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GE Gravity: Benefits and Opportunities for Research

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Selected Paper prepared for presentation at the International Agricultural Trade Research Consortium's (IATRC's) 2017 Annual Meeting: Globalization Adrift, December 3-5, 2017, Washington, DC.

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GE Gravity: Benefits and Opportunities for Research

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INTERNATIONAL AGRICULTURAL TRADE RESEARCH CONSORTIUM

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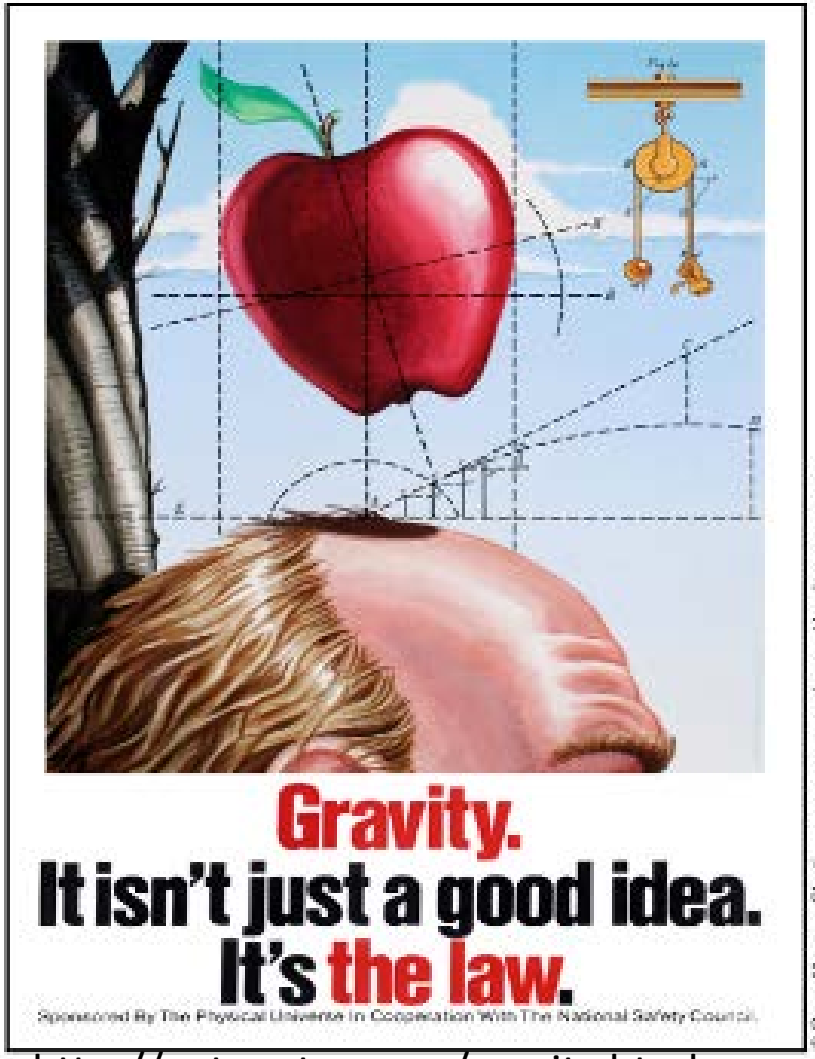
Outline

- Broad overview
- Structural Gravity: Review and Implementations
  - Multilateral Resistances
  - General Equilibrium (GE) Effects of Trade Policy
  - Benefits of GE Trade Indices
- GE Analysis with Structural Gravity
- Practical Considerations and Challenges

Motivation and Background



http://yotoyotov.com/gravity.html

Why is gravity so popular?

Larch and Yotov (2016)

- Intuitive
- A structural model with solid theoretical foundations
- A realistic general equilibrium environment
- A flexible structure
- Predictive power
- Parsimonious data requirements

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Gravity seems to "work" well for:

Aggregate trade

Sector trade

Individual product lines (HS6-digit level)

Some illustrative Results

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Illustrative Results (Partial Effects)

Bergstrand, Larch and Yotov (2015)		Grant & Boys (2012)		Beckman & Arita (2016)	
Total Manufacturing Trade, 1990-2002		Ag. Trade, 1980-2004		Beef trade, 2010-2012	
$EIA_{ij,t}$	0.24**	LogDistance	-1.24***	SPS Measure	-1.38*
$EIA_{ij,t-4}$	0.05**	Border	0.61***	Intariff	-3.83
		Lang	0.44***	EU	0.42
		Colony	0.67***	FTA	0.7*
		ComCol	0.83***	Distance	-1.17***
		RTA	1.33***	Shared border	0.31
		WTO (Bothin)	0.96***	Common language	0.53*
		…			
		R^2	0.67	R^2	0.77

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Illustrative Results (Continued)

Hejazi, Grant & Peterson (2016)			Peterson, Grant & Ramniceanu (2015)		
Global Fruits and Vegetable Trade, HS6-Digit, 2013-2015			U.S. Fruits and Vegetable Exports, HS6-Digit, 2000-2009		
	OLS	PPML		OLS	PPML
BSI	-0.70***	-0.88***	Log Importer Production	-0.22***	-0.13***
Log D.	-1.69***	-0.99***	Log U.S. Production	0.40***	0.80***
RTA	0.99***	1.07***	Log Importer GDP/capita	1.47***	1.12**
			Free Trade Agreement	0.12	0.28*
			SPS	-1.66***	-0.43
R^2	0.53	0.59	R^2	0.52	0.77

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Implication

- High predictive power (R^2 often > 70%)
- Can deliver the partial marginal effect of trade policy on trade flows:
  - RTAs
  - WTO
  - Tariffs, SPS
- However, until recently
  1. Estimates were direct "partial" effects (i.e., holding all else constant)
  2. Gravity framework was unable to deliver full GE counterfactual estimates of trade policy liberalization

Structural Gravity: Review and Implications

- Evolution of Gravity Theory Over Time
  - Eaton and Kortum (2002)
  - Anderson and van Wincoop (2003)
  - Chaney (2008)
  - Arkolakis, Continot and Rodriguez-Clare (2012)
  - Arkolakis and Takahashi (2014)
- Review of the Structural Gravity Model
  - Delivers a tractable framework for trade policy analysis in a multi-country environment

Structural Gravity: Review and Implications

- On the "Beauty" of the Multilateral Resistances (MRs)
  - MRs are GE trade cost terms
  - MR terms should be viewed as informative indices that summarize GE effects of trade costs
  - Can be used to aggregate & decompose the impact of trade policy on consumers and producers and outside countries.
- On the GE Effects of Trade Policy
  - The Full Endowment GE effects of trade liberalization on the value of output/nominal income will be positive in the liberalizing countries and it will likely be negative in the outside countries.

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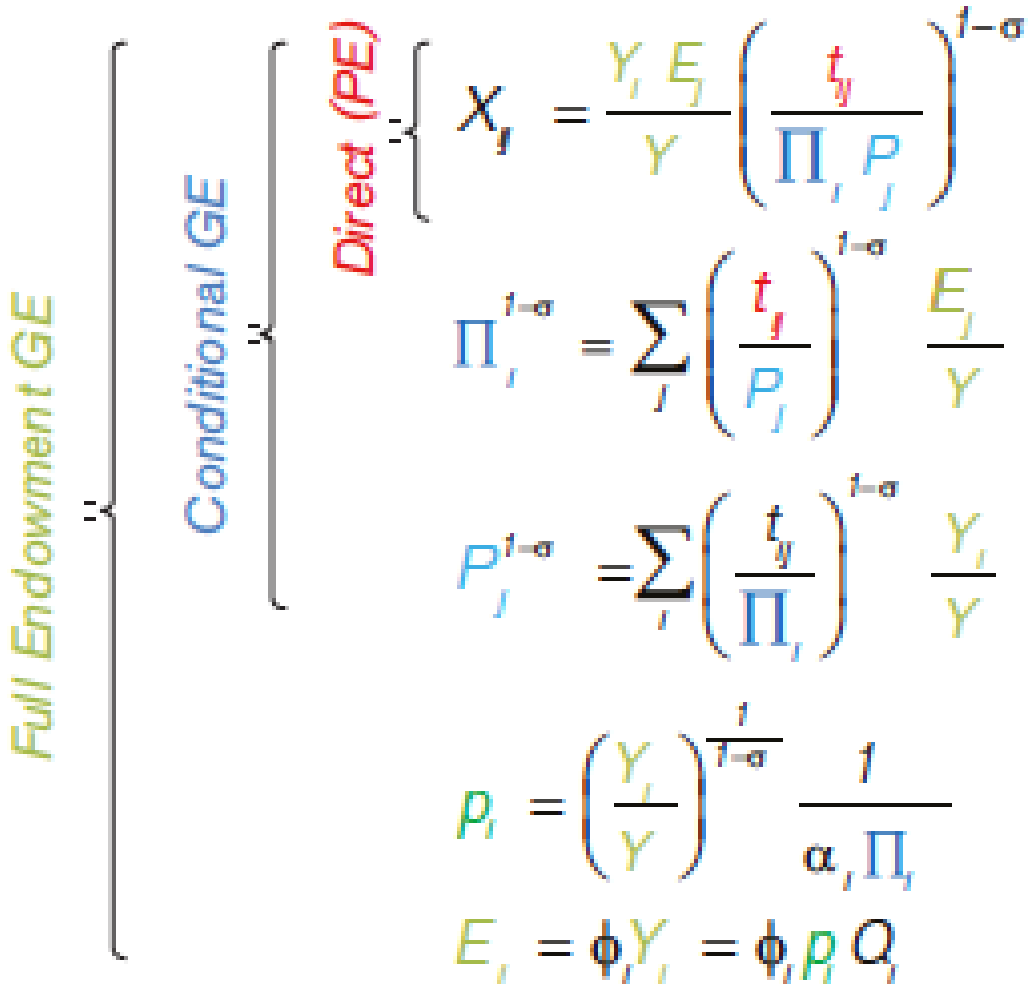
General Equilibrium Trade Policy Analysis with Structural Gravity

- Performing Counterfactuals with Gravity Model (Anderson and Yotov, 2011)
  - Step 1: Construct matrix of baseline trade costs

(note: requires gravity estimation of direct partial effects which has been fraught with inconsistencies in literature (sample selection, zero trade, product aggregation, estimation method, etc.)

  - Step 2: Define counterfactual scenario and construct corresponding trade costs
  - Step 3: Solve the baseline and the counterfactual model
  - Step 4: Collect and report indices of interest

GE Gravity



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How useful is Structural Gravity for understanding Trade Impacts?

- Advantages:
  - Provides solid theoretical foundation
  - Can conduct counterfactual analyses provided
    - We understand underlying policy context (FTAs? SPS? TRQs?)
  - Can deliver welfare and efficiency gains from trade lib.
    - Arkolakis and Rodriguez-Clare (2012): “New Trade Models, Same Old Gains?”

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Practical Considerations and Challenges

Trade Elasticity

From an empirical point of view, we would like to have substantially richer evidence on the magnitude of the trade elasticity based on trade policy variation, and most importantly, on the question of whether the trade elasticity appears to be invariant across time and space, or is dependent on the particular setting. (Goldberg and Pavcnik (2016), p. 31)

What do we need to be mindful of

- Intra-national trade
  - Production
- Intensive vs. Extensive margin: how fit into GE