Food Security, Health and Trade Liberalization

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Outline

- Introduction & motivation
  - Previous evidence
  - Empirical strategy and data
  - Main results
  - Conclusions
Introduction and motivation

- Past half-century marked improvement in food security and health conditions...
- However, still vast difference across and within countries
- Food security/health determinants studied mainly at micro-level and with country case-study
- Less attention to macro determinants:
  - Macro-economic shocks
  - Political and institutional reforms
  - Trade policy reforms
Introduction and motivation

- **Key research question:**
  - Do trade liberalization improve food security/health outcomes?
  - This is a complex research question, because
    - No clear prediction from trade theory
    - Results often country or regional specific
    - Problems in the definition of both the outcome and the treated variable (trade reforms)
Introduction and motivation

• **Prediction from trade theory**
  – Trade is important for food security
    • Trade balance domestic food demand and supply
    • Trade increase the efficiency allocation of resources
    • Creates new opportunities for innovation and productivity growth
  – Trade could be detrimental for food security
    • Creates winner and loser, increasing inequality
    • Negative effect on the income of consumers and/or of producers of import-competing crops
    • Increase risk through imported price volatility
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Previous evidence

• **Food security & trade literature**
  
  – Meta-analysis
  
  • Mc Corriston et al. (2013) out of 34 studies: in 13 (+), 10 (-) and the remaining 11 (mixed)
  
  – Cross-country studies
  
  • Arcand and Hombres (2004), openness weak + effect;
  • Bezuneh and Yiheyis (2009), openness short-run (-), long-run (weakly +)

• **Health & trade literature**

  • Cornia et al. (2008), Blouin et al. (2009): globalization not good for health, due to dietary problems
  
  • Anukriti and Kumler (2012), infant mortality declined relatively slowly in India’s districts more exposed to tariff reform (DiD)
Previous evidence

• Our contribution
  – Broad coverage, 40 reform episodes (1970-2010) in Asia, Africa, Latina America and Middle East
  • We use the extended Wacziarg and Welch (2008) index of trade liberalization (Sachs-Warner)
  – We use the Synthetic control method along the line of Billmeier and Nannicini (2013)
    • It represents a bridge between country case-study and cross-country econometric
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Empirical strategy

• **Synthetic control method** (Abadie & Gardeazabal 2003; Abadie et al. 2013)
  
  – It is a quasi-experimental tool for comparative case studies, closed in spirit to matching
  
  • Objective: to build the “best” counterfactual (synthetic control) to compare the treated unit (reforming country)
  
  – Has been developed for case-study, namely situation where we have few treaded units
Empirical strategy

• **Synthetic counterfactual analysis**
  
  – Let $X_1$ be a $(K \times 1)$ vector of pre-treatment values of $K$ predictors of food security
  
  – Let $X_0$ be a $(K \times J)$ matrix which contains the values of the same variables for the $J$ possible control countries
  
  – Let $V$ be a diagonal matrix with nonnegative components
    
    • The values of the diagonal elements of $V$ reflect the relevant importance of the food security predictors

  – The vector of weights $W$ is chosen to minimize:
    
    • $(X_1 - X_0 W)'V(X_1 - X_0 W)$ subject to $w_j \geq 0$ ($j = 1, 2, ..., j$) and $w_1 + ... + w_J = 1$
Empirical strategy

• SCM in practice
  – To study the trade reform effect on food security/health outcomes
  – We build a **counterfactual** (synthetic control) as a **weighted average** of “all” untreated countries
    • Based on pre-treatment values of **FS predictors X** (including values of the outcome)
    • Minimizes the sum of square differences in the predictors between treated and untreated units
  – The **treatment effect** is evaluated by comparing the trajectory of **post-reform** outcomes of treated countries with that of the synthetic control
Empirical strategy

• SCM in practice

Trade liberalization event

Pre-treatment period

Dynamic treatment effects

$U5MR$

$T-10$  $T_0$  $T+5$  $T+10$

$W^* \sum_{m=1}^{k} \nu_m (X_{1m} - X_{0m} W)^2$

$\hat{t}_{it} = Y_{it} - \sum_{j=1}^{I_C} w_j^s Y_{jt}$

Treated country

Synthetic control
Empirical strategy

• Synthetic control method
  – Advantages over DiD
    • Transparent (and better) counterfactual
    • Control for unobserved time-variant heterogeneity
    • Dynamic treatment effect (short- & long-run effects)
  – Disadvantages:
    • Only overall effect, impossible to disentangle direct and indirect effects
    • Given the few number of observations, statistical inference is problematic
      – Normally overcome by placebo tests (fake experiments)
Data

- **Sample**: 80 developing countries with data (1960-2010) of which 40 treated
- **Treatment variable**: trade liberalization index based on Wacziarg and Welch (2008)
- A country is **closed** to international trade when:
  - overall average tariffs exceed 40 percent
  - non-tariff barriers cover more than 40 percent of its imports
  - it has a socialist economic system
  - the black market premium on the exchange rate exceeds 20 percent
  - much of its exports are controlled by a state monopoly
Data

- **Outcome variable**: under-five mortality rate (U5MR) from UN
  - It is a *health* indicators,... key advantages are disposability (from ‘60) and yearly variation,...

- **Controls X**:
  - Log *per-capita* GDP (Penn World Table)
  - Share of Rural population (FAO)
  - Population growth (Penn World Table)
  - Female primary years of schooling (Barro&Lee)
  - Frequency of wars and conflicts (Kudamatsu)
  - Pre-treatment values of U5MR at $T-10$, $T-5$ and $T_0$
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Main results

- **Negative relation**: trade reforms *reduced* U5MR
  - **20 Countries** (out of 40)
    - 4 Asian (out of 6); 5 African (out of 18); 7 Latin American (out of 12); 4 Middle-East & North-Africa (out of 4)

- **No impact**: trade reform *no effect* on U5MR
  - **19 Countries**

- **Positive relation**: trade reform *increased* U5MR
  - **1 Country**
    - South Africa (1991), largely due to the post-treatment HIV/AIDS diffusion
## Results

### Covariates and average effects for two Asian Countries

<table>
<thead>
<tr>
<th>War</th>
<th>Indonesia 1970</th>
<th>Synthetic Control</th>
<th>Bangladesh 1996</th>
<th>Synthetic Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log GDP per-capita</td>
<td>6.52</td>
<td>6.82</td>
<td>6.58</td>
<td>6.61</td>
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<tr>
<td>Rurale population</td>
<td>0.84</td>
<td>0.79</td>
<td>0.87</td>
<td>0.89</td>
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<tr>
<td>Population growth</td>
<td>0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
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<tr>
<td>Primary school</td>
<td>8.85</td>
<td>6.82</td>
<td>9.49</td>
<td>3.61</td>
</tr>
<tr>
<td>U5MR T₀</td>
<td>165.20</td>
<td>165.23</td>
<td>108.10</td>
<td>109.43</td>
</tr>
<tr>
<td>U5MR T+5</td>
<td>139.89</td>
<td>148.30</td>
<td>83.59</td>
<td>82.95</td>
</tr>
<tr>
<td>U5MR T+10</td>
<td>120.00</td>
<td>135.02</td>
<td>63.40</td>
<td>59.66</td>
</tr>
<tr>
<td>RMSPE</td>
<td>0.23</td>
<td></td>
<td>1.28</td>
<td></td>
</tr>
</tbody>
</table>

RMSPE = Root Mean Squared Prediction Error
Synthetic Ghana: Centrafrica Rep. (0.212); Congo Dem. Rep. (0.341); Malawi (0.079); Panama (0.033); Papua New Guinea (0.145); Sierra Leone (0.172); Siria (0.017).
Results

South Africa SCM and Placebo test

Overlapping between trade reform and HIV/AIDS: seroprevalence from 1% (1990) to 25% (2000)

Synthetic South Africa: Centrafrican Rep. (0.095); China (0.017); Congo Rep (0.07); Iran (0.318); Siria (0.50)
Robustness checks

P-values for the experiments with “positive” trade effect

Given the few observations involved a level of significance of 10% means that the results are fairly robust!
Robustness checks

• We check for the consistency using:
  – Food security indicators (IFPRI: proportion of undernourishment, prevalence of children underweight)
  – Agricultural trade policy patterns in the post-reform years (FAO case studies, Anderson & Nelgen 2013)
• Strong qualitative consistency between our results and the patterns of these indicators
Conclusion

• Impact of trade reforms on child mortality
  – **Negative** and significant for half of the sample (20 countries out of 40)
  – For all other case studies, but one, the effect is **zero**
  – Trade reform effects on child mortality are corroborated by the **changes of other indicators** of food security
  – and by **changes in agr trade policy** (lower taxation, lower protection, elimination of STEs,...)

• The main conclusion is that trade liberalization is not inimical of food security/health outcomes
Conclusion

• What next?
  – We are studying if the **timing** of reforms matters:
    • Is it better to anticipate trade or political reforms?
    • Preliminary findings seem to show that reforming trade **before** a political reform is better for food security
Thank you for your attention
Results

• **Negative relation**: trade reforms **reduced** U5MR

• **No impact**: trade reform **no effect** on U5MR

• **Positive relation**: trade reform **increased** U5MR
Introduction and motivation

- Food insecurity/health problems are emerging as increasingly relevant issues at international level.
- A vast research on food security and malnutrition determinants has been carried out at micro-level.
- Less attention to macro determinants, like institutional and trade reforms.
  - The link between trade and food security has become crucial after the recent commodity price spikes.
  - WTO has raised the issue of predicting the implications of further trade liberalization on food security in a more uncertain world.