



Analyzing the Poverty Impacts of Biofuel Mandates

Thomas Hertel
Purdue University

Building on collaborations with Dileep Birur, Roman Keeney, Maros Ivanic, Ana Rios, Farzad Taheripour, Wally Tyner and L. Alan Winters

Outline

- **Motivation**
- **Transmission of Poverty Impacts due Global Price Shocks from Biofuels**
- **Quantitative Framework for Assessing Poverty Impacts of Biofuels**
- **Analysis of Poverty Impacts of EU-US Biofuels Mandates in a sample of 16 countries**
- **Conclusions**

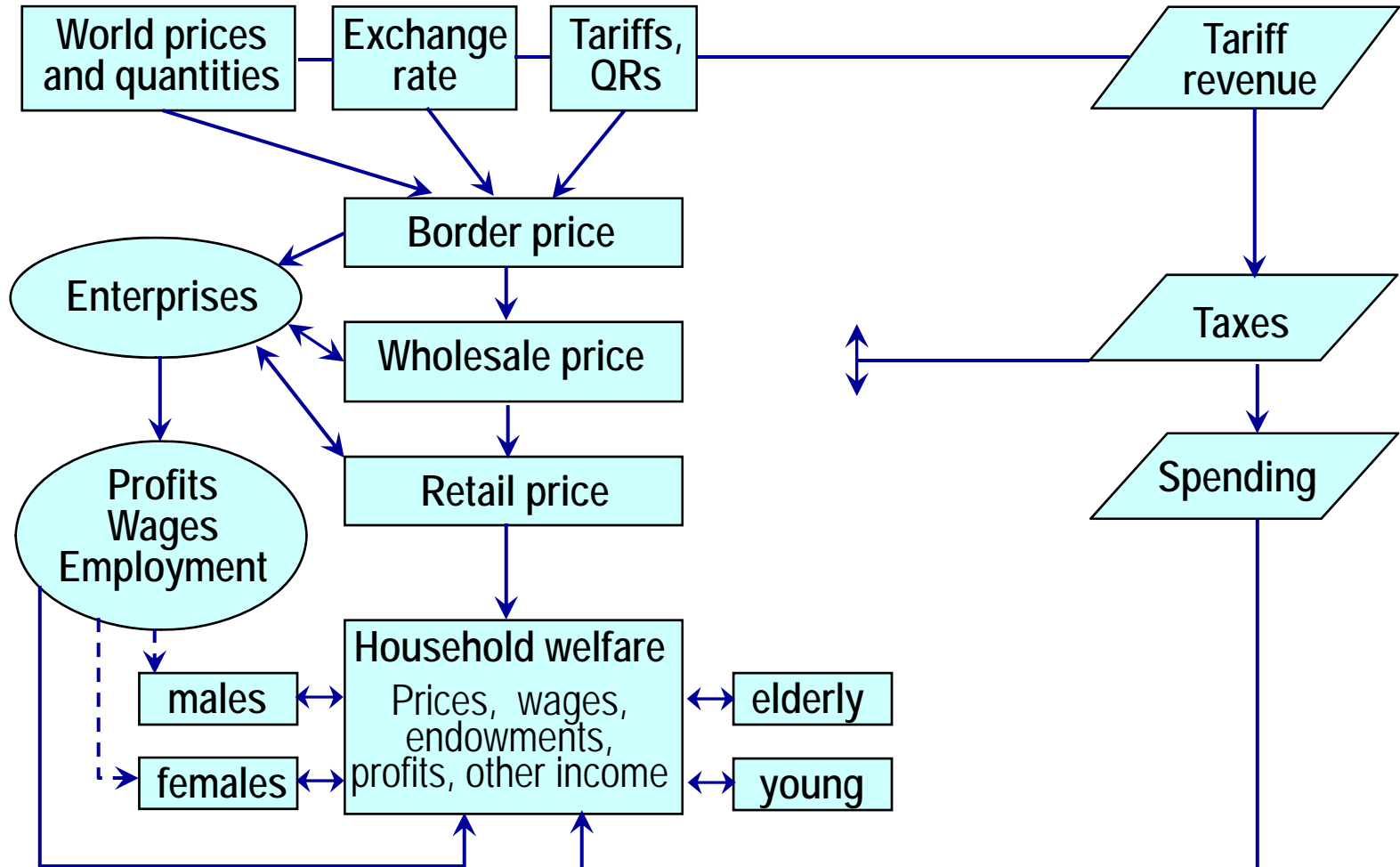
Motivation

- **Poverty impacts of biofuels have assumed a high profile due to the recent food price spike**
- ***Ex post* analysis of higher food prices & poverty (Ivanic and Martin) show significant impacts**
- **But wide range of estimates of portion of price hike attributable to biofuels**
- **Regardless of magnitude, there is the question of *qualitative impact* on the poor in developing countries; who will be helped, who will be hurt?**
- **Ambiguous:**
 - higher food prices hurt the poor wherever they live and work
 - on the other hand, higher agricultural prices benefit rural incomes – and most of world's poor still live in rural areas

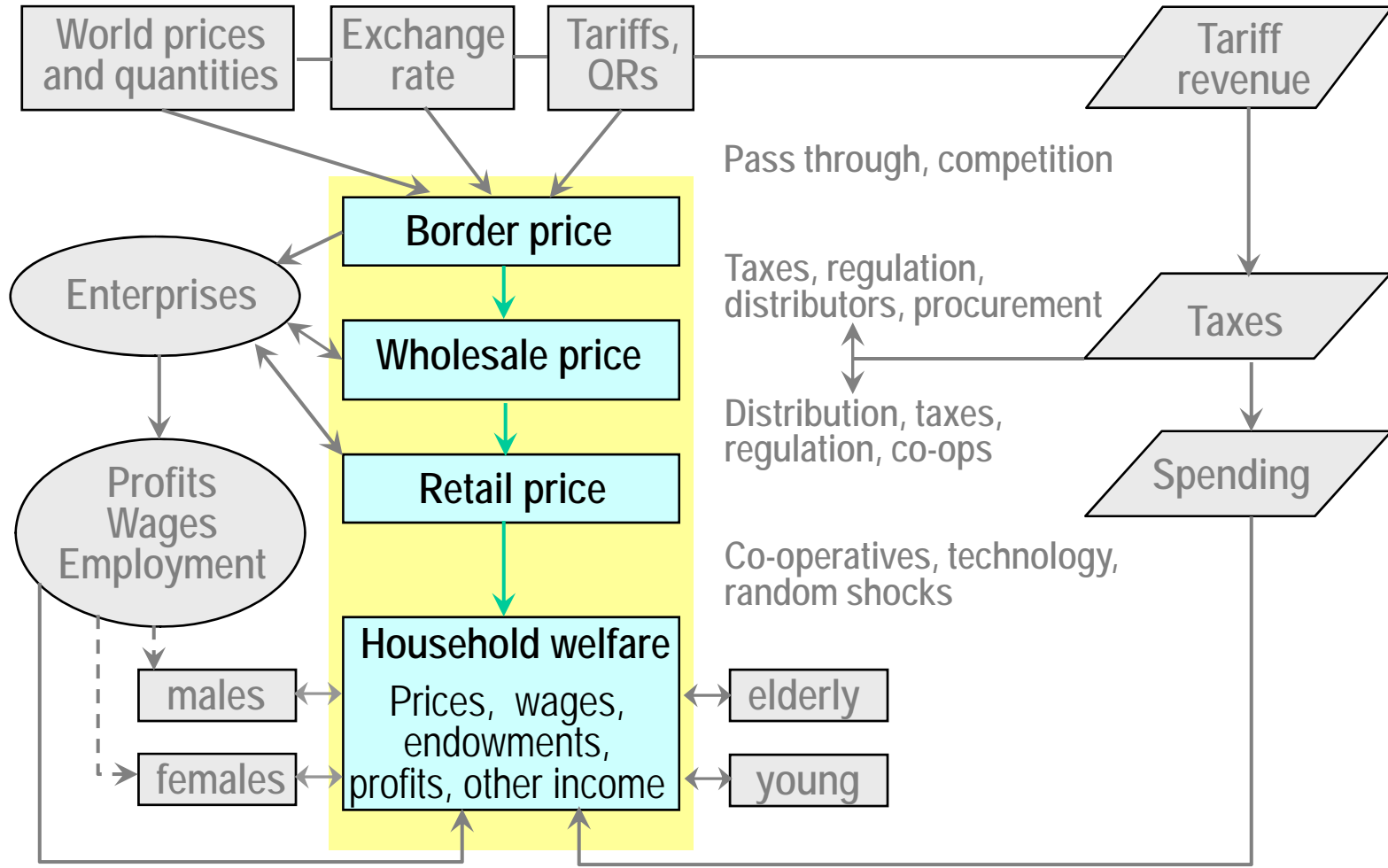
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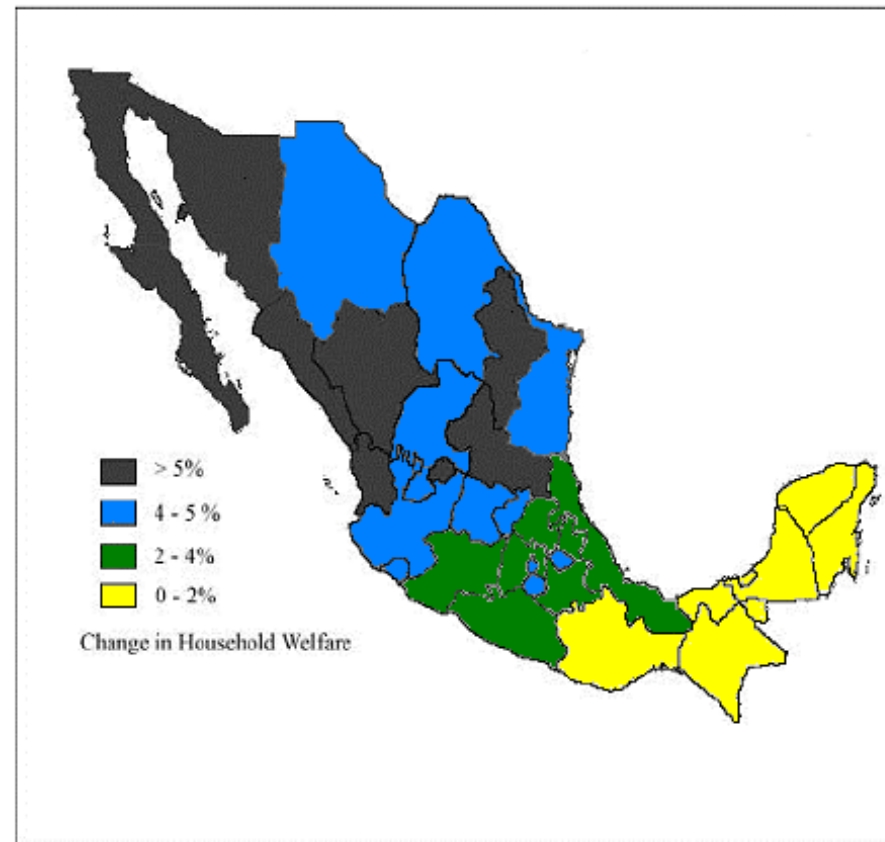
Poverty impact of higher world prices (Winters)



Price Transmission to Households

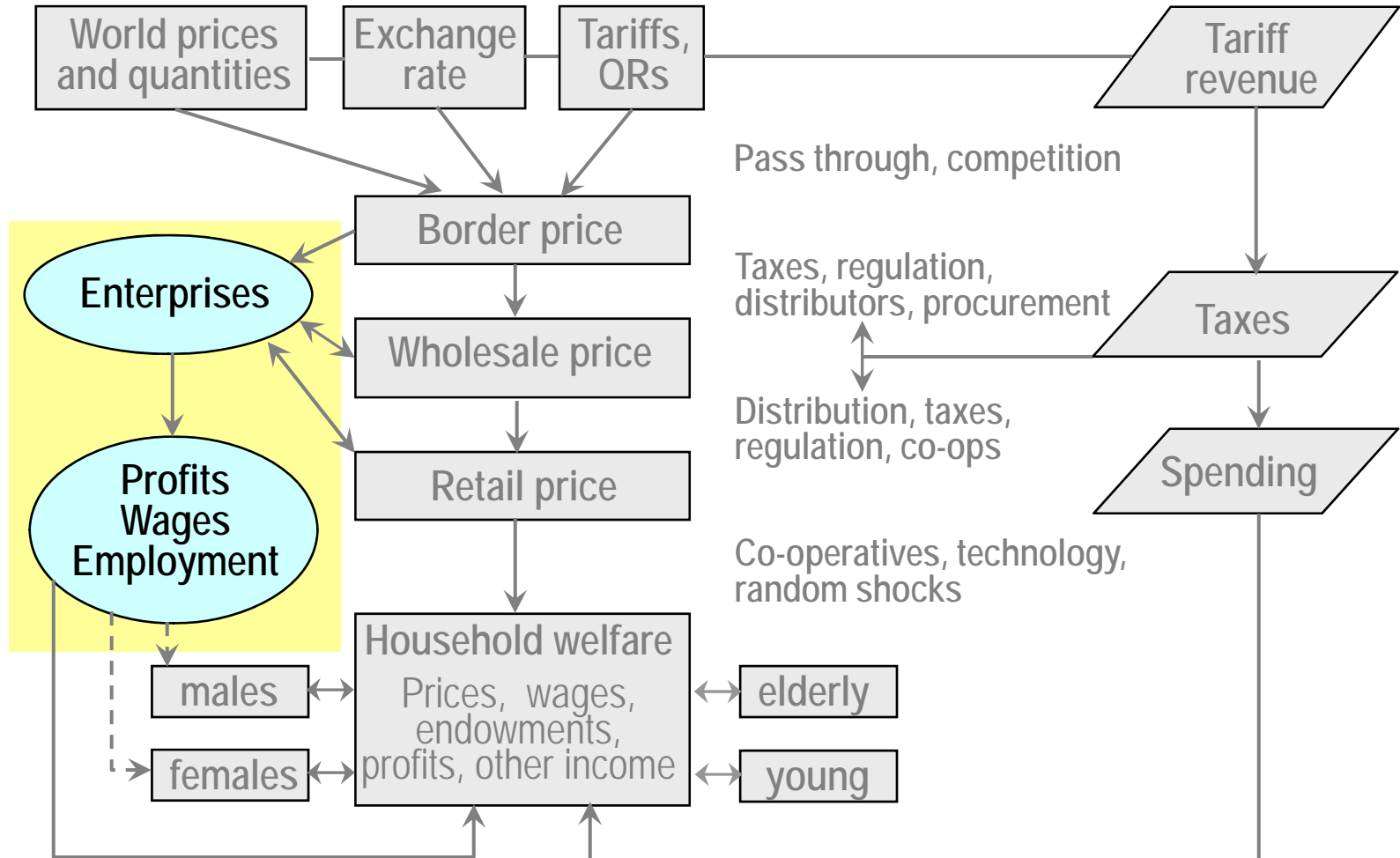


Incomplete price transmission yielded unequal gains from Mexican border price changes in 1990's



Source: Nicita, 2004

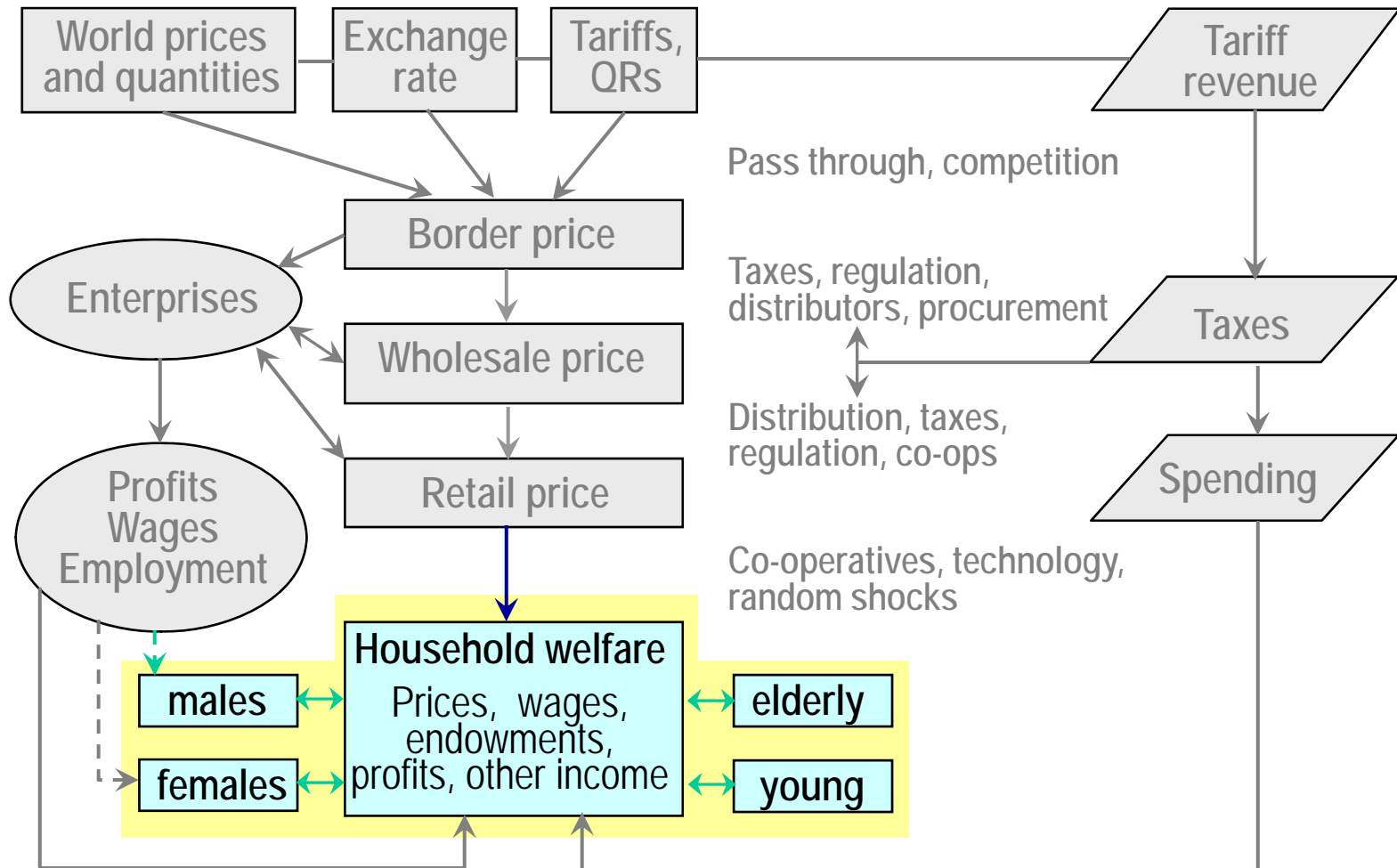
The Role of Labor Markets



Econometric Analysis of Rice Price Impacts on Wages: Ravallion's (1990) study of Bangladesh

- Many of the poor in Bangladesh are landless:
 - Hurt by higher food prices
 - But may gain if reflected in higher wages
- Condition for gain: elast of unskilled rural wages wrt rice $>$ budget share of rice in total wage income
- Observe expenditure share from survey data, estimate wage-price elasticity:
 - SR elasticity of 0.22 means that landless labor hhlds will lose from higher rice prices
 - LR elasticity of 0.47 (roughly equal to staple grains share for poorest hhlds) means that some hhlds may gain in LR
- *Time frame matters – SR poverty may increase more*

Conceptual Framework: Household Impacts



Home production and migration/transfers can mitigate impacts of higher food prices on households

- ***Ex post* Analysis of Indonesian Crisis: Smith et al. (2002)**
- **Focused on earnings and employment response to commodity price and wage shocks due to the Crisis:**
 - **Formal sector rural real wages fell by as much as 60%**
 - **But combined hhld income only fell by 37%**
 - **Dampening effect due to stability of agr self-employment earnings**
 - **When add home production, full income fell by only 21%: rural hhlds proved “remarkably resilient”**
 - **Urban hhlds fared less well:**
 - **Formal wages dropped less (55%) but**
 - **Full income dropped more (43%): less diversified**
 - **Differential engendered remarkable reverse migration: Agr absorbed additional 7.2% of labor force! (20% increase in farm labor)**

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Rationale for Simplified Framework

- **Country case studies are needed to account for complexities noted above**
- **But also need for international cross-section study to identify common patterns**
- **Work with sample of 16 countries in Latin America, Africa, Asia; focus on \$1/day poverty:**
 - **Instead of reporting all individual country impacts, focus on three sample statistics and look for insights:**
 - **AV = average value (not very interesting)**
 - **AAV = average absolute value (is chng big or small?)**
 - **SC = AV/AAV (is it consistently positive or negative?)**

Framework for analysis (1)

- **GTAP model, modified version incorporates:**
 - Biofuels & by-products (Birur et al.; Taheripour et al.)
 - land use by AEZ (Lee et al.)
 - factor market segmentation (Keeney-Hertel)
 - Poverty module and revised factor earnings (Hertel et al.)
- **Used to elicit national price and earnings impacts of multilateral biofuel mandates**
- **Trade specification dampens international price transmission; full transmission *within country***
- **Micro-simulation model used to evaluate household-level impacts**
- **Medium term comparative static analysis:**
 - Long enough for markets to clear
 - But ignore impact on capital accumulation

Framework for analysis (2)

- **Estimate earnings shares and density of the population around the poverty line in each of 7 income-based strata**
- **Use estimated consumer demand system to predict consumption changes at poverty line**
- **Estimate change in stratum poverty due to combination of earnings/consumption impacts**
- **Combine into estimate of national poverty using shares of strata in national poverty headcount**

Focus Countries and Stratification

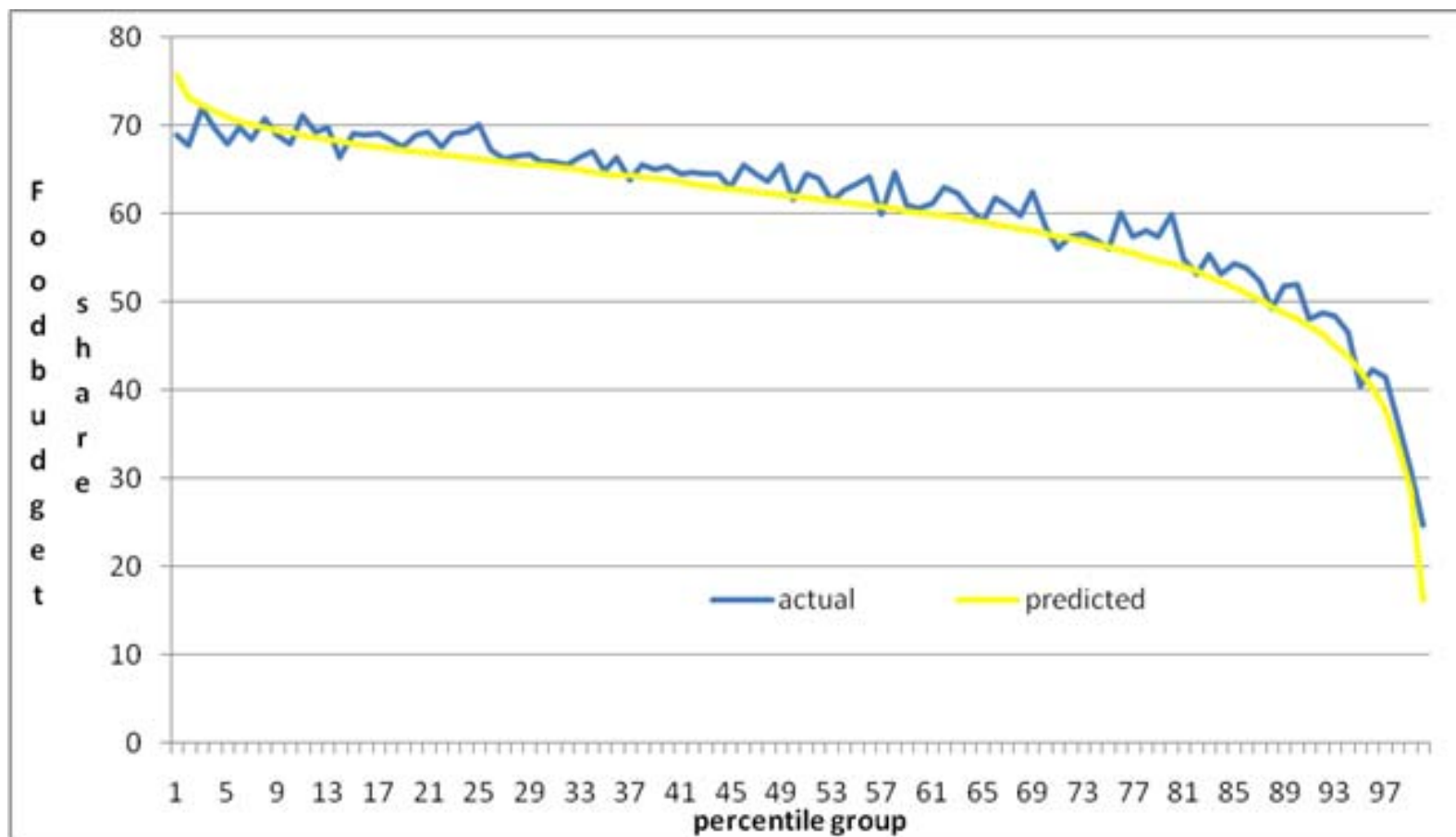
- **Survey data availability determines country selection:**
 - Disaggregated in v.6 GTAP data base
 - Household survey available to the World Bank
 - Disaggregation of income sources in survey
- **Leads to sixteen countries (will be expanded in v.7):**
 - Africa: Malawi, Mozambique, Tanzania, Uganda, Zambia
 - Asia: Bangladesh, Indonesia, Philippines, Thailand, Vietnam
 - Latin America: Brazil, Colombia, Chile, Mexico, Peru, Venezuela
- **Stratification of households into 7 groups by earnings specialization (> 95% of income from one source):**
 - Agr self-employment, non-agr self-employment, wage labor (rural and urban), transfer dependent, diversified (rural and urban)

The poor spend a disproportionate share of income on food

Commodity	Poverty share	Average share
Staple grains	0.22	0.14
Livestock	0.19	0.14
Other food	0.23	0.15
Food	0.63	0.43
Nondurables	0.20	0.21
Durables	0.06	0.10
Services	0.11	0.26
Total	1.00	1.00

Factor	Poverty share	Average share
Capital	0.10	0.58
Skilled labor	0.04	0.09
Unskilled labor	0.69	0.26
Land	0.04	0.04
Transfers	0.14	0.04
Total	1.00	1.00

Share of expenditure on food in Bangladesh: model predicted vs. actual values

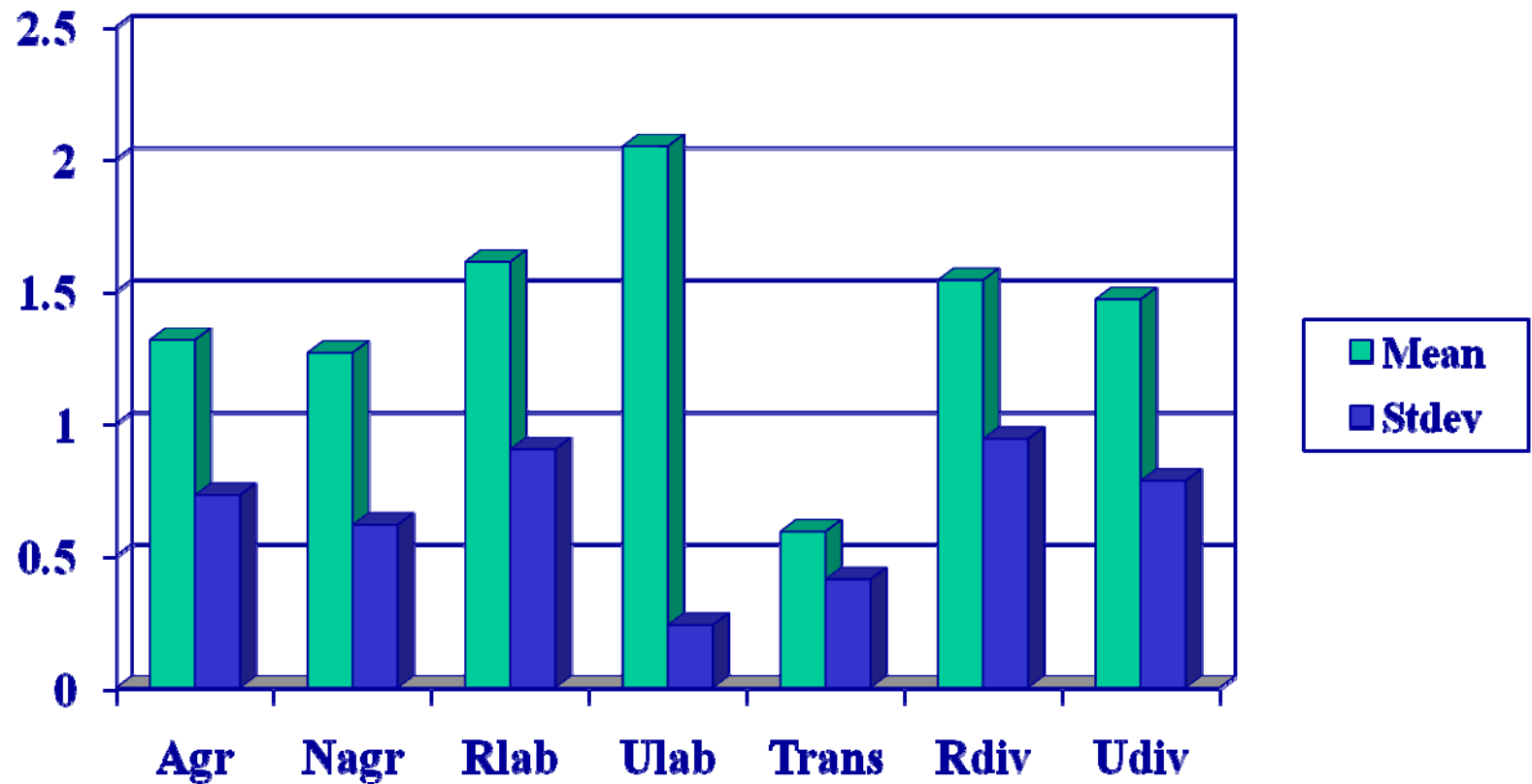


Source: Verma, Hertel and Preckel, 2009

Rural and transfer dependent hhlds are disproportionately poor

Stratum	Average pop- ulation share	Average po- verty rate
Agricultural	0.12	0.41
Nonagricultural	0.15	0.28
Urban labor	0.12	0.13
Rural labor	0.08	0.28
Transfers	0.05	0.51
Urban diverse	0.23	0.13
Rural diverse	0.25	0.32

Average poverty elasticity, \$1/day by stratum (& std deviation)



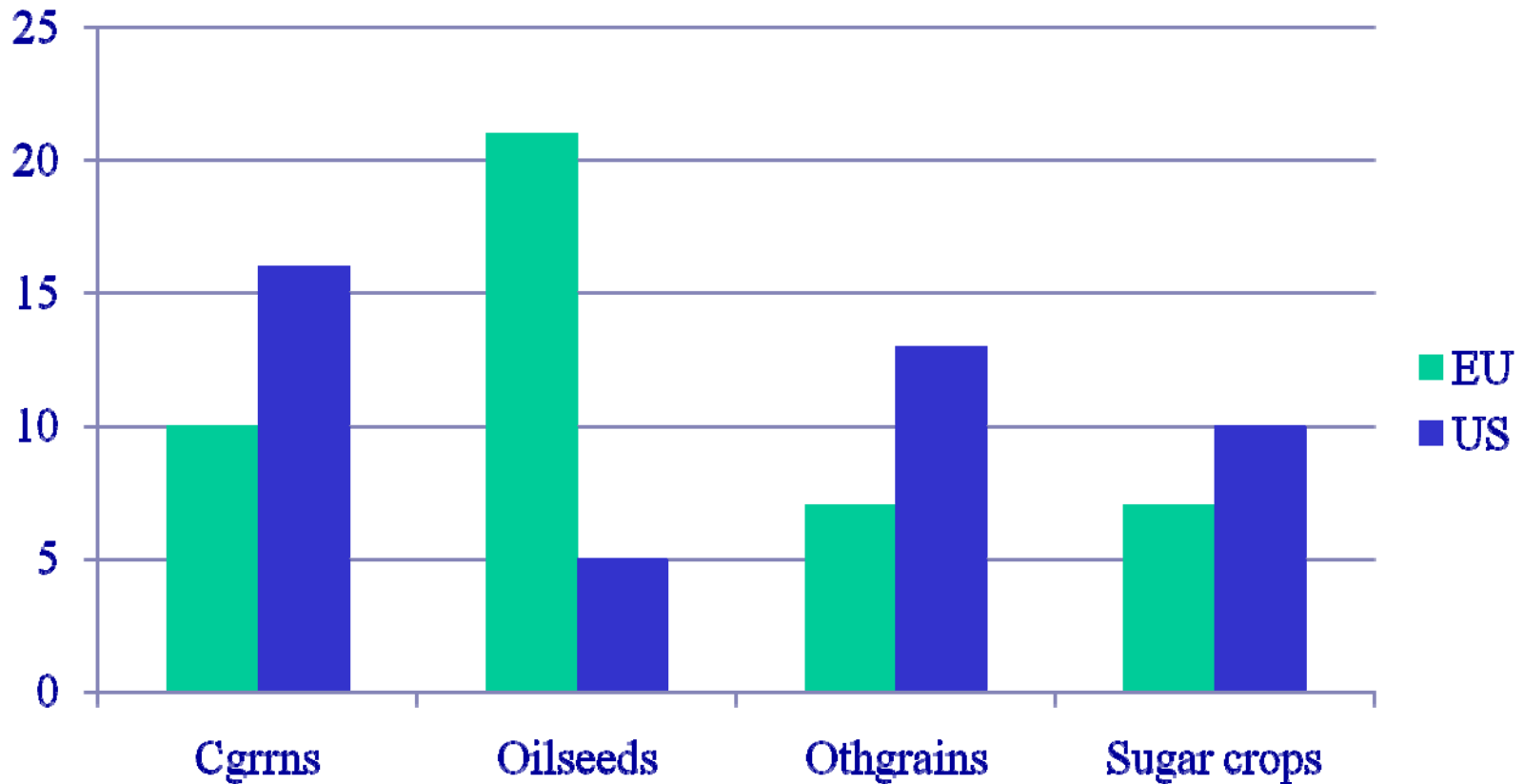
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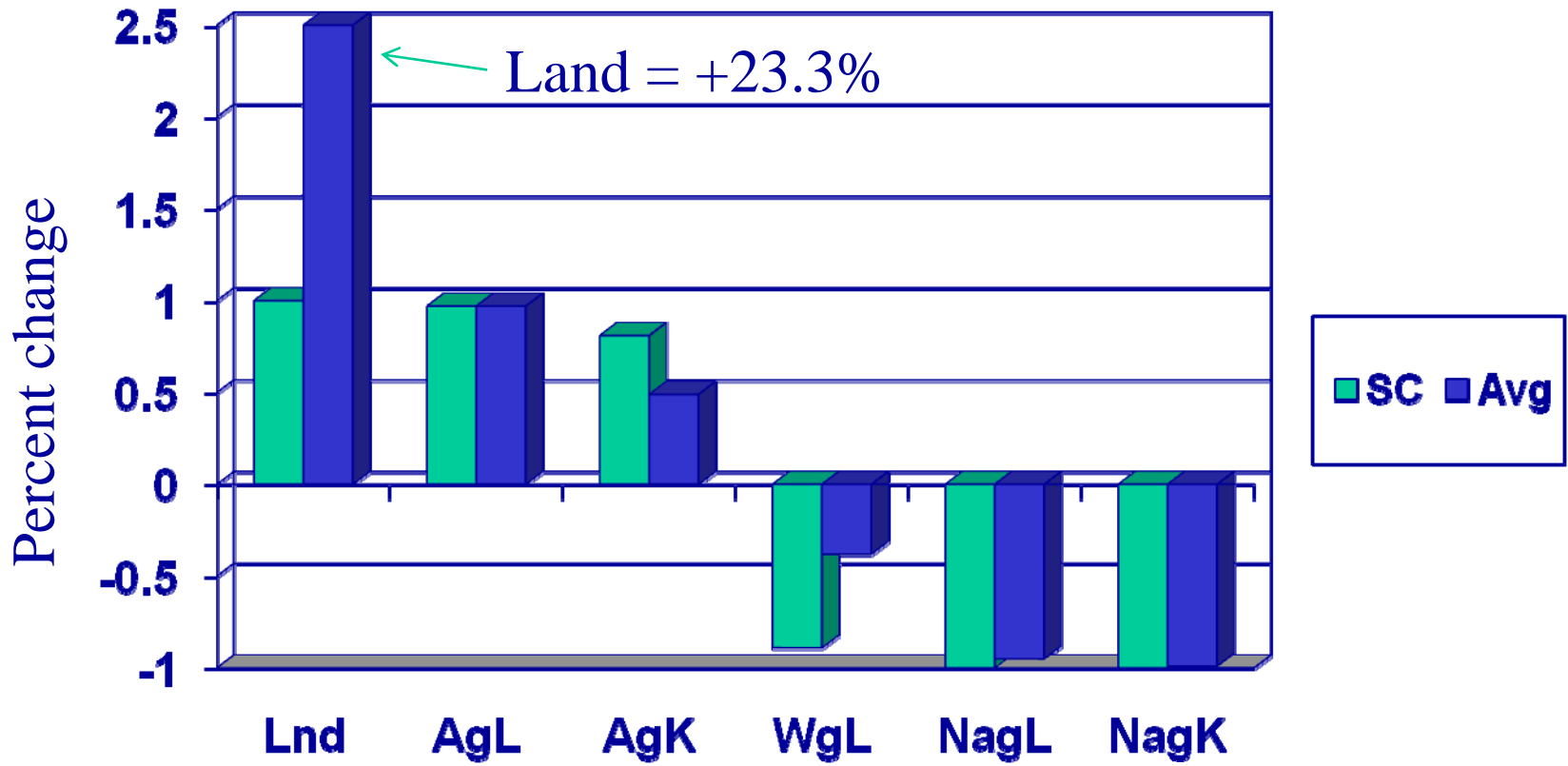
Historical and mandated growth in biofuels: US and EU

		US			EU-27		
<i>Fuel Consumption:</i>	<i>Units</i>	2001	2006	2015	2001	2006	2015
Liquid fuels for Transport:							
Petroelum	<i>Quad Btu</i>	25.96	27.57	29.63	18.20	18.20	18.50
Total Biofuels ¹	<i>Quad Btu</i>	0.150	0.503	1.133	0.037	0.224	1.156
Ethanol	<i>Quad Btu</i>	0.149	0.471	1.049		0.035	0.183
Biodiesel	<i>Quad Btu</i>	0.001	0.032	0.084	0.037	0.189	0.973
Share of biofuels in liquids for transport (energy basis)	<i>%</i>	0.58	1.83	3.82	0.20	1.23	6.25

Medium run price impacts of biofuels growth using GTAP-BIO-AEZ model (regional % chng relative to baseline)

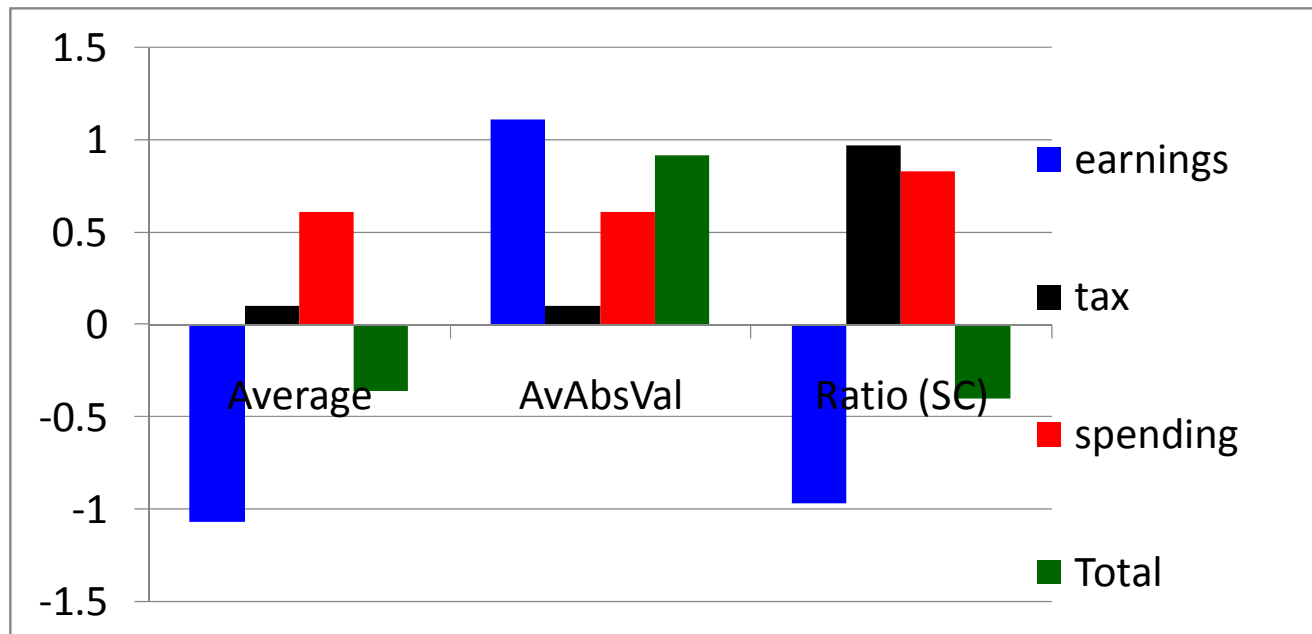


Summary of impacts on real, after-tax earnings: by earnings source-j

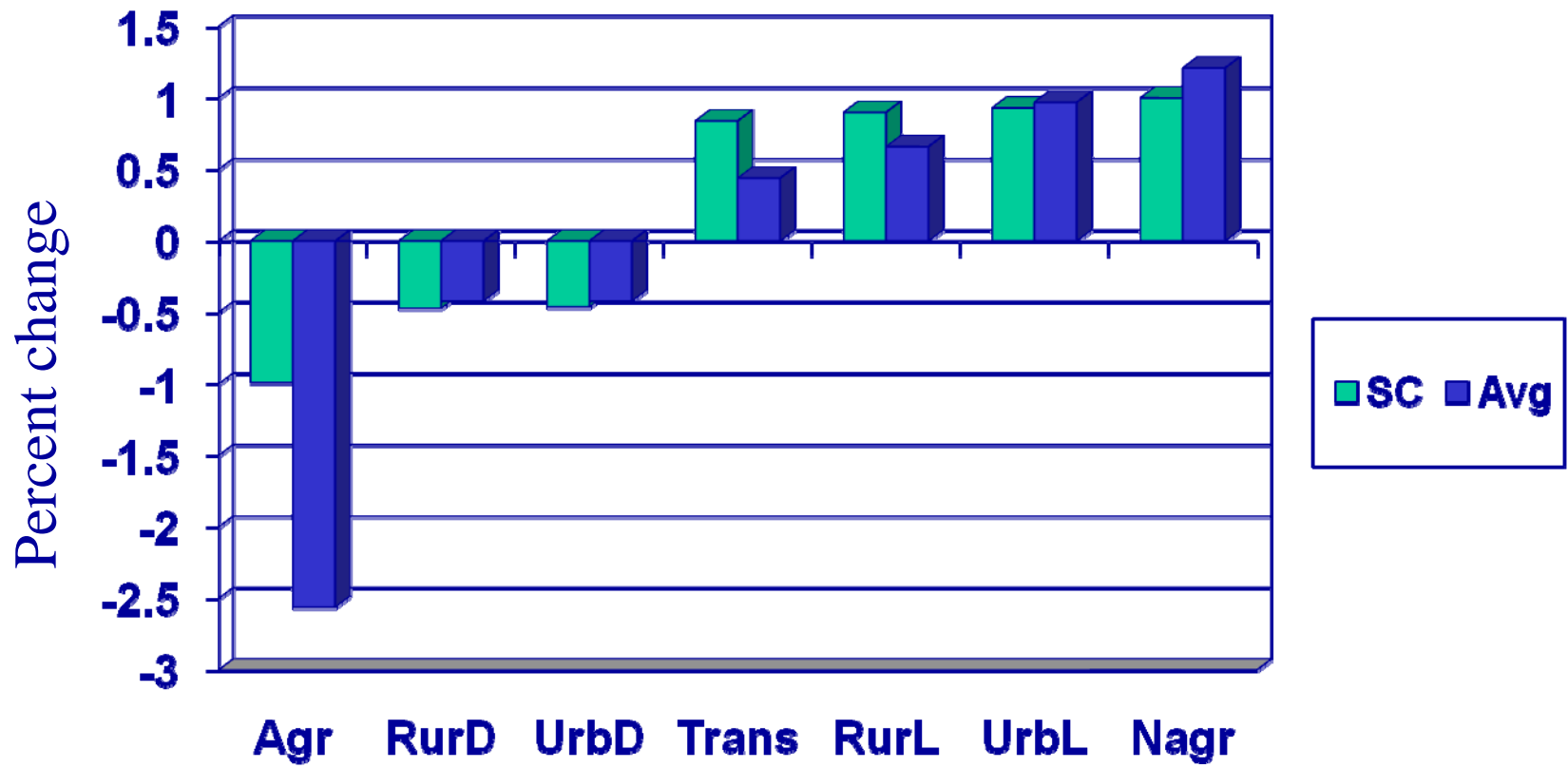


Skilled labor groups and transfers omitted from figure

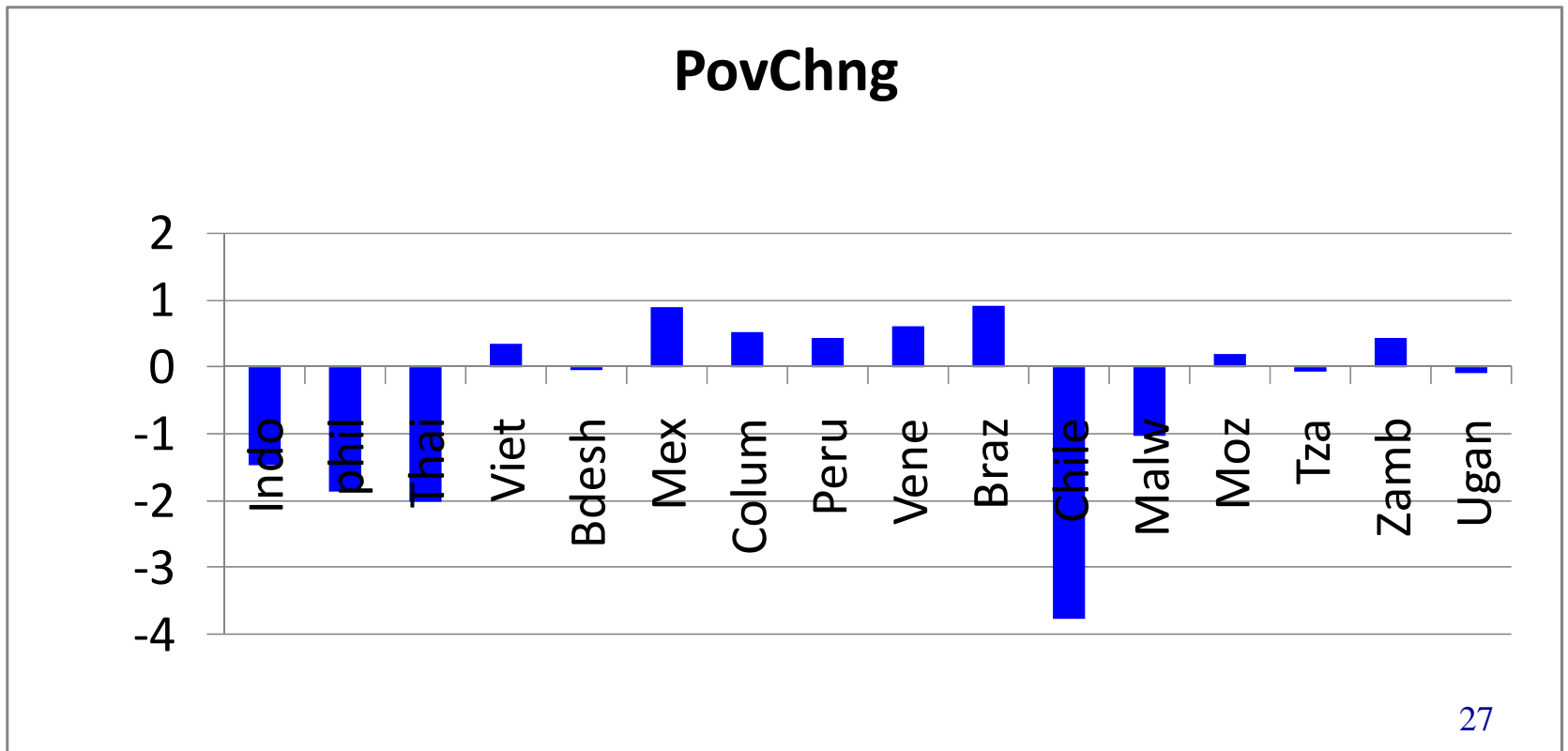
Disaggregating poverty impacts by source



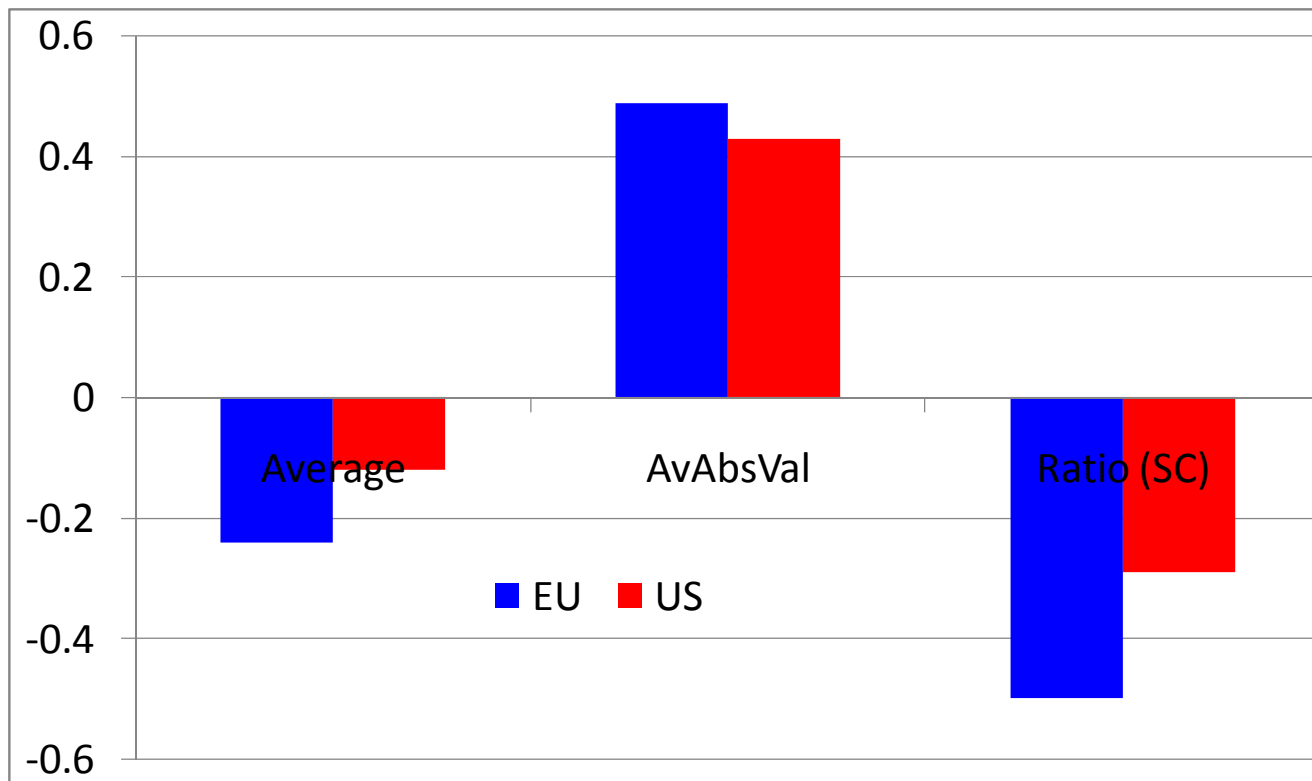
Poverty impacts on individual strata are rather consistent



But national poverty impacts vary widely across 16 focus countries (% change)



Poverty Impacts of EU and US Biofuel mandates are similar in magnitude and consistency



Conclusions

- **Poverty impacts of biofuels are complex, and definitive assessment will depend on country case studies**
- **Likely that SR and LR impacts differ significantly**
- **This analysis offers broad-based MR assessment across sample of 16 countries and finds some systematic patterns:**
 - **Biofuels boost food prices and agricultural returns, as expected**
 - **Earnings effect makes systematic contribution to poverty reduction**
 - **Spending effect systematically boosts poverty**
 - **Poverty falls among agr self-employed and diversified households**
 - **Poverty rises for wage labor, transfer and nonagr self-employed**
 - **National poverty impacts mixed: rises in LatAm, declines in Asia**
- **Results are *very* preliminary:**
 - **Need further scrutiny; explore differential impacts: US vs. EU**
 - **Minimalist approach is complementary to country case studies**

Selected References

- Birur, D., T.W. Hertel, and W. Tyner. 2008. “Impact of Biofuel Production on World Agricultural Markets: A Computable General Equilibrium Analysis”, GTAP Working Paper, Center for Global Trade Analysis.
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- Taheripour, F., T.W. Hertel, W.E. Tyner, J.F. Beckman and D.K. Birur (2008) “Biofuels and their By-Products: Global Economic and Environmental Implications.” Paper Presented at the 11th Annual Conference on Global Economic Analysis held at Helsinki, Finland, during June 12-14, 2008.