Up in Smoke?: Tobacco Production’s Effect on Childhood Stunting in Malawi

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**Research Question:**
How does cash crop adoption affect children’s health?

**Research Method:**
- Casual model of adoption effects
- Predicted probabilities used as optimal instrument (Wooldridge)
- Two step GMM instrumenting for the cash crop adoption decision.

**Smallholder Adoption Constraints:**

**Production:**
- Minimum tobacco sales requirement for tobacco floors
- Credit constraints preventing best farm practices

**Consumption:**
- Volatile & relatively high recent maize prices

World Bank identified relationship between tobacco production & higher levels of stunting.

**Measuring Stunting**

\[ y = \beta_0 + \beta_1 X + \beta_2 D + u. \]

- \( y \): z score of children 6-60 months old
- \( D \): burley adoption dummy
- \( X \): Vector of observable control attributes
- Endogeneity of \( D \).

**Ideal Model**

\[ y_i = \delta_0 + \delta_2 X + \delta_1 f + \mu_i. \]

- \( \delta_0 \): Average maize price by district
- \( \delta_2 \): Number of tobacco growing households by district

**First Stage Probit**

Predicting tobacco adoption:

\[ P(D_i = 1 | z) = \Phi(\delta_1 z_1 + \delta_2 z_2) \]

Optimal predicted probabilities instrument

\[ P(D = 1 | z) \]

**Two Step GMM**

Moment Conditions:

\[ \sum_{i=1}^{n} \sum_{l=2}^{L} (y_i - x_i \beta)^{l-2} = 0 \]

GMM criterion function:

\[ \beta = \arg \min \left( \sum_{i=1}^{n} \sum_{l=2}^{L} (y_i - x_i \beta)^{l-2} \right) \]

Dependent variable, \( z \) score

**Farm Income Distribution**

**Results**

- Average treatment effect reduces z-scores by 1 standard deviation
- If non-producers adopted, stunting increases

**Conclusions**

- Tobacco adoption causes lower children’s health outcomes
- Lower health outcomes appear concentrated in low income tobacco producers
- Policymakers should incentivize food crop production for the poorest households

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**Table:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Tobacco Only</th>
<th>Maize Only</th>
<th>Both IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco Producer</td>
<td>-0.154*</td>
<td>-0.446</td>
<td>0.986***</td>
</tr>
<tr>
<td>Male</td>
<td>0.208***</td>
<td>0.210***</td>
<td>0.215***</td>
</tr>
<tr>
<td>Mother’s Educ, high</td>
<td>0.153*</td>
<td>0.161*</td>
<td>0.176**</td>
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<tr>
<td>Bed Nets, always</td>
<td>0.203**</td>
<td>0.198***</td>
<td>0.185**</td>
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<tr>
<td>Permanent Floor</td>
<td>0.161**</td>
<td>0.175**</td>
<td>0.183**</td>
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<tr>
<td>Farm Income 2 of 5</td>
<td>0.0124</td>
<td>0.0133</td>
<td>0.0148</td>
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<tr>
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<td>0.00381</td>
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<td>Farm Income 4 of 5</td>
<td>0.0025</td>
<td>0.0089</td>
<td>0.184*</td>
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<td>Farm Income 5 of 5</td>
<td>0.0024</td>
<td>0.0029</td>
<td>0.479*</td>
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<tr>
<td>Regional Maize Price</td>
<td>-0.0089</td>
<td>-0.0113</td>
<td>0.0155*</td>
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<tr>
<td>Central Region</td>
<td>0.279**</td>
<td>0.298**</td>
<td>0.329**</td>
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<td>Observations</td>
<td>5,740</td>
<td>5,740</td>
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