}_{j,k}^{id} + \psi_3 \text{Competition}_{j,k} + \psi_4 \text{mtax}_{j,k} + \sum \kappa_h Z_{i,j,k} + \omega_{i,j,k}$$

where $\mu_{i,j,k}$ and $\omega_{i,j,k}$ are random error terms for firm $i$ in sector $j$ from country $k$. The efficiency level is $\text{Efficiency}_{i,j,k}$.
Empirical Analysis

- The other key variables are the sectoral average cross-efficiency levels represented by $\text{Cefficiency}^d_{j,k}$ and $\text{Cefficiency}^id_{j,k}$, $\text{Competition}_{j,k}$ for sector $j$ in country $k$. 
Empirical Analysis

- The other key variables are the sectoral average cross-efficiency levels represented by $C_{efficiency}^{d,j,k}$ and $C_{efficiency}^{id,j,k}$, Competition$_{j,k}$ for sector $j$ in country $k$.
- The variable $mtax_{j,k}$ represents tax facing individual firms in sector $j$ in country $k$. $Z_{i,j,k}$ are other firm characteristics.
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The variable $m_{\text{tax}}_{j,k}$ represents tax facing individual firms in sector $j$ in country $k$. $Z_{i,j,k}$ are other firm characteristics.

The second set of regressions consider the endogenous subsidy. For this we add another sector-level equation:

$$m_{\text{tax}}_{j,k} = \varphi_0 + \varphi_1 A_{\text{vEfficiency}}^{d}_{j,k} + \varphi_2 A_{\text{vEfficiency}}^{id}_{j,k} + \varphi_3 \text{Competition}_{j,k} + \varphi_4 \text{Interaction}_{j,k} + \sum \zeta_h H_{j,k} + \eta_{j,k},$$
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- $AvEfficiency^d_{j,k}$ and $AvEfficiency^{id}_{j,k}$ are the average efficiencies for sector $j$ in country $k$ for direct and indirect exporters.
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$$m_{\text{tax}} \, j, k = \varphi_0 + \varphi_1 \text{AvEfficiency}^{d} \, j, k + \varphi_2 \text{AvEfficiency}^{id} \, j, k + \varphi_3 \text{Competition}_{j, k} + \varphi_4 \text{Interaction}_{j, k} + \sum \zeta_{h} H_{j, k} + \eta_{j, k},$$

- $\text{AvEfficiency}^{d} \, j, k$ and $\text{AvEfficiency}^{id} \, j, k$ are the average efficiencies for sector $j$ in country $k$ for direct and indirect exporters.
- Two pairs of equations are estimated using the recursive method.
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The survey lacks price data thus we use the log of net revenue from export as dependent variable.
Data

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- $\text{mtax}_{j,k}$, is the median response of direct exporters in sector $j$ of country $k$, to a question that asks the respondent to rank the existing tax burden as either no obstacle, minor, moderate, major or very severe obstacle to operations.
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- $\text{Competition}^{j,k}$ represents median categorical response of direct exporters in sector $j$ in regards to the number of competitors they face in the sector.
Other control variables included are:

- Owner \(i, j, k\): proportion of ownership by a foreign individual or company denoted by;
- Website \(i, j, k\): the use of website for business with clients and suppliers (binary variable);
- Credit \(i, j, k\): access to line of credit and overdraft facility (categorical variable); and
- Age \(i, j, k\): age of the firm.

We pick total sales figure from two years (\(Sales_i, j, k\)) and book value of machinery and equipment 1 year ago (\(Machinery_i, j, k\)) to serve as level variables in the regressions.
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Industry related variables are essential, *inter alia*, to investigation the interaction between direct and indirect mode exporters.
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Introduction

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- $M_{skill_{j,k}}$ is firms’ median rank of availability of skilled manpower as a business constraint in sector $k$. $Av_{regulation_{j,k}}$ is the average response in regards to time required to deal with government regulations. $M_{labor_{j,k}}$ refers to median severity rank of government’s labor regulation as a business constraints.
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Some country-specific variables were collected from the World Development Indicator (WDI).
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Table 1 gives the definitions of all the variables used.
### Table 1: Definition of Variables

<table>
<thead>
<tr>
<th>Variable Notation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>log$(\text{Export}^{id})$</td>
<td>Log of export sales for direct exporter</td>
</tr>
<tr>
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<td>Log of export sales for indirect exporter</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Firm's own efficiency level</td>
</tr>
<tr>
<td>Cefficiency</td>
<td>Average cross efficiency levels</td>
</tr>
<tr>
<td>Competition</td>
<td>Median number of competitors of direct exporters</td>
</tr>
<tr>
<td>mtax</td>
<td>Median tax on direct exporters</td>
</tr>
<tr>
<td>Sales</td>
<td>Total sales 2 years ago</td>
</tr>
<tr>
<td>Owner</td>
<td>Percentage of firm owned by foreign private sector</td>
</tr>
<tr>
<td>Machinery</td>
<td>Machinery &amp; equipment 1 year ago</td>
</tr>
<tr>
<td>Website</td>
<td>=1 if the firm uses website for business with clients and/or suppliers, and = 0 otherwise</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product (in 2000 constant dollar)</td>
</tr>
<tr>
<td>Age.</td>
<td>Age of the firm</td>
</tr>
<tr>
<td>Credit</td>
<td>=1 if the firm has access to line of credit and overdraft</td>
</tr>
<tr>
<td>AvEfficiency</td>
<td>Average efficiency level of direct exporter</td>
</tr>
<tr>
<td>Interaction</td>
<td>Interaction between efficiency and competition</td>
</tr>
<tr>
<td>AvSales</td>
<td>Average total sales 2 years ago</td>
</tr>
<tr>
<td>Mdskill</td>
<td>Median business constraint: skills of available workers</td>
</tr>
<tr>
<td>Avregulation</td>
<td>Av time dealing with government regulations</td>
</tr>
<tr>
<td>Mdlabor</td>
<td>Median business constraint: Business constraint: labor regulations</td>
</tr>
<tr>
<td>LGDP</td>
<td>Log of GDP</td>
</tr>
</tbody>
</table>
Sample Characteristics

- About 78% of exporters in the pooled sample export directly; the remaining 22% export via intermediaries.
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- The extent to which one industry uses direct versus indirect mode varies quite a bit across industries.
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the extent to which one industry uses direct versus indirect mode varies quite a bit across industries.

Direct export mode is still the main mode of export in all the industries.
Most of the direct exporters are large and medium sized firms, and most indirect-exporting firms are medium and small sized ones.
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In the sample, about 65% of all the observations are fully owned by locals.
Introduction

- Most of the direct exporters are large and medium sized firms, and most indirect-exporting firms are medium and small sized ones.
- In the sample, about 65% of all the observations are fully owned by locals.
- The proportion of firm’s with any foreign ownership tend to be larger for direct exporters (37%) than for indirect exporters (26%).
Table 3. Distribution of firms by industry for direct and indirect exporter

<table>
<thead>
<tr>
<th>Industry</th>
<th>Indirect Exporters (%)</th>
<th>Direct Exporters (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textiles</td>
<td>1.69</td>
<td>8.65</td>
<td>10.34</td>
</tr>
<tr>
<td>Leather</td>
<td>0.26</td>
<td>1.9</td>
<td>2.16</td>
</tr>
<tr>
<td>Garments</td>
<td>4.28</td>
<td>8.52</td>
<td>12.81</td>
</tr>
<tr>
<td>Agro-industry</td>
<td>1.17</td>
<td>6.14</td>
<td>7.31</td>
</tr>
<tr>
<td>Food</td>
<td>3.63</td>
<td>10</td>
<td>13.63</td>
</tr>
<tr>
<td>Beverages</td>
<td>0.04</td>
<td>0.26</td>
<td>0.3</td>
</tr>
<tr>
<td>Metals and machinery</td>
<td>2.16</td>
<td>9.52</td>
<td>11.68</td>
</tr>
<tr>
<td>Electronics</td>
<td>0.22</td>
<td>1.04</td>
<td>1.25</td>
</tr>
<tr>
<td>Chemicals and pharmac.</td>
<td>1.73</td>
<td>8.05</td>
<td>9.78</td>
</tr>
<tr>
<td>Wood and furniture</td>
<td>0.78</td>
<td>4.24</td>
<td>5.02</td>
</tr>
<tr>
<td>Non-metal. and plastic</td>
<td>1.13</td>
<td>5.45</td>
<td>6.58</td>
</tr>
<tr>
<td>Paper</td>
<td>0.04</td>
<td>1.34</td>
<td>1.38</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>4.63</td>
<td>13.11</td>
<td>17.74</td>
</tr>
<tr>
<td>Total</td>
<td>21.77</td>
<td>78.23</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 4. Distribution of direct and indirect exporters by emp. size

<table>
<thead>
<tr>
<th>Employment Size</th>
<th>In percent</th>
<th>small (&lt; 20)</th>
<th>medium (20-99)</th>
<th>large (100+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Exporters</td>
<td>38.02</td>
<td>41.15</td>
<td>20.83</td>
<td></td>
</tr>
<tr>
<td>Direct Exporters</td>
<td>17.19</td>
<td>35.29</td>
<td>47.52</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5. Level of foreign ownership distribution

<table>
<thead>
<tr>
<th>Nature of Ownership</th>
<th>Indirect Exporters (%)</th>
<th>Direct Exporters (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non foreign ownership</td>
<td>73.45</td>
<td>62.47</td>
</tr>
<tr>
<td>Minority foreign ownership</td>
<td>4.99</td>
<td>5.72</td>
</tr>
<tr>
<td>Half foreign ownership</td>
<td>1</td>
<td>1.72</td>
</tr>
<tr>
<td>Majority foreign ownership</td>
<td>5.39</td>
<td>8.33</td>
</tr>
<tr>
<td>Full foreign ownership</td>
<td>15.17</td>
<td>21.77</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 6: Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Export$^{id}_{i,j,k}$)</td>
<td>469</td>
<td>6.67e+10</td>
<td>4.02e+11</td>
<td>150 6.</td>
<td>49e+12</td>
</tr>
<tr>
<td>Efficiency$^{i,j,k}$</td>
<td>469</td>
<td>0.28</td>
<td>0.35</td>
<td>1.05e-06</td>
<td>1</td>
</tr>
<tr>
<td>Xefficiency$^{id}_{j,k}$</td>
<td>461</td>
<td>0.33</td>
<td>0.23</td>
<td>0.05</td>
<td>1</td>
</tr>
<tr>
<td>Competition$^{j,k}$</td>
<td>368</td>
<td>3.9904891</td>
<td>2.8489286</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>mtax$^{j,k}$</td>
<td>465</td>
<td>1.4086022</td>
<td>1.1539527</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Sales$^{i,j,k}$</td>
<td>431</td>
<td>1.834E+09</td>
<td>9.807E+09</td>
<td>0</td>
<td>1E+11</td>
</tr>
<tr>
<td>Owner$^{i,j,k}$</td>
<td>505</td>
<td>20.777558</td>
<td>38.056674</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Website$^{i,j,k}$</td>
<td>497</td>
<td>0.2796781</td>
<td>0.4492932</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>GDP$^{k}$</td>
<td>497</td>
<td>2.784E+10</td>
<td>5.38E+10</td>
<td>212034806</td>
<td>1.8E+11</td>
</tr>
<tr>
<td>Age$^{i,j,k}$</td>
<td>501</td>
<td>18.914172</td>
<td>17.30834</td>
<td>0</td>
<td>95</td>
</tr>
<tr>
<td>Credit$^{i,j,k}$</td>
<td>499</td>
<td>0.3707415</td>
<td>0.483488</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 6 (contd.): Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \log(Export_{i,j,k}^d) )</td>
<td>1649</td>
<td>1.13e+11</td>
<td>7.01e+11</td>
<td>434</td>
<td>1.68e+13</td>
</tr>
<tr>
<td>( Efficiency_{i,j,k} )</td>
<td>1626</td>
<td>0.32</td>
<td>0.35</td>
<td>2.62e-07</td>
<td>1</td>
</tr>
<tr>
<td>( Xefficiency_{j,k}^d )</td>
<td>1349</td>
<td>0.32</td>
<td>0.22</td>
<td>0.045</td>
<td>1</td>
</tr>
<tr>
<td>( Competition_{j,k} )</td>
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<td>(iii)</td>
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<td>0.806***</td>
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<td>-0.612***</td>
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<td><strong>Website(i,j,k)</strong></td>
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<td><strong>Age(i,j,k)</strong></td>
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<td><strong>Mach.(i,j,k)</strong></td>
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\(\text{\(i\)}\) is the first theoretical framework, \(\text{\(ii\)}\) is the second theoretical framework, \(\text{\(iii\)}\) is the empirical results, \(\text{\(iv\)}\) is the theoretical and empirical results, and \(\text{\(v\)}\) is the empirical results with different control variables.
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<td>( Eff_{i,j,k} )</td>
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<td>0.568***</td>
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<td>( Ceff_{id,j,k} )</td>
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<td>-0.392*</td>
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<td>-0.772***</td>
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<td>( Sales_{i,j,k} )</td>
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<td>( Website_{i,j,k} )</td>
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<td>-0.94**</td>
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Table 9. Estimation results for median tax burden on direct exp.

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<th>(3) Order Logit</th>
<th>(4) Order Logit</th>
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<td>AvEff ( d_{j,k} )</td>
<td>-0.266***</td>
<td>-0.312***</td>
<td>-0.359**</td>
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<td>(0.0804)</td>
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<td>Interact. ( j,k )</td>
<td>0.0268**</td>
<td>0.0325***</td>
<td>0.0344**</td>
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<td>AvSales ( j,k )</td>
<td>-3.66e-13</td>
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