



Global Trade Analysis Project

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Evidence-based policy-making: Economic models, data and research institutions to tackle future challenges

Presentation by Thomas W. Hertel
Center for Global Trade Analysis, Purdue University
Roma Tre University
November 17, 2022



Outline of the talk

- **Institutional innovation to support evidence-based policies**
- **Local capacity building is key**
- **Beyond GDP: Broader impacts of trade policies**
- **Beyond trade policy: Global Sustainability challenges**
- **Global-Local-Global analysis of sustainability**



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Institutional Innovation to bolster Evidence-based Policy-making

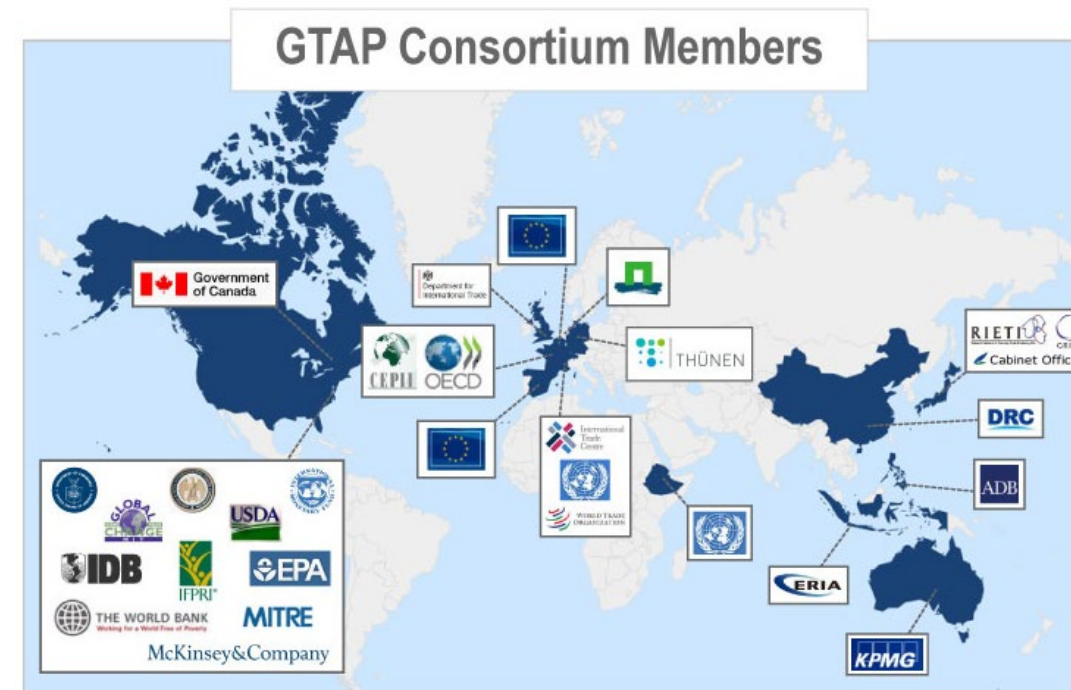


GTAP evolved in response to institutional challenges (Chp 12 in Dixon & Jorgenson eds.)

- **Agency-based *global* economic models:**
 - Methodology often poorly documented; rarely peer reviewed
 - Data base treated as strategic asset, rarely shared with outsiders
 - Unfavorable findings result in project termination
- **University-based *global* economic modeling projects:**
 - Insufficient contact with policy makers (with notable exceptions)
 - Limited financial support – cross-subsidized from other grants
 - Little incentive to invest in data base; focus on “toy” models
 - When do invest, keep model and data until rents and publications extracted
- **Consequences:**
 - Expensive projects, generating un-replicable results, yielding little scientific progress and limited credibility with decision makers

GTAP as an Institutional Innovation

- **Publicly funded project, based in academia:**
 - Core support from 34 national/international agencies
 - Free for contributors and consortium members
 - Newest Data Base is sold to public; older versions freely available
 - Contributors and consortium obtain early/serve as peer-reviewers of pre-releases
 - GTAP 11 has 160 regions, 65 sectors
- **Advantages:**
 - Academic base ensures continuity
 - Consortium ensures:
 - policy relevance
 - access to information
 - Individuals work to comparative advantage
 - Capitalize on network externalities
- **Challenges:**
 - It all comes down to the people!





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Key Lesson #1: A research consortium that capitalizes on the continuity and integrity of academia, while remaining closely engaged with policy making institutions can leverage the strengths of both while avoiding the weaknesses of institutions based solely in academia or solely in a public agency

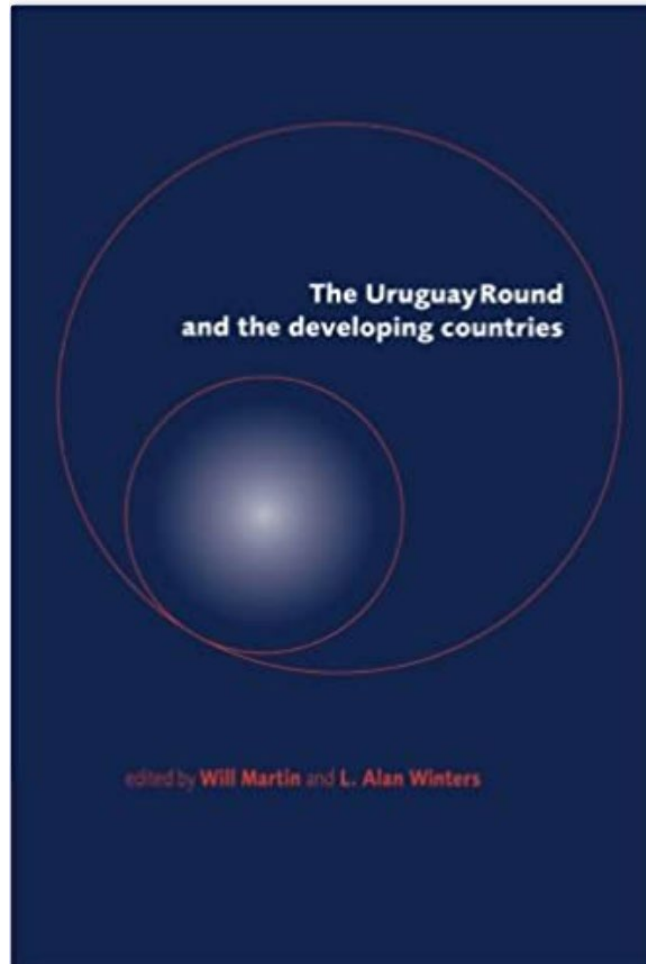


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Capacity Building to support Evidence-based Policy-making

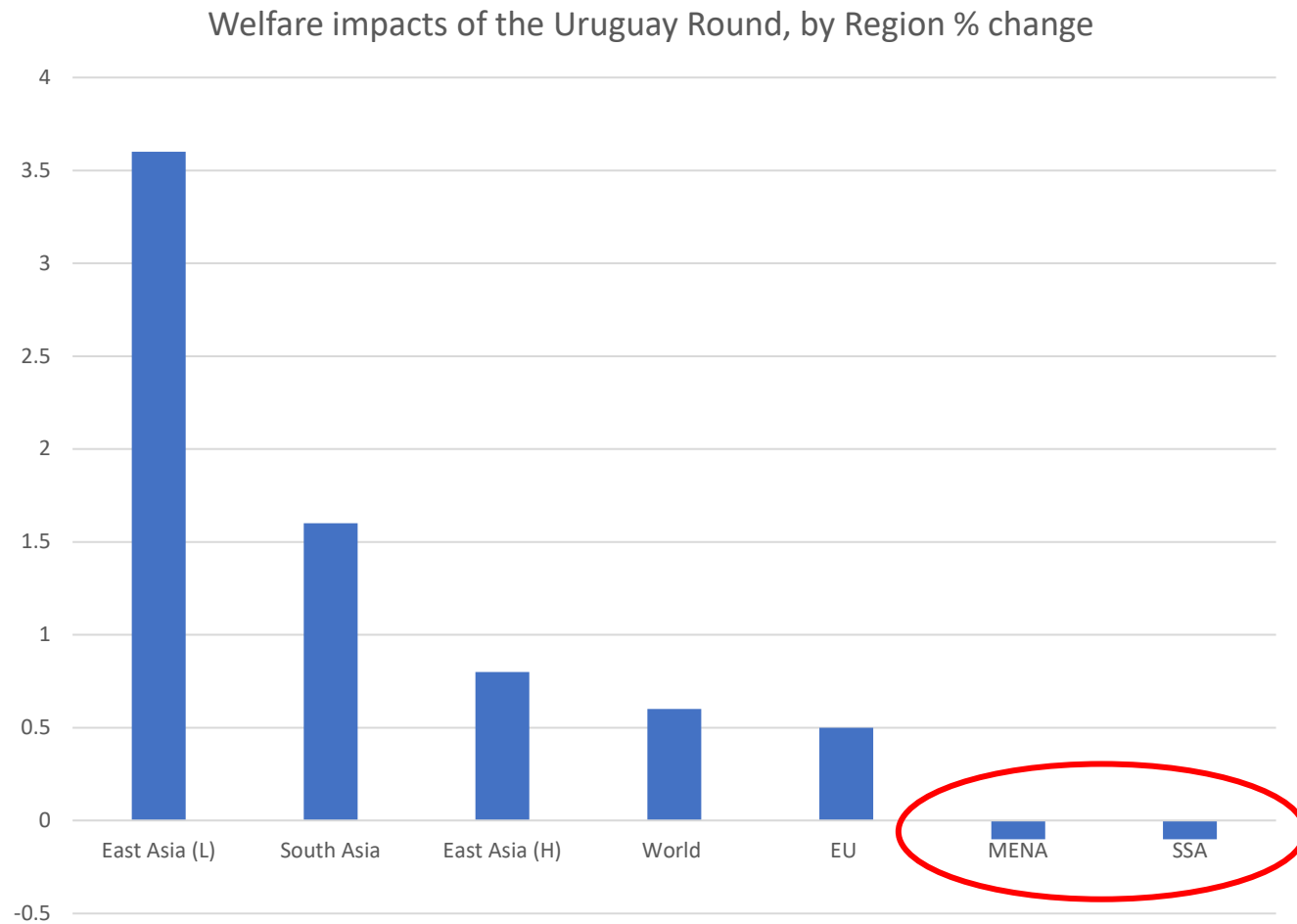


WTO was established in wake of Uruguay Round multilateral trade negotiations (1995)



- WB Conference to evaluate impacts on developing countries in 1994; *first high-level use of GTAP*
- Top scholars present – *but none based in the Global South*
- Participation in global economic modeling of trade policies limited to Paris (OECD), Washington (World Bank), Geneva (WTO) etc.
- *Developing countries were largely on the sidelines of these negotiations*

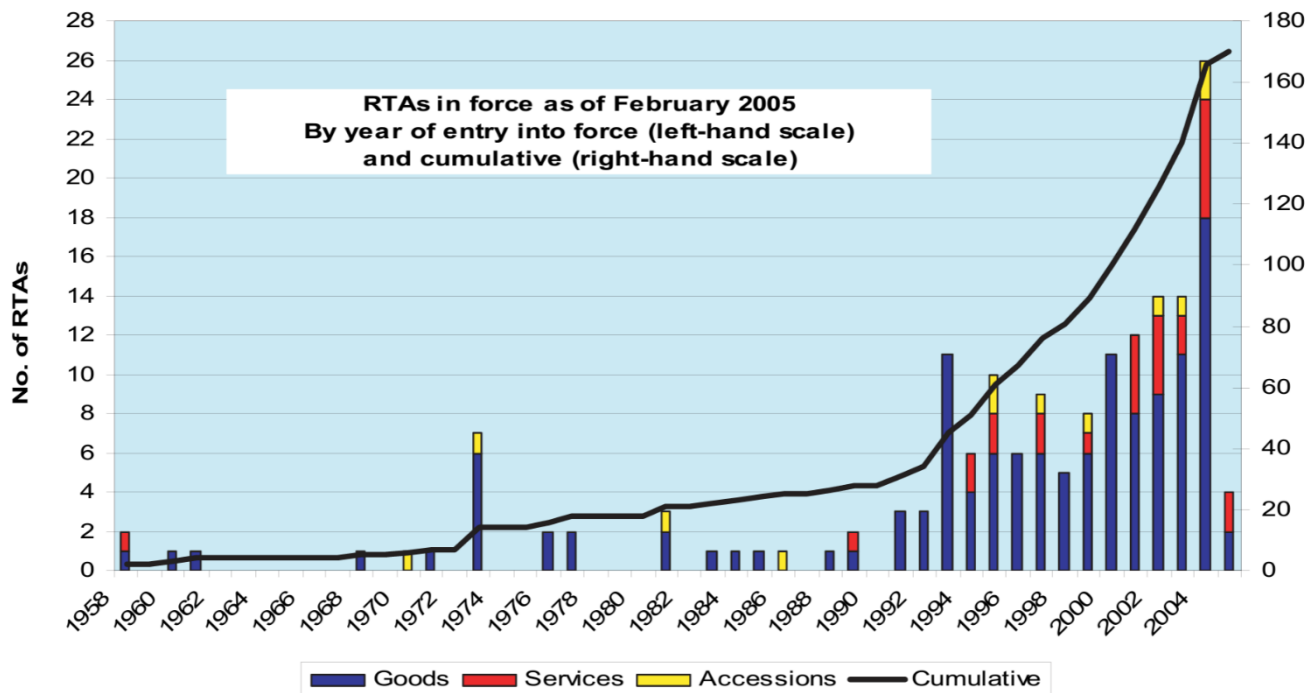
Africa and the Middle East were only regions predicted to lose from the UR



- *UR predicted to shrink SSA trade, relative to baseline*
- Presentation to SSA Finance ministers at the UN Economic Commission for Africa in 1997
- Led to interest in GTAP at UNECA

Explosion of bilateral and regional trade agreements in wake of UR

Chart 1: Notified RTAs to the GATT/WTO (1948-2005) by entry into force



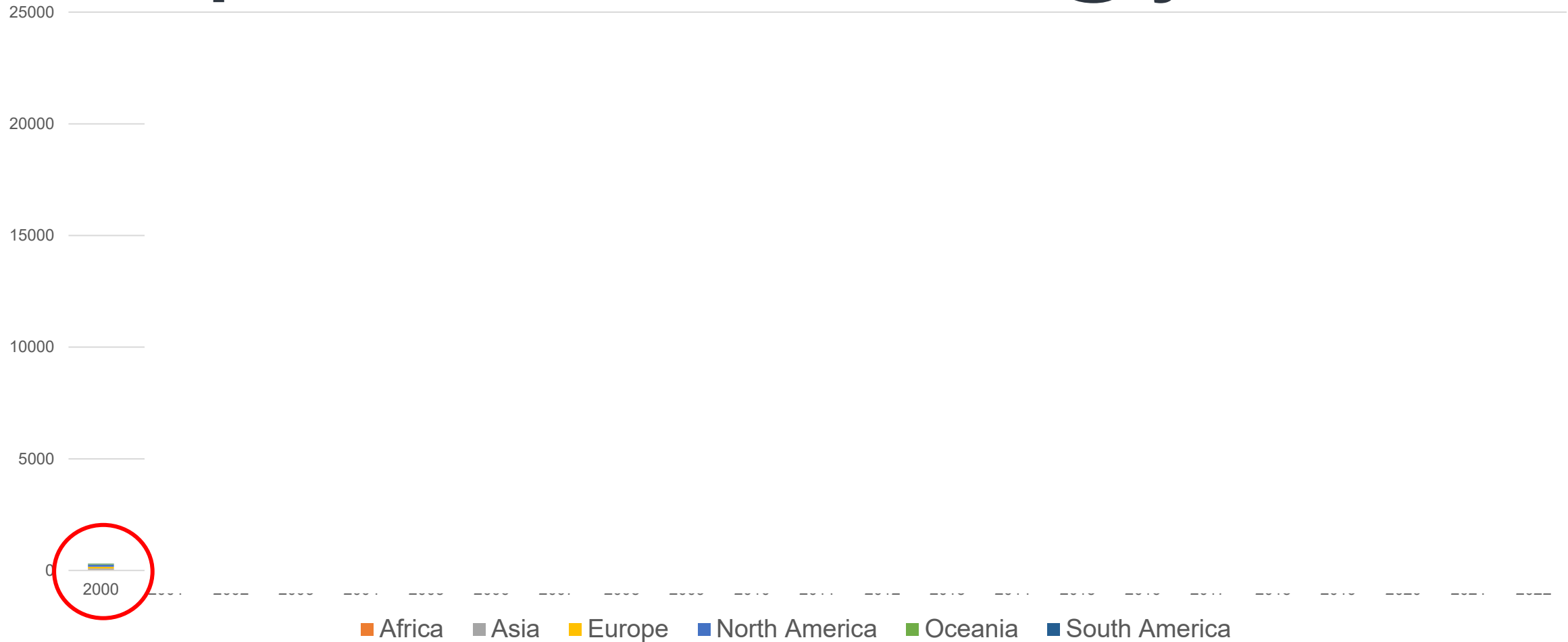
- Growing disillusionment with speed and depth of WTO reforms
- However, introduces asymmetric negotiating power

Bilateral trade/partnership agreements were also being negotiated in SSA region



- EU economic partnership agreement with South Africa concluded in 1999
- Negotiations coincided with the first African GTAP short course in 1998 in South Africa

GTAP Network in SSA negligible; largely Europe and North America @ year 2000



GTAP Conference hosted by UN-Economic Commission for Africa in Addis Ababa (2006)

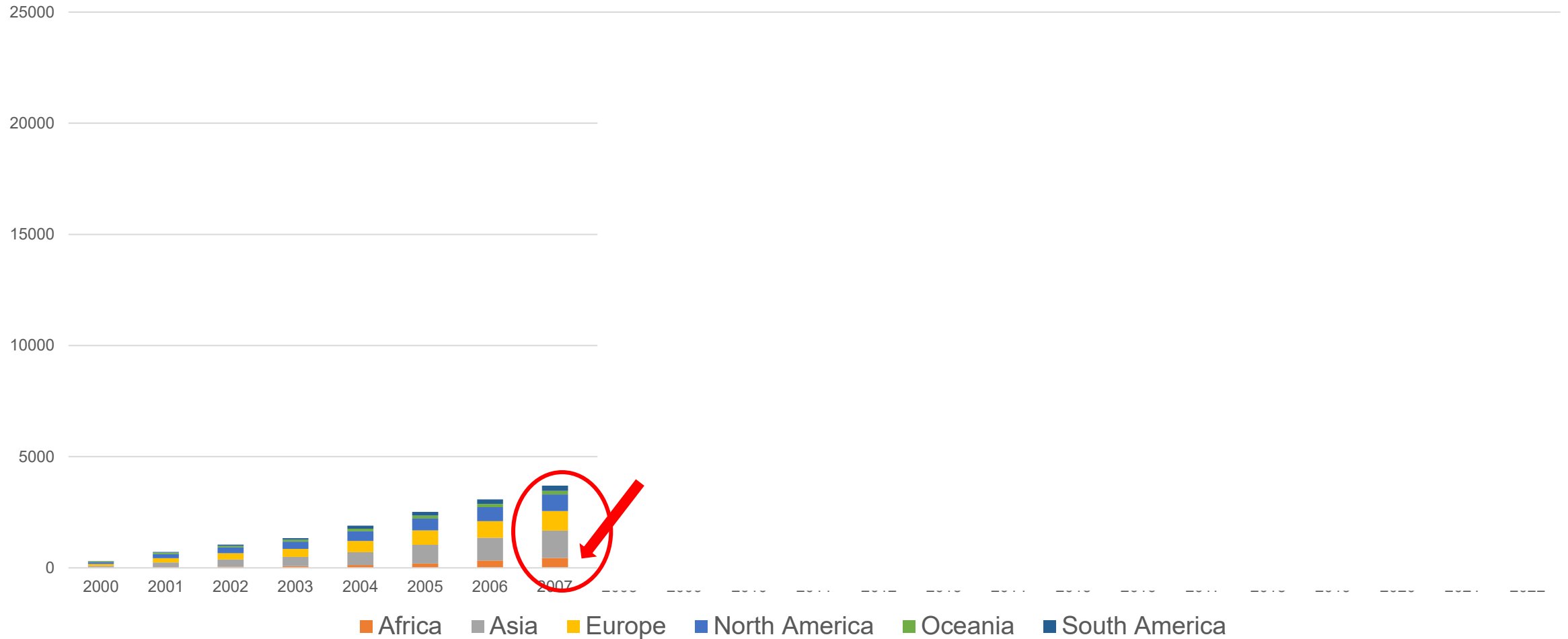
- Focus on poverty impacts of trade and development policies
- Sponsorship for many participants from Africa from the Development Banks allows for widening of network
- Paired with short courses in Africa to build capacity



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GTAP Network in Africa begins to grow



Africa embarks on a South-South regional trade agreement

- African Continental Free Trade Agreement signed in 2018, came into force in 2021
- No longer looking solely to the Global North to expand trade and fuel economic growth
- *GTAP-based analysis undertaken by UN Economic Commission for Africa as well as in African capitals supported negotiations*
- Implementation remains challenging, as with all such trade agreements, this is a long run undertaking





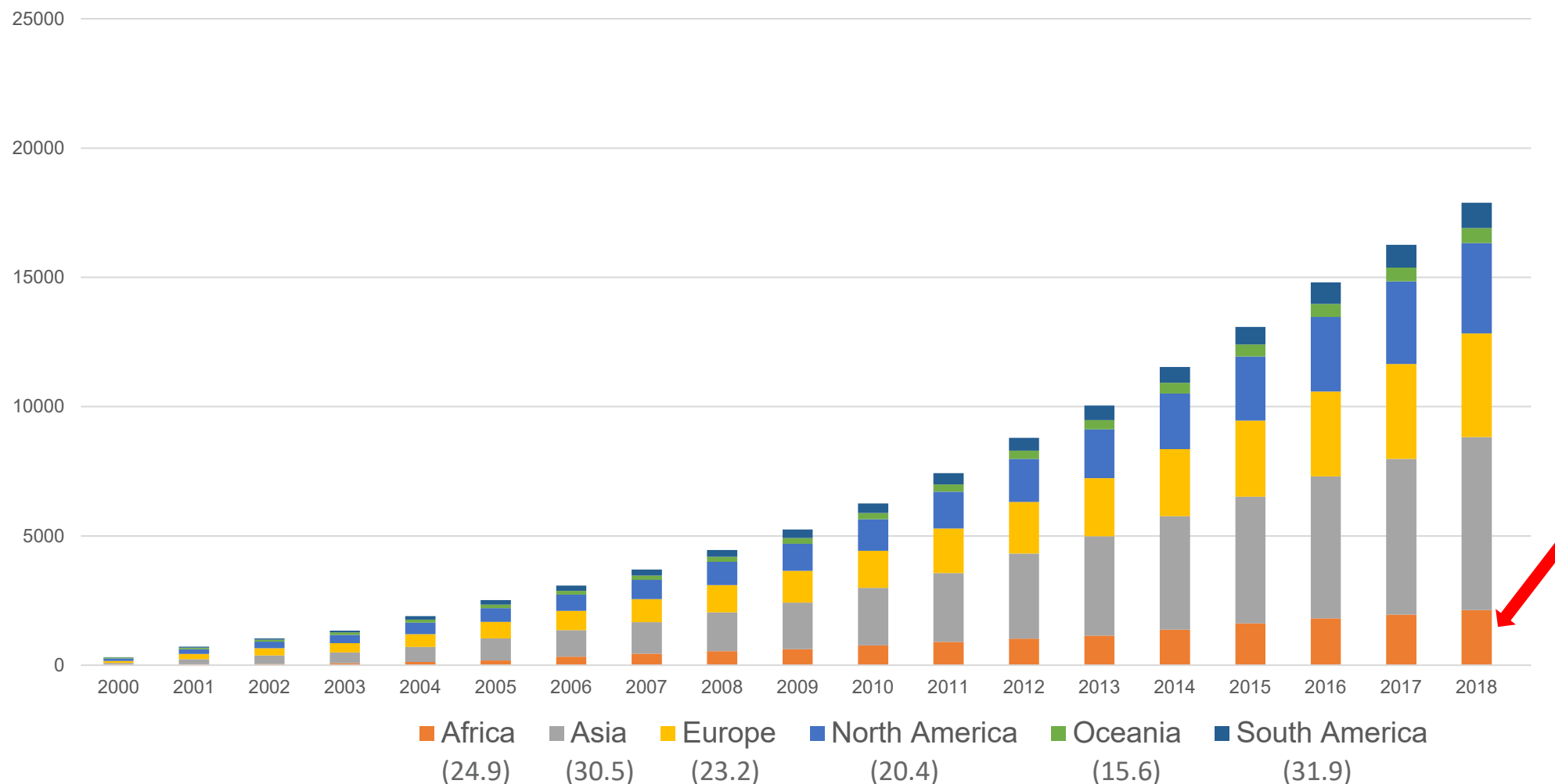
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“The popularization, improvement and increased use of **GTAP** tools have allowed **UNECA** to undertake **robust empirical analysis** leading to the **formulation of sound policy recommendations** which have greatly resonated in the ears of African policy makers. In fact, not only were recommendations heard but **they have actually influenced the design, implementation and monitoring of a number of reforms** on the ground”



Stephen Karingi, Director, Regional Integration and Trade Division,
UNECA from *Journal of Global Economic Analysis*, 2017

GTAP Network continues rapid growth, driven by network externalities and crowd-sourcing of data; now **2,000+ members in Africa**



Notes: (1) Annualized growth rate in parenthesis, (2) Approx 65% in academia, (3) Approx 32% female



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Key Lesson #2: Countries will not voluntarily make meaningful policy reforms until they can generate the evidence-basis for these reforms in the Ministries where the decisions must be taken. Local capacity building is key.



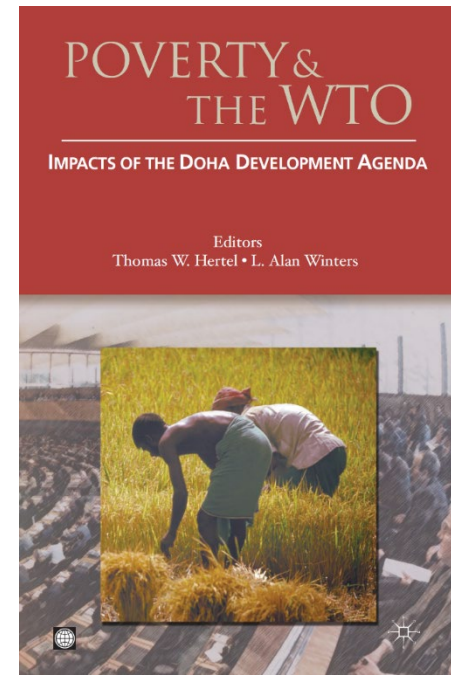
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Looking beyond GDP



Poverty impacts of trade reforms

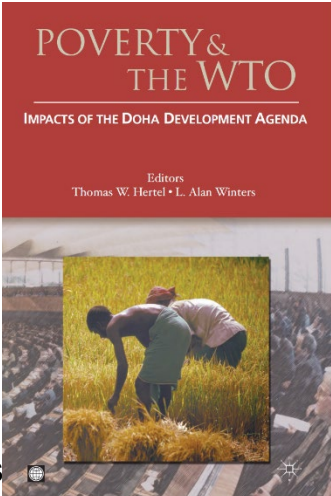
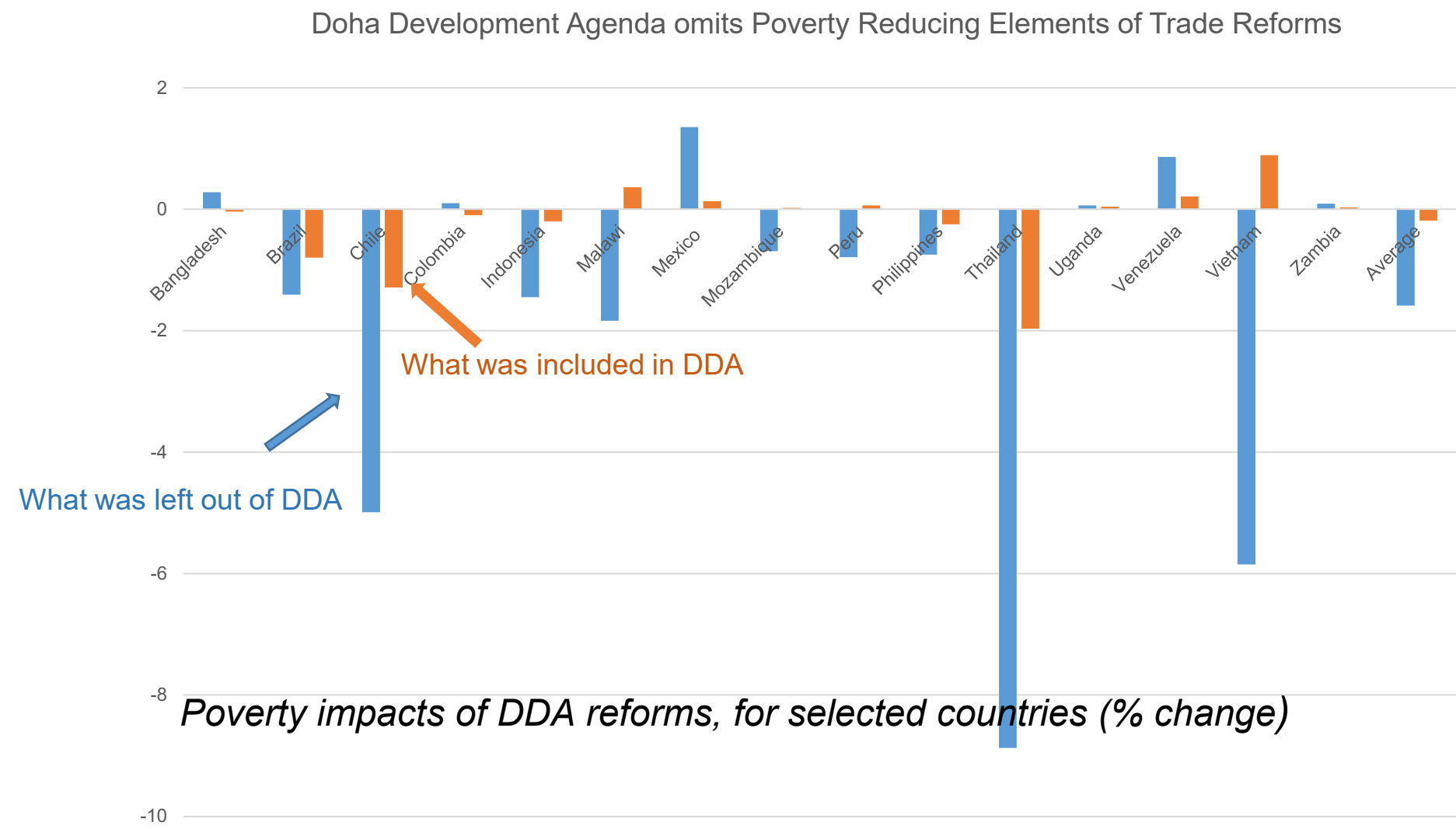
- Tendency to focus on aggregate impacts that are readily generated by trade models: GDP, regional welfare, trade, production, employment
- Emphasis in Doha Development Agenda of WTO was on development and poverty reduction
- World Bank funded my sabbatical to lead a project on the DDA and poverty:
 - Collaboration with Alan Winters
 - Commissioned a dozen studies using varied tools/models
 - Funded global dissemination findings



Selected findings

- **Contrary to expectations – Brazilian poverty was reduced following improved market access to EU:**
 - Benefits accrued to large farmers
 - But also to unskilled workers employed in agriculture
 - Leads to an overall poverty reduction
- **Within-country transmission of international price changes to rural areas is often weak, so the impacts of the DDA were expected to be spatially heterogeneous**
- **When you are focusing on poverty reduction, it is really labor markets that matter most, since the poor have few endowments outside their own labor – even if this involves self-employment or peasant farming.**

Major finding: What was left out of the Doha Development Agenda was more significant for poverty reduction than what was included





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Key Lesson #3: The widespread availability of data and modeling tools for evidence-based analysis of policy impacts brings a level of transparency that can make it hard to reach consensus agreements



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Beyond trade policy: Addressing the sustainability challenges of the 21st century



MEETING THE GLOBAL SUSTAINABLE DEVELOPMENT GOALS ON A CHANGING PLANET WITH LIMITED LAND AND WATER RESOURCES



MANY GOALS RELATE TO LAND AND WATER RESOURCES, SUGGESTING WE NEED AN INTEGRATIVE APPROACH TO ASSESS IMPACTS



Biofuels: A global sustainability challenge

- Initial analysis suggested maize-based ethanol in the US was a win-win-win:
 - Lowering GHG emissions
 - Improving energy security
 - Boosting farm incomes
- Led to legislation to implement a biofuel mandate in the US

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Ethanol Can Contribute to Energy and Environmental Goals

[ALEXANDER E. FARRELL](#), [RICHARD J. PLEVIN](#), [BRIAN T. TURNER](#), [ANDREW D. JONES](#), [MICHAEL O'HARE](#), AND [DANIEL M. KAMMEN](#) [Authors Info & Affiliations](#)

Life-cycle analyses ignored market impacts

- Half of the increase in global cereals consumption during 2006-08 period was due to US ethanol production!
- This, in turn, boosted prices and encouraged land conversion and increased production elsewhere
- “Indirect Land Use Change” (ILUC) became as hot topic.

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Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change

[TIMOTHY SEARCHINGER](#), [RALPH HEIMLICH](#), [R. A. HOUGHTON](#), [FENGXIA DONG](#), [AMANI ELOBEID](#), [JACINTO FABIOSA](#), [SIMLA TOKGOZ](#), [DERMOT HAYES](#), AND

[TUN-HSIANG YU](#) [Authors Info & Affiliations](#)

GTAP-BIO model & variants are used by California Air Resources Board to determine biofuels' ILUC

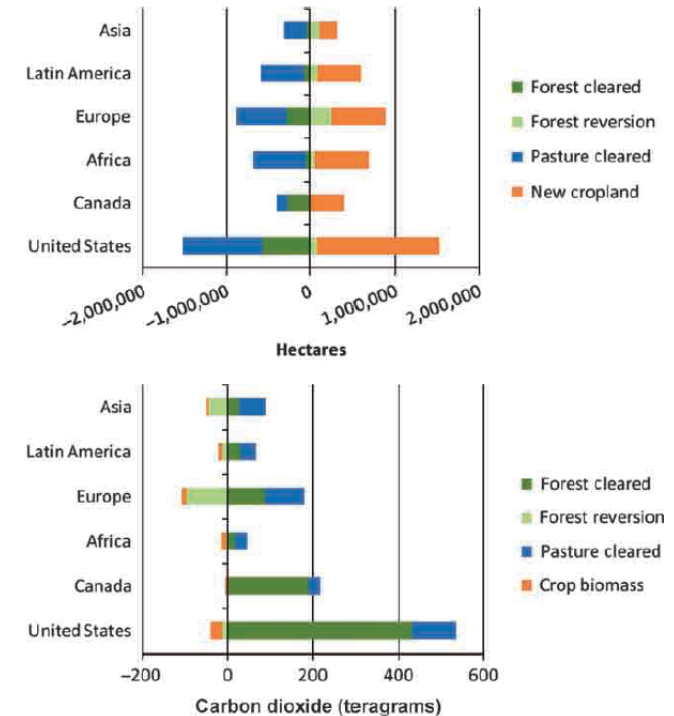
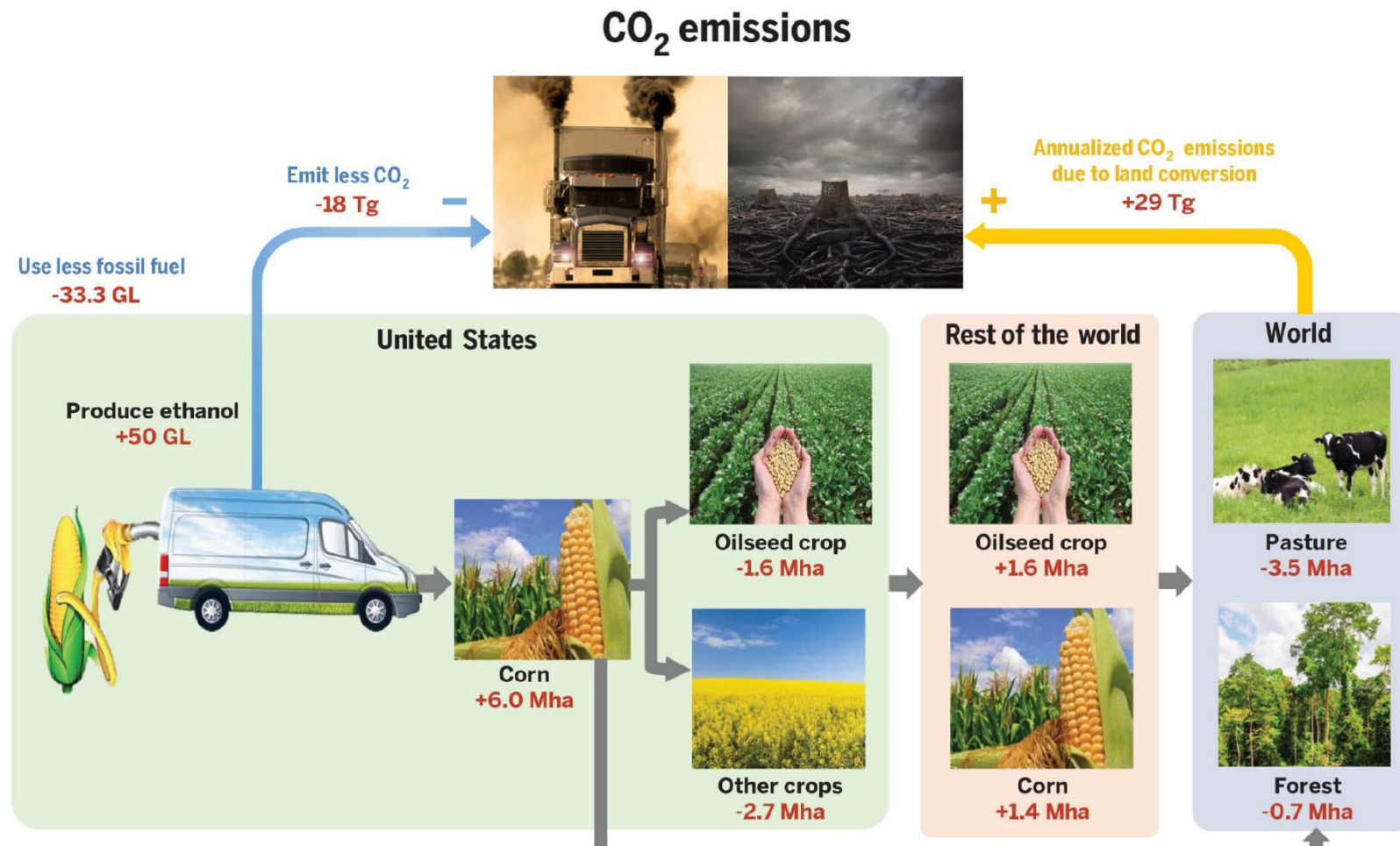


Figure 1. Global land conversion and associated greenhouse gas emissions due to increased maize ethanol production of 50.15 giga liters per year at 2007 yields, by region.

Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions: Estimating Market-mediated Responses

Liu et al., "Systems Integration for Sustainability", Science, 2015
Hertel et al., 2010. BioScience



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Key Lesson #4a: It is not always the best model that is used for evidence-based policy analysis – rather is it the model that is publicly available and most readily usable

Key lesson #4b: Economists providing evidence-based policy analysis must read and publish in the influential interdisciplinary science journals

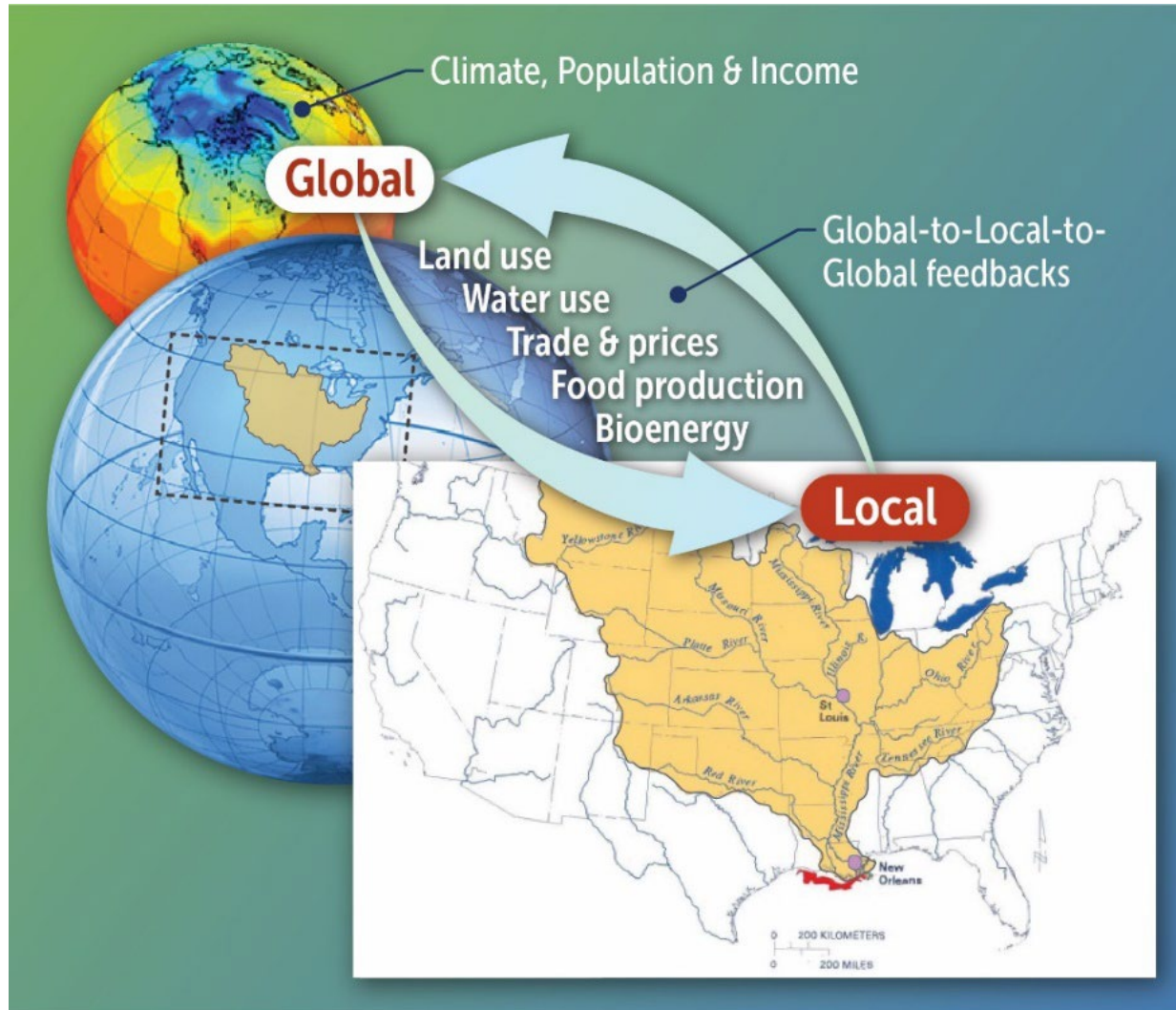


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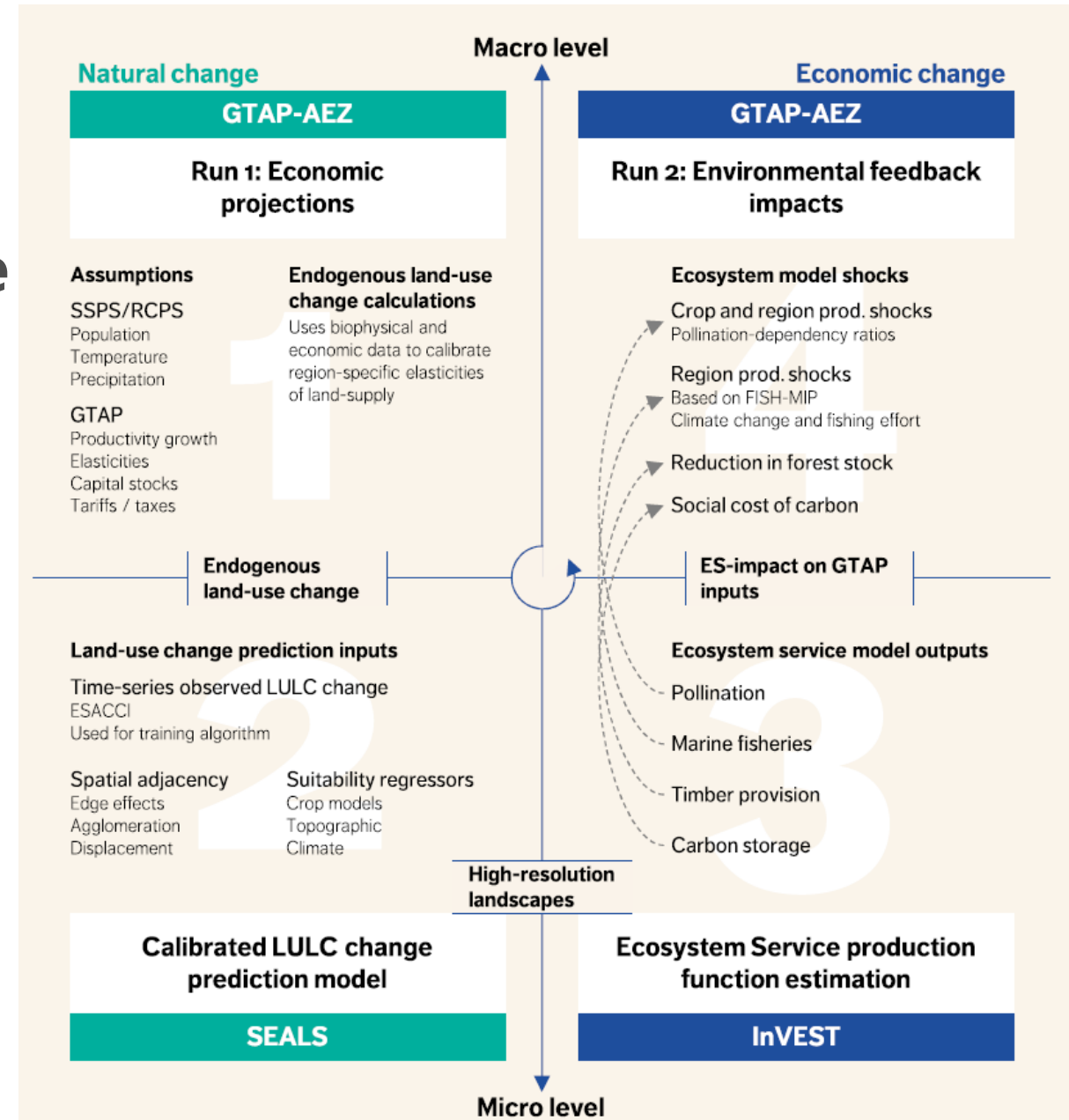
Global-to-Local-to-Global Analysis for Sustainability Assessments



- Recognizes that *global forces are driving local sustainability stresses*
- Yet the character of these stresses & *solutions vary by locality*
- Furthermore, *local responses can have global consequences*
- *Trans-disciplinary collaboration* is critical and global economic context is essential

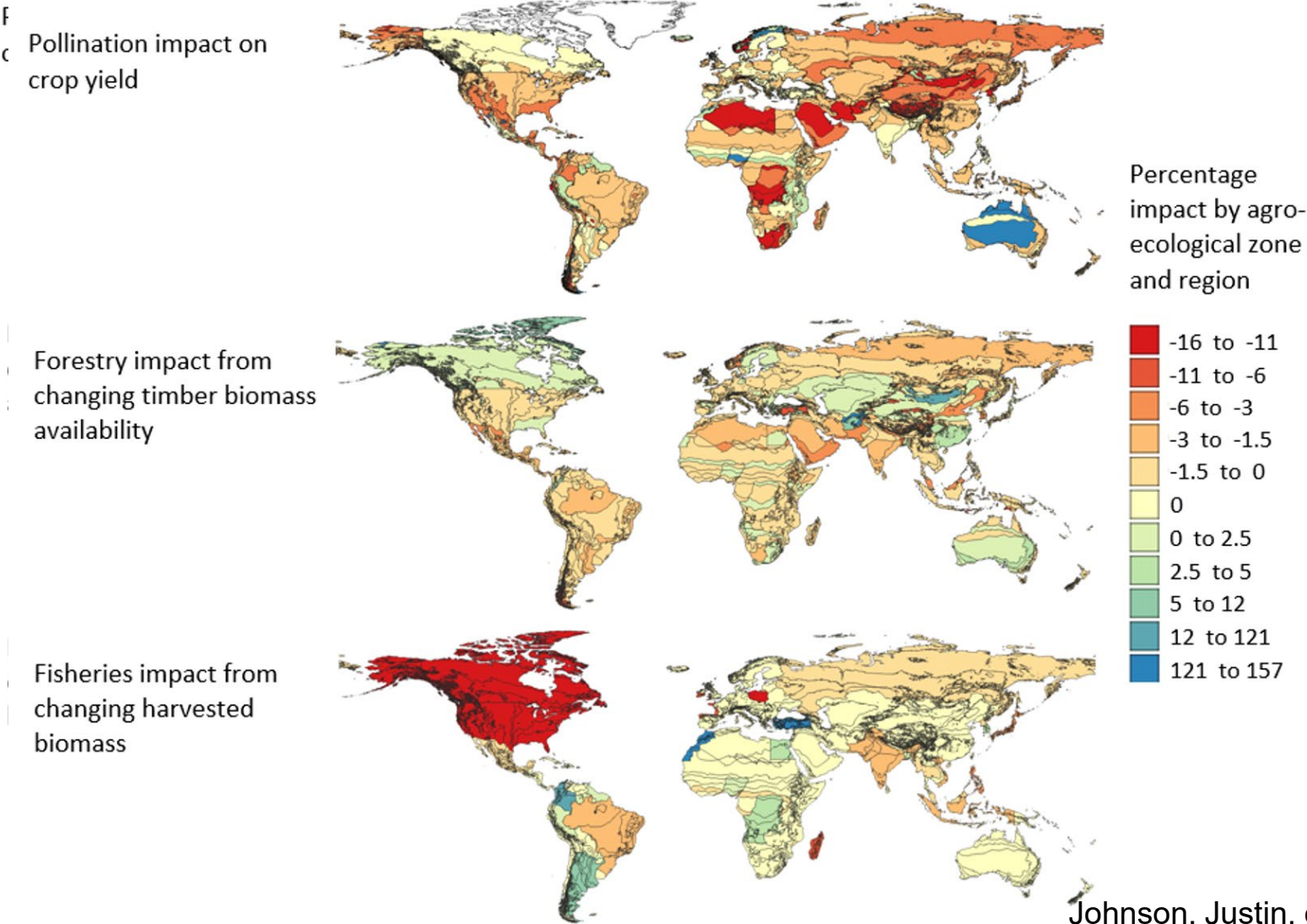
Quantifying the macro-economic impacts of conservation policies

- Collaboration between GTAP and NatCap networks
- Evolution of economy alters land use
- Land use affects ecosystem services
- Ecosystem services affect economy

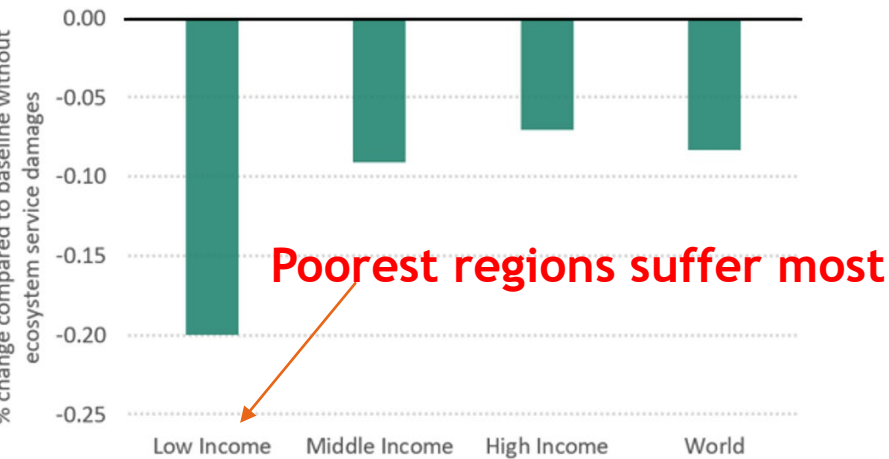


2030 BAU scenario results in degraded ecosystem services & reduced welfare

B. Ecosystem service impact by agro-ecological zone and region

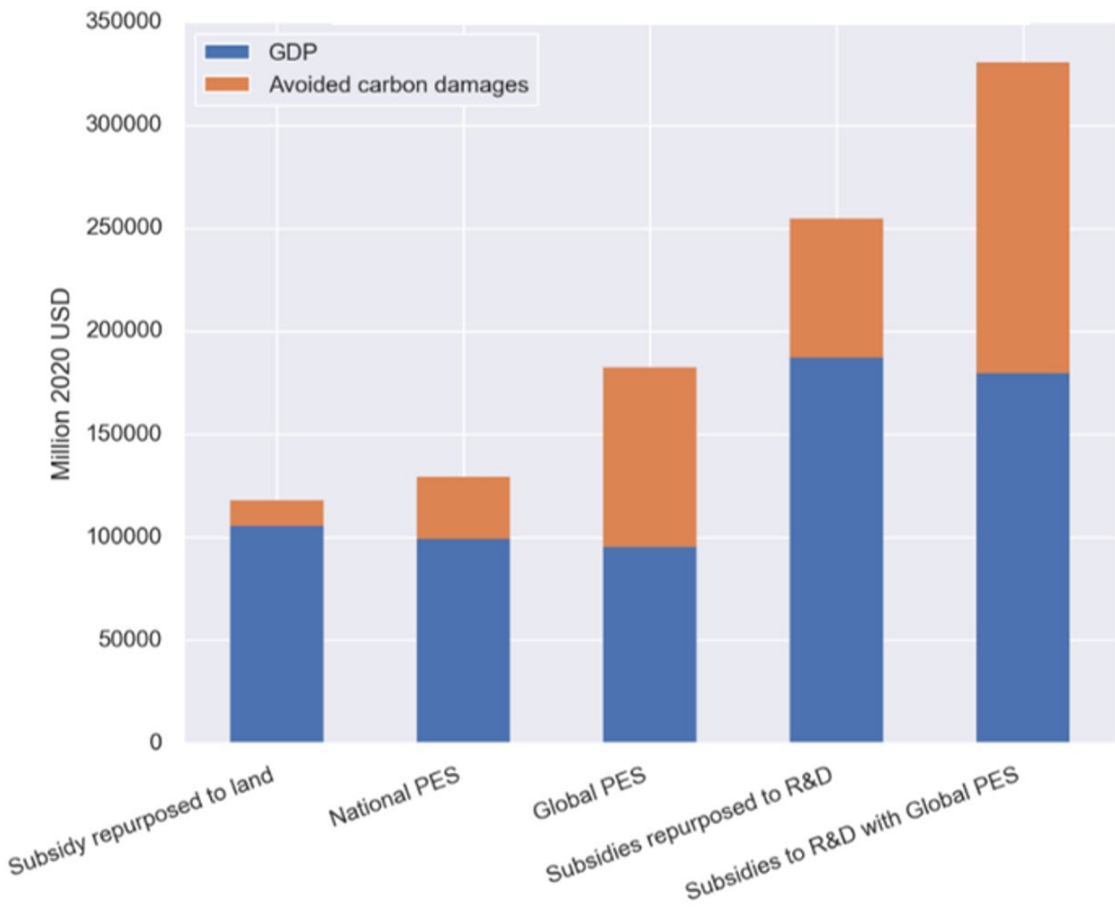


A. Regional welfare losses from degraded ecosystem services

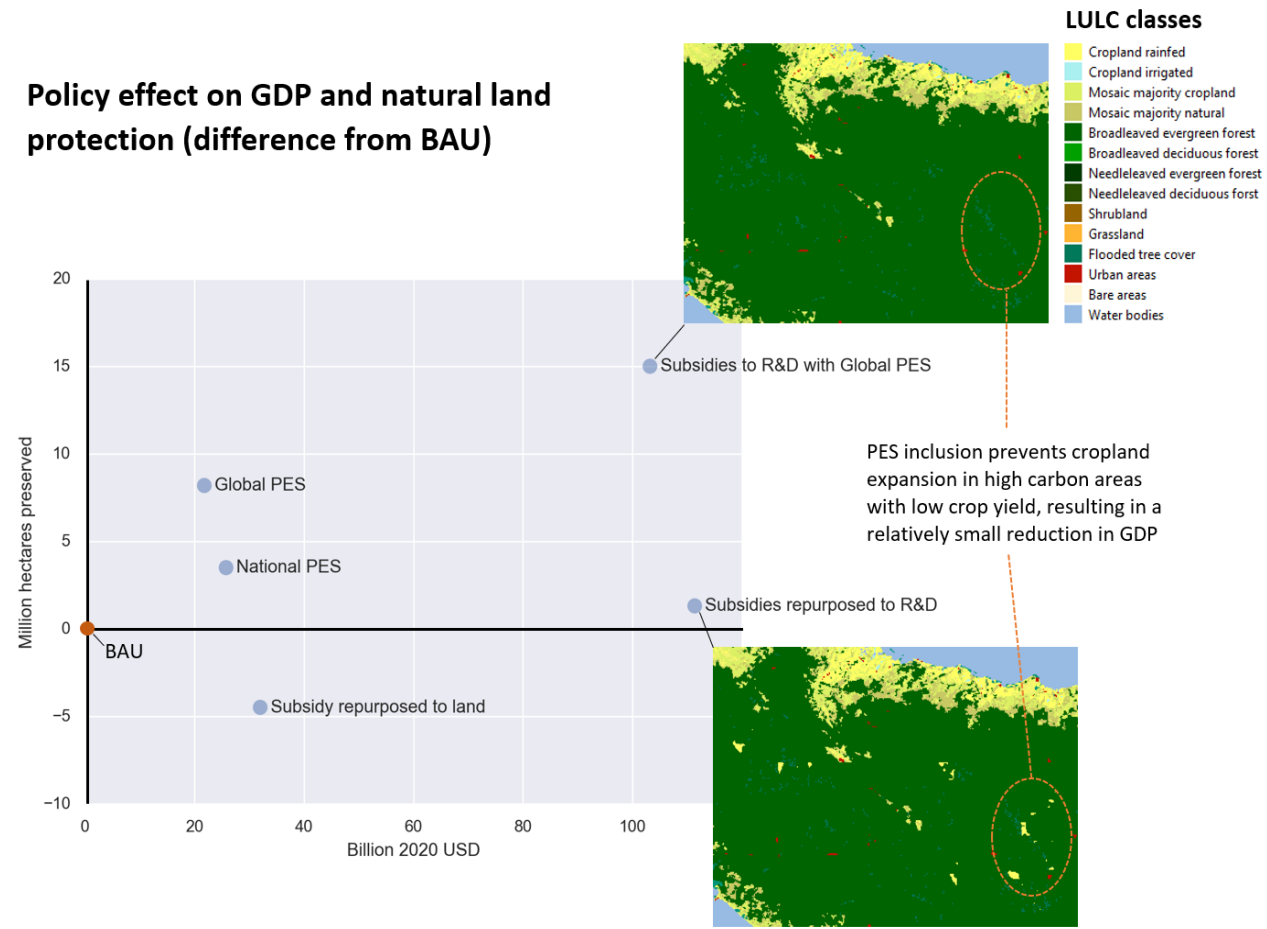


Policy responses can improve outcomes

B. Policy improvement over BAU with carbon sequestration value



Policy effect on GDP and natural land protection (difference from BAU)





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Key lesson #6: Evidence-based policy analysis related to the world's sustainability challenges is most effective when couched in a Global-Local-Global framework.

GLASSNET: An International Network of Networks designed to tackle GLG challenges

<https://mygeohub.org/groups/glassnet>



Global-Local-Global Analysis of Systems Sustainability
GLASSNET
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Meeting the Global Sustainable Development Goals on a Changing Planet with Limited Land and Water Resources

GLASSNET's impact on key stakeholders will make a difference in achieving the SDGs. Our network has the potential to provide decision makers from a wide-array of areas with the data needed to properly assess actions that will affect the environment, the economy and local communities.



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