

## **Conflict and Trade: Implications for Agriculture and Food Security**

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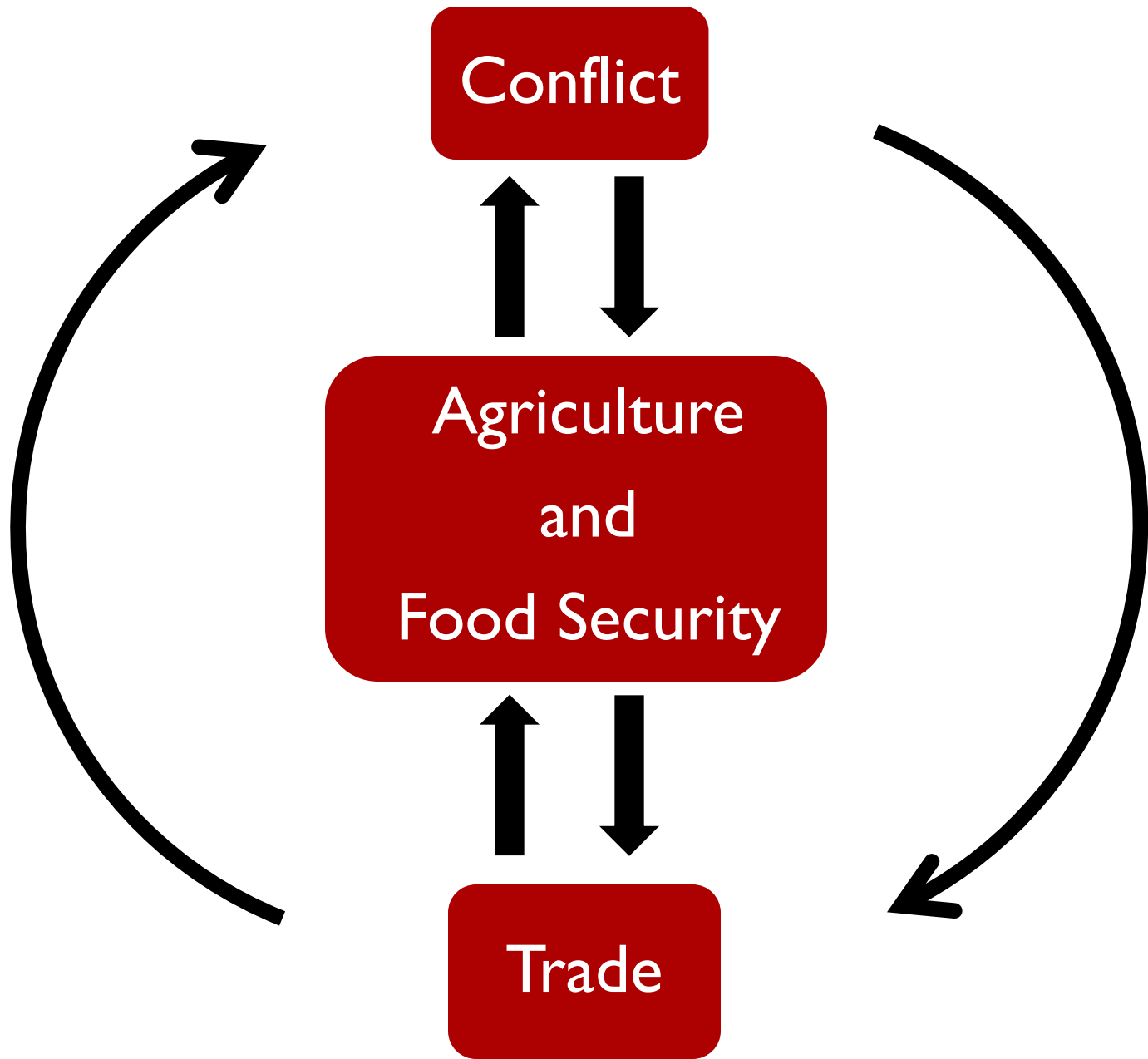


# **Conflict and Trade: Implications for Agriculture and Food Security**



IATRC Annual Meeting, December 9, 2014

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# Definitions

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## Conflict

- ▶ “Fight, battle, war”, “a competitive or opposing action of incompatibilities”
- ▶ Violence, armed conflict, war, terrorism, riots, protests, insecurity, etc.
- ▶ Between countries (external)
- ▶ Within countries (internal)
- ▶ Between individuals

## Trade

- ▶ “Activity or process of buying, selling, or exchanging goods or services”
- ▶ Total trade, bilateral trade, exports, imports, trade openness, etc.
- ▶ Between countries
- ▶ Within countries
- ▶ Between individuals, households, and firms within markets

## Food Security

- ▶ Availability of food
  - ▶ Production
  - ▶ Stocks
  - ▶ Trade
- ▶ Access to food
  - ▶ Affordability (income, prices)
  - ▶ Distance to market
- ▶ Utilization of food
  - ▶ Nutritional value
  - ▶ Hygienic preparation
  - ▶ Intra-household allocation
- ▶ Stability of three pillars

## (Lack of) Emphasis on conflict by agricultural economists

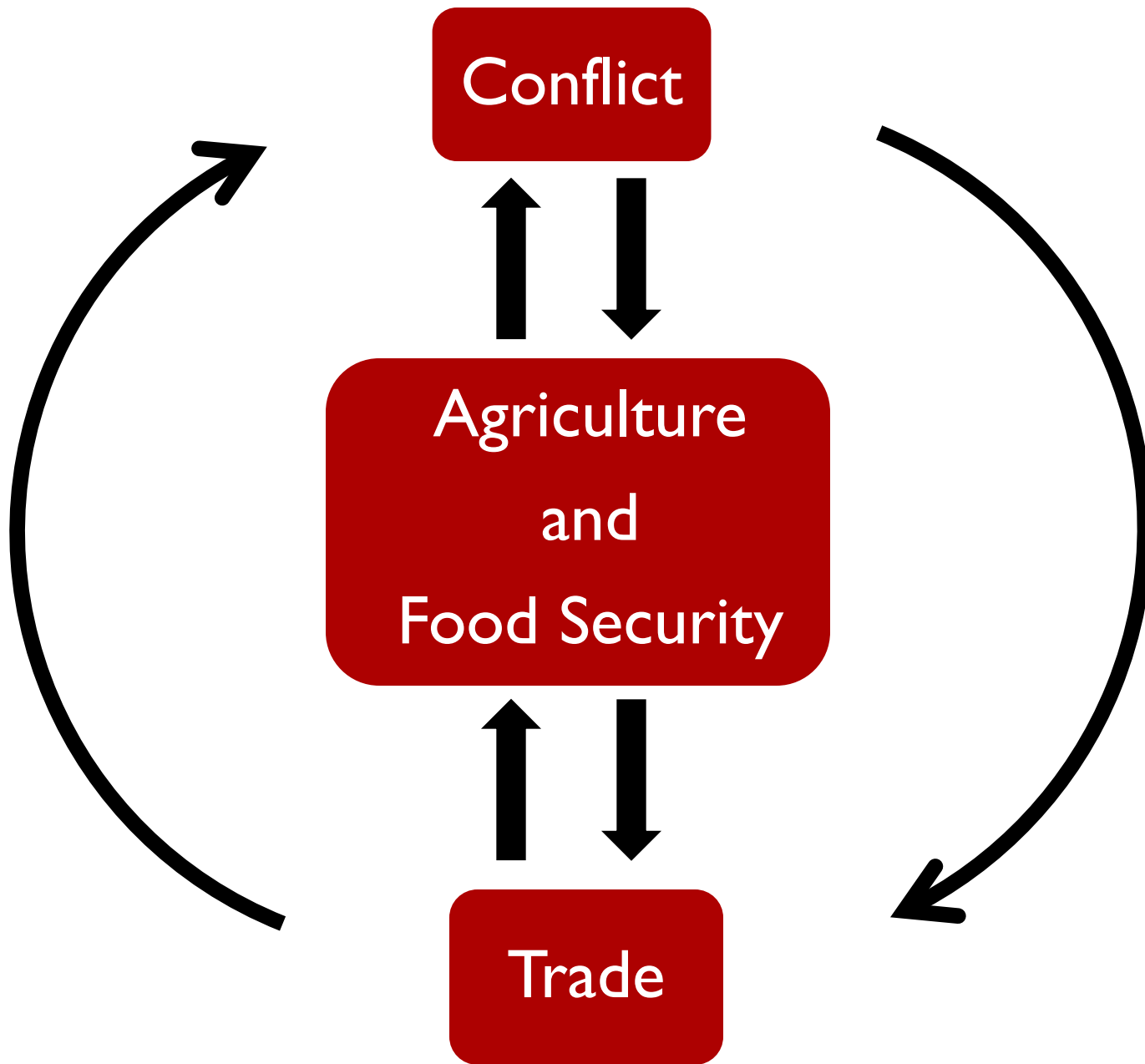
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- ▶ AJAE: one paper and one proceedings paper
  - ▶ Extreme Weather and Civil War: Does Drought Fuel Conflict in Somalia through Livestock Price Shocks? (Maystadt & Ecker, 2014)
  - ▶ Food Aid During Conflict: Can One Reconcile its Humanitarian, Economic and Political Economy Effects? (Stewart, 1998) (proceedings)
  
- ▶ AAEA Annual Meetings: six papers in six years
  - ▶ 2014            one paper
  - ▶ 2013            one paper
  - ▶ 2012            one paper
  - ▶ 2011            three papers
  - ▶ 2010            zero
  - ▶ 2009            zero

# Why should agricultural economists care?

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- ▶ Approximately 1.5 billion people live in conflict-afflicted, post-conflict, and fragile countries (World Bank, 2011).
- ▶ Countries in conflict derive large shares of GDP from agricultural sector.
  - ▶ 1990-2013 avg. ag share: war 19% ; no war 12% (p-value = 0.0004)
  - ▶ Source: own calculations, 186 countries, UCDP/PRIO and WB WDI data
- ▶ There are large estimated losses in agricultural value added due to conflict.
  - ▶ 1970-1997: annual losses of \$4.3 billion (FAO, 2000).
- ▶ Current challenges due to climate change, resource scarcity, and growing populations necessitate careful analysis of agricultural production and trade.
- ▶ GDP growth originating from the agriculture sector is twice as effective in reducing poverty as GDP growth originating outside the agriculture sector (World Bank, 2007).



# Conflict

- ▶ Large literature spanning economics and political science (international relations)
- ▶ Macro- and microeconomic approaches
- ▶ Theoretical approaches
  - ▶ Ricardian, Marxist, game theoretical
- ▶ Empirical approaches
  - ▶ Cross-section
  - ▶ Panel (gravity model, SUR)
  - ▶ Time series (Granger)
  - ▶ Natural experiments
  - ▶ Case studies
  - ▶ Event studies
- ▶ Empirical challenges
  - ▶ Measurement and data scarcity
  - ▶ Causality and simultaneity

# Trade





## Does conflict reduce trade?

- ▶ Yes, conflict represents added transaction costs due to (direct costs of) destruction of lives, property, infrastructure, land, transportation networks, etc.
  - ▶ Glick & Taylor (2010); Nitsch & Schumacher (2004); Bayer & Rupert (2004)
  - ▶ Terrorism, internal conflicts, and external conflicts are equivalent to 30% tariff (Bloomberg & Hess, 2006)
  - ▶ Spillover effects of internal and external conflicts on bilateral trade of uninvolved neighbors (Qureshi, 2013)
  - ▶ Terrorism affects trade directly (transaction costs) and indirectly (counter-terrorism policies, lower GDP) (Mirza & Verdier, 2008)
- ▶ No, some evidence but endogeneity and omitted variables not fully addressed (Barbieri & Levy, 1999, & coauthors; Kim & Rousseau, 2005)



## **More evidence, on the indirect costs; conflict affects ...**

- ▶ Risk preferences (Callen et al., 2014 - Afghanistan) and trust and preferences for market participation (Cassar et al., 2013 - Tajikistan); persistent conflicts are driven by cycle of inter-ethnic trade and trust (Rohner et al., 2013)
- ▶ Total factor productivity, with differential affects for foreign firms (Klapper et al., 2013 - Cote d'Ivoire)
- ▶ Market interactions, like selling off assets as coping strategy (Verpoorten 2009 - Rwanda)
- ▶ Land and labor markets (Seernels & Verpoorten, 2012 – Rwanda)

Conflict represents a long-term tax on economic activity (higher risk premium) leading to lower capital formation and a reallocation of resources across sectors; the expectation of future conflict drives decisions (Abadie & Gardeazabal, 2003, 2008; Bloomberg & Hess, 2004, 2006)



## Does trade reduce conflict?

- ▶ Yes, interdependence reduces incentive for conflict (Polachek, 1978, 1980, & coauthors; Oneal & Russett, 1999, & coauthors; and *Journal of Conflict Resolution, Journal of Peace Research*)
- ▶ No, larger gains from trade mean more to fight over (Siegler, 1992; Barbieri 1996, & coauthors; Morrow, 1999)
- ▶ Mixed and varying results depending on ...
  - ▶ Context, like resources and prices (Skaperdas & Syropoulos, 2001, theoretical)
  - ▶ Temporal and spatial (global, regional, dyads) coverage
  - ▶ Measures of trade (e.g., flows, openness) and conflict (e.g., internal, external)
  - ▶ Empirical methods - whether endogeneity is addressed and how missing trade data are accounted for (Hegre et al., 2010; Magee & Massoud, 2010)



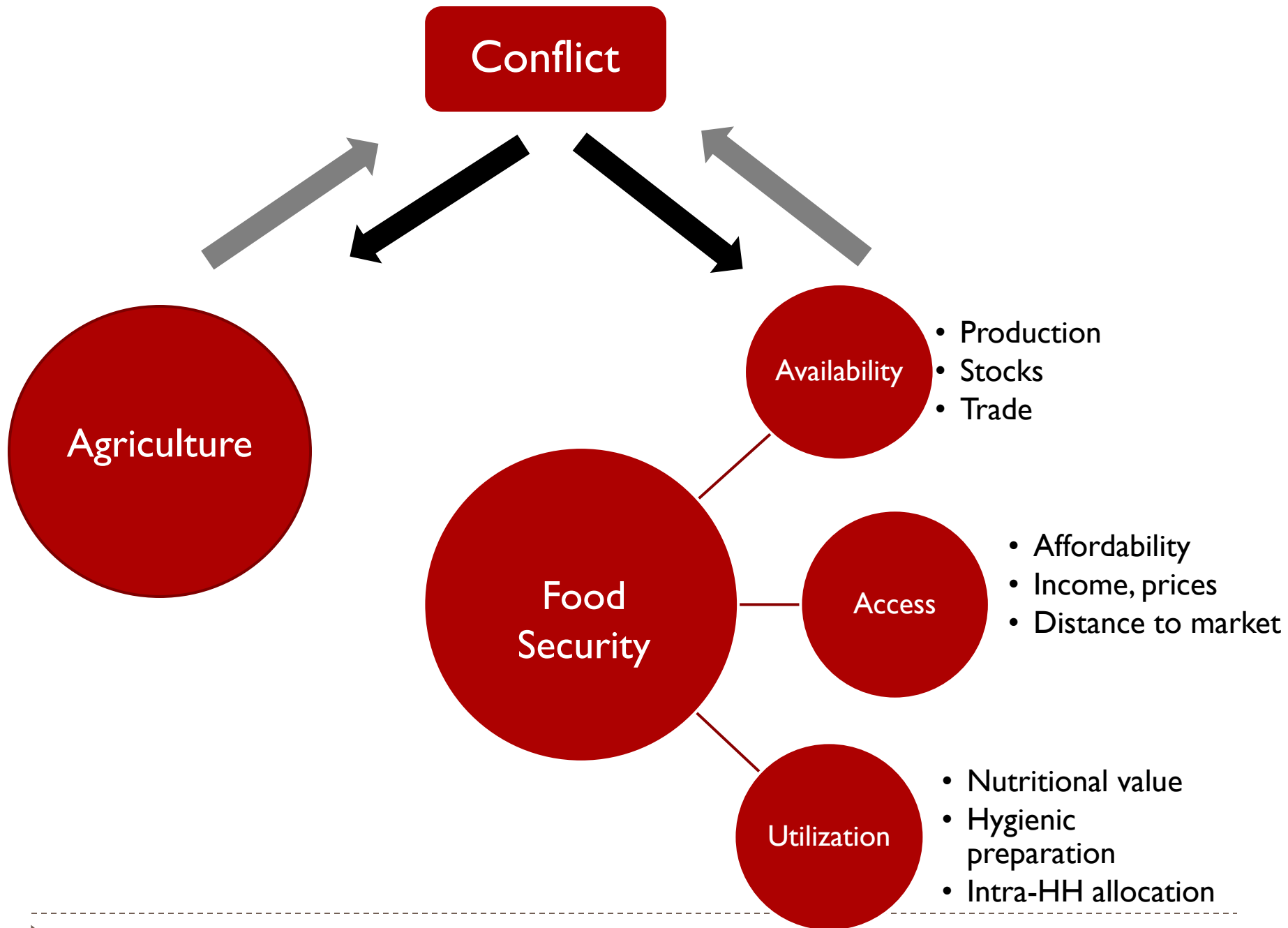
## Additional evidence

- ▶ Bilateral trade openness deters bilateral conflict but multilateral trade openness can escalate bilateral conflict (Martin et al., 2008a)
- ▶ Trade openness deters severe wars but increases risk of lower-scale conflict (Martin et al., 2008b)
- ▶ Trade can increase or decrease interstate conflict depending on specific goods examined (Goenner, 2010; Li & Reuveny, 2011)
- ▶ Regional trade institutions reduce interstate military attacks (Aydin, 2010), but effects may differ based on context (Hafner-Burton & Montgomery, 2012)
- ▶ Trade sanctions can reduce initiation of war (Becsi & Lahiri, 2007, theoretical)

## Recent reviews

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- ▶ On conflict and trade: Polachek & Seiglie (2007), Polachek & Robst (2008)
- ▶ On civil war: Blattman & Miguel (2010); Collier & Hoffman (2007); and poverty: Justino (2009)



Conflict



Agriculture and  
Food Security

## Empirical challenges

- ▶ Reverse causality
  - ▶ Conflict destroys lives, food production and distribution systems, livestock, livelihoods, etc. – which can lead to food insecurity
  - ▶ Food insecurity is a subset of poverty, linked to a broader set of economic and social grievances – which can lead to conflict
- ▶ Simultaneity: common drivers of conflict and food insecurity
  - ▶ Poverty and low development
  - ▶ Negative shocks, such as climatic changes
  - ▶ Discriminatory policies
- ▶ Reviews: Barrett (2013); Brinkman & Hendrix (2011); Messer & Cohen (2006); Teodosijevic (2003); Cohen & Pinstrip-Andersen (1999); de Soysa et al. (1999)

Conflict



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## Conflict ...

- ▶ Destroys food supplies and productive capacities (Messer & Cohen, 2006; Messer et al., 2002; Paarlberg, 2000)
- ▶ Reduces calories per capita and child hunger (Scanlan & Jenkins, 2001) and dietary diversity (Dabalen & Paul, 2014 - Cote d'Ivoire)
- ▶ Affects agricultural markets and subsistence farming (Brück, 2006 - Mozambique), food production, supply, marketing, and accessibility (Clarke, 2000 - Afghanistan), and agricultural investment across the value chain (Kimenyi et al., 2014 - Mali and Nigeria)
- ▶ Hinders development progress more broadly (Gates et al., 2012)



Conflict



Agriculture and  
Food Security

## Additional evidence

- ▶ Interstate wars fought in cities; intrastate wars fought in rural areas (FAO, 2000)
- ▶ Military deployments affect food prices and wages but insurgent attacks do not (Bove & Gavrilova, 2014 – Afghanistan)
- ▶ Conflict and post-conflict economies may function differently from peace economies (Brauer & Dunne, 2010), and it's important to account for conflict-related coping strategies when analyzing welfare (Bozzoli & Brück, 2009)
- ▶ Food price shocks have differential effects on food security in conflict areas (D'Souza & Jolliffe, 2013 - Afghanistan)
- ▶ Even short bouts of violence can have long-term implications for the agricultural sector, reducing export growth rates (Muhammad et al., 2014 - Kenya)

Conflict



Agriculture and  
Food Security

## How do agriculture and food security affect conflict?

- ▶ Food insecurity is not a necessary or sufficient cause of conflict but may be a proximate cause; stronger link with internal than external conflict
- ▶ Agricultural income affects opportunity costs of rebellion and potential spoils of war; competition over resources leads to conflict (Collier, 1999, & coauthors; Blattman & Miguel, 2010)
- ▶ Reductions in arable land are associated with increased likelihood of civil war (Black, 2010); resource scarcity is associated with communal violence (Kahl, 2006)
- ▶ Agricultural investment is key in maintaining peace in post-conflict countries (Erskine & Nesbitt, 2009)
- ▶ Low rainfall increases likelihood of conflict (Miguel et al, 2004), for example, through livestock prices (and thus income) (Maystadt & Ecker, 2014 – Somalia); review on climate and conflict: Burke, et al., forthcoming

Conflict



Agriculture and  
Food Security

## Do commodity price shocks increase conflict?

- ▶ Yes, (theoretical work) prices of labor-intensive commodities (e.g., agricultural crops) linked to conflict through opportunity cost channel (Dal Bó & Dal Bó, 2011)
- ▶ Yes, ag, mineral, oil export and import prices increase internal conflict (Besley & Persson, 2008; Dube & Vargas, 2013 - Colombia) but government policies can mitigate impact of food price increases, breaking link to conflict (Carter & Bates, 2012)
- ▶ Yes, food price increases can lead to political instability (Arezki & Brückner, 2011a) and food-related protests (Bellemare, 2014), but with heterogeneous effects for low and high income countries (Arezki & Brückner, 2011b) and no effect of price volatility (Bellemare, 2014)
- ▶ No, no effect on onset of conflict, some evidence of reduction in conflict duration (Bazzi & Blattman, 2014)

Conflict



Agriculture and  
Food Security

## Additional evidence

- ▶ Lower per capita food supply associated with civil war onset in some contexts (Boehmer & Sobek 2009), with breakdown in democracy (Reenock et al., 2007), with conflict in Arab world (Maystadt et al., 2014)
- ▶ Poor nutrition (with poverty and poor health) increases conflict (Pinstrup-Andersen & Shimokawa, 2008)
- ▶ U.S. food aid increases incidence and duration of civil conflict, no effect on interstate conflict (Nunn & Qian, 2014)
- ▶ Development projects associated with both increases and decreases in violence (Crost et al., 2014; Berman et al., 2013)

# What can agricultural economists add to analysis of conflict and post-conflict countries?

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1. Production (technology adoption, farm management)
2. Market integration and price transmission
3. Natural resource management (climate change)
4. Shock mitigation and risk management strategies (crop diversification, credit, insurance, safety nets)
5. Sector-specific analysis (perishability, storability)
  - ▶ Agricultural products vs. manufactured goods
  - ▶ Cereals, pulses vs. sweet potatoes, cassava, cooking bananas

With an emphasis on causality, simultaneity, and measurement

# An Example

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## **Violence, Instability and Trade: Evidence from Kenya's Cut Flower Sector**

Andrew Muhammad (ERS), Anna D'Souza (Baruch College, CUNY), and William Amponsah (Georgia Southern University)  
World Development (Nov 2013)

Did the post-election violence and instability following the 2007 Kenyan presidential election have implications for trade, specifically exports of cut flowers to EU?

## Context: post-election violence in Kenya

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- ▶ Started Dec. 30, 2007, lasted 2-3 months, along ethnic lines, sporadic, throughout country
- ▶ Scale and rapid spread of violence was largely unanticipated and unprecedented (Human Rights Watch, 2008; Kloop, 2008; Mkangi & Githaiga, 2012; Anderson & Lochery, 2008)
- ▶ Over 1,000 people killed, over 500,000 people displaced, billions of dollars in property damage (UNHCR, 2008)

## Context: fresh cut flowers

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- ▶ Is important foreign exchange earner (Kenya Ministry of Agriculture, 2010), with peak season in February
- ▶ Employs 50,000-60,000 people directly and over 500,000 people indirectly (Kenya Flower Council, 2009)
- ▶ Supported by ideal climate, proximity to large import markets, good infrastructure, enabling policy environment
- ▶ Includes over 120 established (heterogeneous) grower-exporters
- ▶ Requires a stable and effective supply chain and an efficient transportation system because goods are highly perishable



**Table I. Summary Statistics for Model Variables:  
January 2000–March 2012**

	Mean	Std. Dev.	Min.	Max.
	Monthly quantity (kilograms)			
<b>Kenya</b>	4,932,675	1,604,214	1,667,900	7,835,200
<b>East Africa</b>	1,612,707	1,122,461	315,000	3,752,500
<b>Ecuador</b>	994,818	366,619	333,100	1,861,500
<b>ROW</b>	1,354,484	549,947	481,900	2,811,900
	Monthly value (€)			
<b>Kenya</b>	17,970,600	5,762,263	6,679,374	30,008,000
<b>East Africa</b>	5,818,419	3,947,535	1,340,981	14,030,400
<b>Ecuador</b>	5,711,016	2,690,116	1,457,110	14,678,300
<b>ROW</b>	5,820,788	2,846,782	2,185,465	16,916,700
	Price (€/kilogram)			
<b>Kenya</b>	3.669	0.275	3.177	4.492
<b>East Africa</b>	3.797	0.522	2.838	5.479
<b>Ecuador</b>	5.57	0.779	2.463	8.034
<b>ROW</b>	4.257	0.778	3.028	8.125
	Market share (%)			
<b>Kenya</b>	51.43	6.19	30.88	64.47
<b>East Africa</b>	15.19	6.9	4.71	30.08
<b>Ecuador</b>	15.59	3.15	9.51	24.5
<b>ROW</b>	17.79	9.02	5.92	42.31

▶ Monthly EU imports (EUROSTAT, 2012)

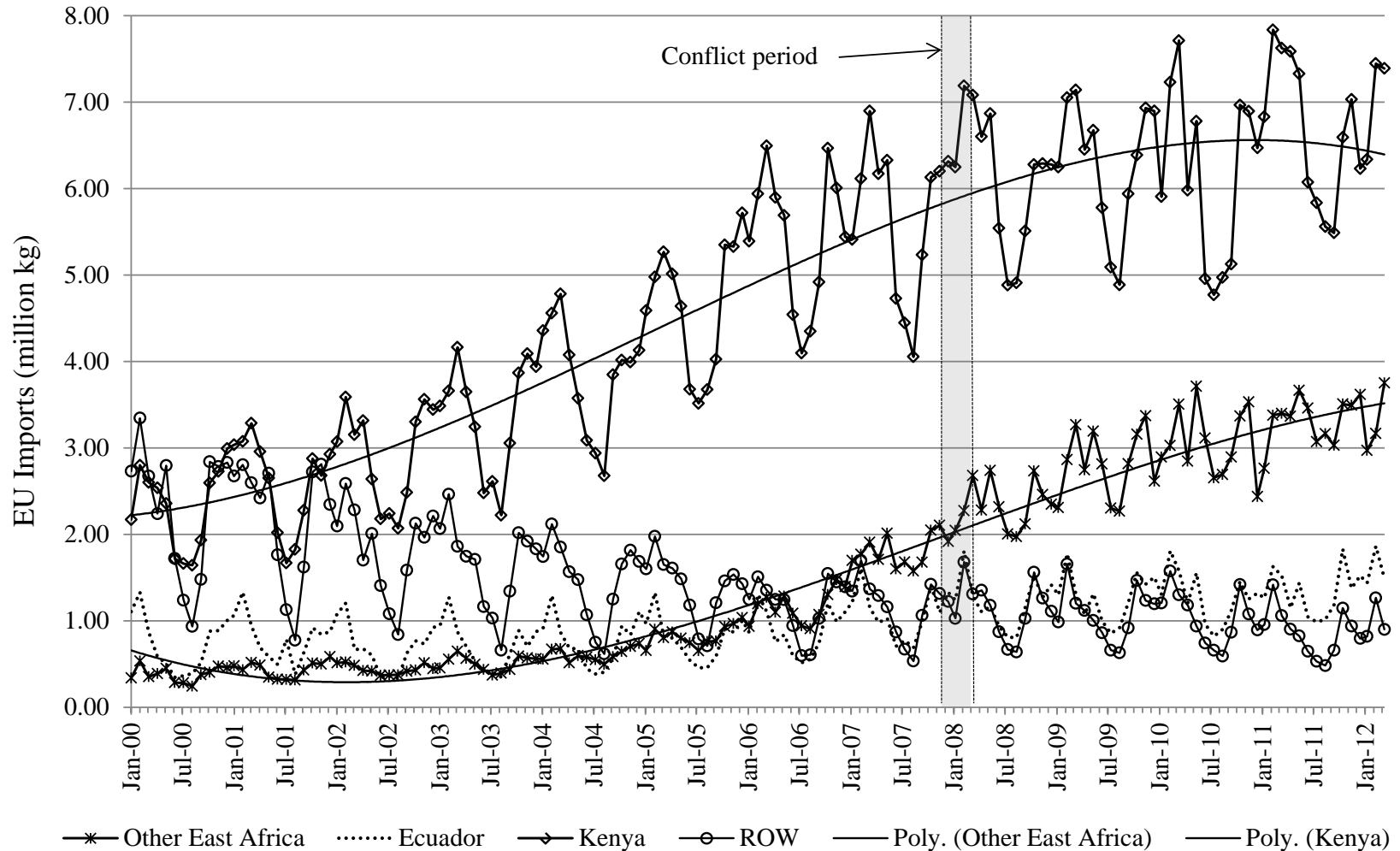
▶ “Fresh cut roses and buds of a kind suitable for bouquets or for ornamental purposes”

▶ East Africa: Ethiopia, Tanzania, and Uganda

**ROW is the rest of the world. Std. Dev. is the standard deviation.**

# Roses Imported by the EU by Source

## January 2000 – March 2012



Source: Eurostat

# Methodology

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- ▶ Estimate a Rotterdam model using Seemingly Unrelated Regressions (Maximum Likelihood Estimation)
  - ▶ Where Importer Demand for Roses from a particular source =  $f$  {Importer's Total Expenditures on all imported roses, Price of Roses from that source, Prices of Roses from other sources}.
- ▶ Use a gradual switching regression model to look at the pre-violence period, the transition period, and the post-violence period, i.e., identify a structural break.
- ▶ Use 12-period log differences to remove seasonality.
- ▶ Use one-quarter transition period (based on log-likelihood tests for transition period).

**Table 4. Annual growth rates and expenditure elasticities by exporting source**

	2000:1-2007:12	2008:4-2012:3	Difference
	Annual growth rate		
<b>Kenya</b>	0.032 (0.007)**	-0.015 (0.008)	-0.048 (0.011)**
<b>Other East Africa</b>	0.083 (0.019)**	0.047 (0.011)**	-0.036 (0.022)
<b>Ecuador</b>	-0.012 (0.013)	0.011 (0.016)	0.024 (0.021)
<b>ROW</b>	-0.094 (0.010)**	-0.043 (0.028)	0.051 (0.030)
	Expenditure elasticity		
<b>Kenya</b>	0.92 (0.085)**	1.157 (0.123)**	0.238 (0.150)
<b>Other East Africa</b>	1.29 (0.243)**	1.124 (0.160)**	-0.166 (0.290)
<b>Ecuador</b>	1.089 (0.168)**	0.706 (0.240)**	-0.383 (0.293)
<b>ROW</b>	0.993 (0.123)**	0.409 (0.424)	-0.584 (0.442)

Asymptotic standard errors are in parentheses.

\*\* and \* denote the 0.01 and 0.05 significance level, respectively.

ROW is the rest of the world.

## Results and implications

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- ▶ Impact of violence on exports is equivalent to a 17.2% tariff or a €33 million cumulative loss during the period 2008-2011.
- ▶ Short-run disruption could have induced importing firms to turn to other sources; moving back could be costly (adjustment costs).
  - ▶ Only small fraction of export relationships in violence-affected areas survived in following growing season (Macchiavello and Morjaria, 2011)
- ▶ Indicators related to democracy, political competition, and the ease of doing business declined.
- ▶ Story: violence and instability caused an increase in perceived risk and uncertainty of doing business in or importing from Kenya (relative to its competitors) by European importers.
- ▶ Findings underscore the possible role of violence in hindering a country's export potential.

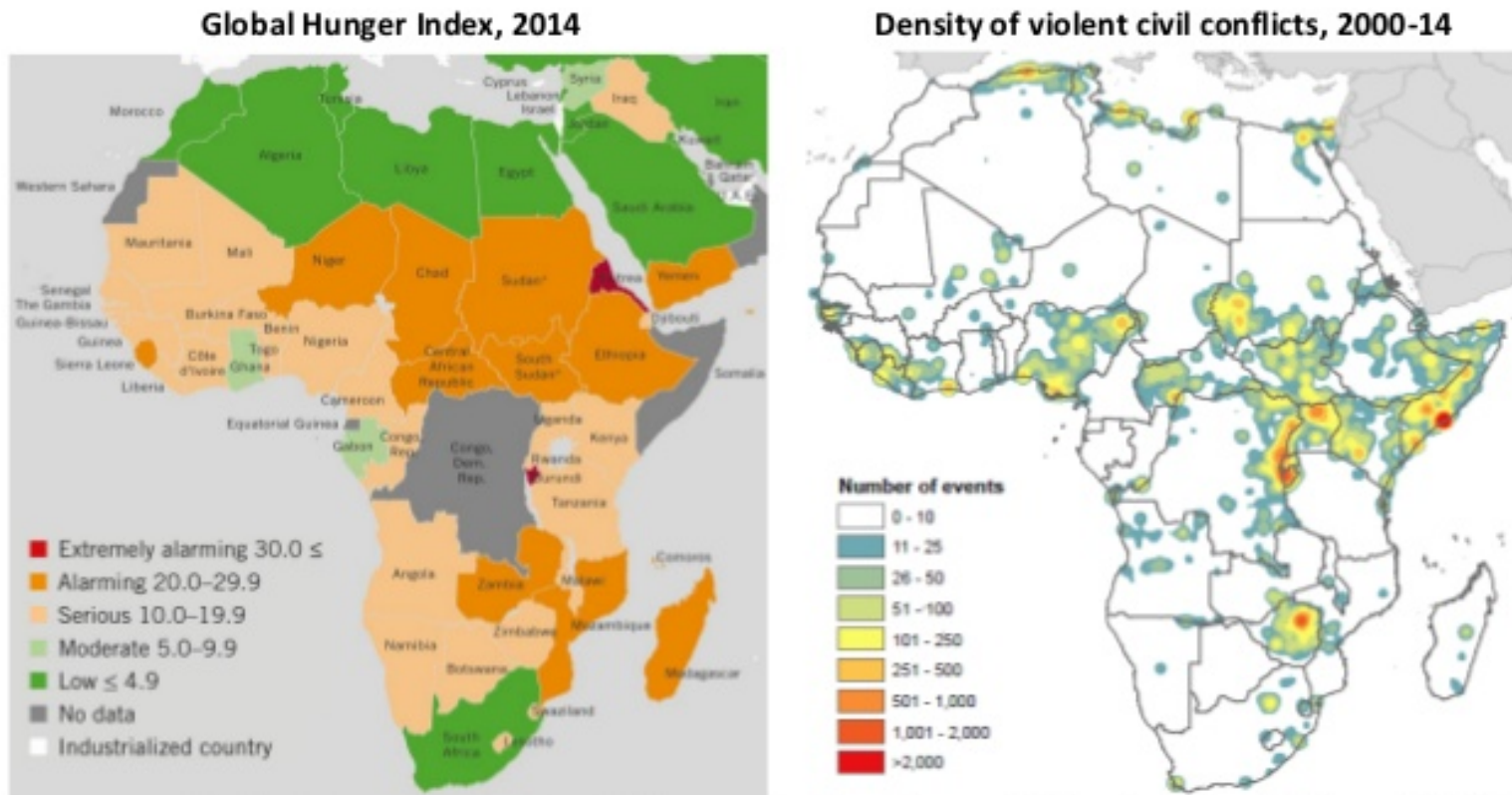
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Thank you

All references are available upon request

# Correlation between food insecurity and civil conflict in Africa

- Significant cross-country correlation between the Global Hunger Index and violent civil conflict events (0.30) and conflict fatalities (0.37) in Africa.



Source: “Building Resilience through Food Security Policies and Programs,” presentation by Olivier Ecker (IFPRI) at Committee on World Food Security, FAO, Rome, Oct 2014

**References from “Conflict and Trade: Implications for Agriculture and Food Security,” presented by Anna D’Souza, Baruch College at IATRC 2014 Theme Day. Contact: [anna.dsouza@baruch.cuny.edu](mailto:anna.dsouza@baruch.cuny.edu)**

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