Implications of Food Price Shocks for Poverty in 2030

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Motivation

- Food prices expected to rise in the next 15 years
  - On average between 26–63 percent depending on the scenario
- Climate change a factor in rising food prices
  - Conventional development scenario (SSP5): 60 percent of countries experience larger food prices because of climate change
  - Unequal development scenario (SSP4): over 60 percent of countries experience lower food price increases
- The poor can be negatively affected by sudden increases in food prices
  - Sudden increase in food prices in 2008 increases global poverty by over 100 million (Ivanic and Martin, 2008)
- How vulnerable will the poor be to food price shocks in 15 years?
  - The number of poor may differ
  - Their food consumption shares may change
  - The number of net food sellers may also change
  - What is the likely role of climate change in this?
Overview of the method

- Evaluate the sources of incomes and patterns of expenditure of households at the present time for a number of developing countries
  - Focus on food consumption and production
  - Use household surveys that describe households’ total consumption and food production
  - Currently ten countries are included: Albania, Ghana, Iraq, Liberia, Moldova, Niger, Senegal, Sierra Leone, Tajikistan and Vietnam
- Fast-forward household surveys into 2030
  - Alter households’ incomes and population weights to match two growth scenarios—a high-growth (SSP5) and low-growth (SSP4) one
  - Apply food price changes depending on presence of absence of climate change
- Measure the vulnerability of extreme poverty to food price shocks
  - Simulate a 100-percent food price shock under all scenarios
  - Consider changes in poverty rates by strata
Currently 10 countries included
- Recent surveys from 2005–2012 (average age 5.5 years)
- Our vision is to expand to 30+ countries
Scenario sources

- **Population Growth**
  - Projections from World Bank’s Health Nutrition and Population Statistics for urban and rural population growth

- **Economic Growth**
  - Two projections from the International Institute for Applied System Analysis’ SSP database
    - Conventional development (SSP5): low socio-economic challenges for adaption, high socio-economic challenges for mitigation
    - Unequal development (SSP4): high socio-economic challenges for adaption, low socio-economic challenges for mitigation

- **Food price changes**
  - Two sets of projections of food price changes from Potsdam Institute for Climate Impact Research (PIK) that explore scenarios based on possible climate change outcomes
    - No impact of climate change
    - Full impact of climate change
Scenario descriptions—our sample statistics

- **Population growth**
  - Total Population Growth of 34 percent (2.0 percent/year)
  - Rural Population Growth of 18 percent (1.1 percent/year)
  - Urban Population Growth of 58 percent (3.0 percent/year)

- **Economic growth**
  - High growth—174 percent (6.9 percent/year)
  - Low growth—153 percent (5.2 percent/year)

- **Food Price Change**
  - High growth
    - without climate change—31 percent increase (1.8 annually)
    - with climate change—29 percent increase (1.7 annually)
  - Low growth
    - without climate change—77 percent increase (3.8 annually)
    - with climate change—61 percent increase (3.2 annually)
Fast-forwarding of households to 2030

- Scale uniformly weights of households to match population growth and makeup
  - We currently consider urban and rural decomposition
  - In the future, we would like to bring additional characteristics to match better SSP4 and SSP5 scenarios
- Increase income of households based on the forecast
  - A uniform increase in household incomes and total expenditure after population adjustment
- Adjust household food consumption based on the change in incomes and food prices
  - Estimate income and own- and cross-price elasticities
    - CDE preferences
    - Parameter estimates from the GTAP database
    - Elasticities calibrated based on parameter estimates and observed consumption shares
Real growth between 130 and 190 percent by 2030
Modest population growth at 9 percent
  - Reduction in rural population by 7 percent
  - Increase in urban population by 39 percent
Likely improved the standards of living of most people
Change in income distribution in Niger

- High economic growth between 130 and 220 percent
- Large population growth of 80 percent
  - Rapid increase in poorer rural population (70 percent)
  - Increase in urban population by over 130 percent likely to squeeze incomes of rural population
- Many worse off within low economic growth scenario

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Extreme increases in food prices between 40 and 320 percent

- Interestingly, food prices increase less with climate change in Vietnam

Consumption shares likely higher despite higher incomes

- Number of net food sellers likely to be affected
Generally higher food consumption shares for most households

- The only exception: poorest households in high-growth scenario
### Implication of scenarios for poverty rates

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Baseline level</th>
<th>High-growth</th>
<th>Low-growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population</td>
<td>29.1%</td>
<td>12.6%</td>
<td>18.7%</td>
</tr>
<tr>
<td>Farmer headed</td>
<td>31.3%</td>
<td>14.1%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Female headed</td>
<td>15.9%</td>
<td>1.2%</td>
<td>11.7%</td>
</tr>
<tr>
<td>Male headed</td>
<td>29.2%</td>
<td>12.6%</td>
<td>18.8%</td>
</tr>
<tr>
<td>Non-farmer headed</td>
<td>24.4%</td>
<td>10.8%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Rural</td>
<td>28.6%</td>
<td>5.6%</td>
<td>14.5%</td>
</tr>
<tr>
<td>Urban</td>
<td>19.1%</td>
<td>10.3%</td>
<td>12.9%</td>
</tr>
</tbody>
</table>

**Table:** Average extreme poverty headcount levels

- Both scenarios likely to reduce extreme global poverty
- More substantial poverty reduction with higher growth
Assessment of resilience of extreme poverty to food price shocks

- We simulate a 100-percent food price shock and measure its poverty impact
  - Each country faces the same food price shock similar to one observed in 2008
  - All other prices assumed to remain unchanged
- We assume a short-run closure
  - No time for producers to respond
  - No time for wages to adjust
We use the basic Deaton (1989) framework for assessing households’ welfare.

- Net welfare change depends on the net selling position of the household and price changes.
- We add substitution on the side of consumption.
- Households follow the CDE preference structure with estimates from the GTAP database.

\[
\hat{W}_h = \hat{p}'s_h + \frac{1}{2}\hat{p}'\epsilon\hat{p}s_h + \hat{p}'q_h + \frac{1}{2}\hat{p}'\mu\hat{p}q_h
\]

- \(s_h\) — household-specific vector of consumption shares,
- \(q_h\) — household-specific vector of production shares (of total expenditure),
- \(p\) — a country-specific vector of price changes.

We ignore production adjustment and wage rate changes.

- Interested in short-run impacts of future food price shocks.
- Based on the present poverty lines (PovCalNet), determine which households are in poverty after the shock.
### Implication of scenarios for poverty rates

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Baseline level</th>
<th>High-growth w/o climate change</th>
<th>High-growth w/o climate change</th>
<th>Low-growth w/o climate change</th>
<th>Low-growth w/o climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population</td>
<td>24.5%</td>
<td>19.2%</td>
<td>18.9%</td>
<td>21.9%</td>
<td>22.8%</td>
</tr>
<tr>
<td>Farmer headed</td>
<td>20.9%</td>
<td>16.5%</td>
<td>16.2%</td>
<td>17.3%</td>
<td>18.6%</td>
</tr>
<tr>
<td>Female headed</td>
<td>31.5%</td>
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<td>28.4%</td>
<td>24.3%</td>
<td>27.3%</td>
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<td>18.3%</td>
<td>21.2%</td>
<td>22.1%</td>
</tr>
<tr>
<td>Non-farmer headed</td>
<td>27.2%</td>
<td>20.2%</td>
<td>20.1%</td>
<td>26.0%</td>
<td>26.5%</td>
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<tr>
<td>Rural</td>
<td>25.6%</td>
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<td>25.7%</td>
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<td>Urban</td>
<td>26.8%</td>
<td>17.6%</td>
<td>17.4%</td>
<td>24.6%</td>
<td>24.7%</td>
</tr>
</tbody>
</table>

Table: Average changes in extreme poverty headcount following a 100-percent food price shock

- Poverty impact of a 100-percent food price shock declines in all scenarios
  - Largest decline among urban households under the high growth scenario
Conclusions

- Projected growth rate is the major driving force in global reduction of extreme poverty
  - Even though high-growth scenario is likely to improve the outcomes more, the low-growth scenario is still very favorable to extreme poverty
- Resilience to sudden food price shocks does not decline as much as poverty rates do
  - Food consumption shares increase, making households more susceptible to food price changes despite smaller poverty headcount
- Climate change alone appears to be less important for sensitivity to food prices
  - Resilience to food price shocks is not greatly affected
  - However, in the pessimistic growth, avoiding climate change helps households noticeably
Directions for future research

- Some variability exists among the results among individual countries
  - Need to expand sample to the level of Ivanic and Martin (2014) to cover most of the world’s poverty
  - Establish confidence intervals around the results
- Better projections of household characteristics and distribution needed
  - We probably need to match more characteristics in addition to urban/rural population and income growth
  - Work underway to provide more elaborate projections
- Need to consider long-run impacts as well
  - Long-run poverty impacts of higher food prices appear opposite to short-run impacts
  - Does the conclusion change in 2030?