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The Crucial Role of International Trade in Adaptation to Climate Change

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Large yield changes from Climate Change

↓

Large changes in comparative advantages

↓ ?

Large changes in international trade

Large trade changes only if adjustments in domestic demand and supply not enough to reduce the imbalances.

Recent work by Costinot, Donaldson, and Smith (2016, JPE):

- Acreage changes will play a big role in adaptation
- Role of international trade minimal
  - Because large adaptation through demand and supply

Conclusion challenged here:

- Development of a new agricultural trade model with spatially-explicit land use
- Analyze the role of each adjustment margin

Key elements of the modeling framework

Main elements

- Static general equilibrium trade model
- 50 countries
- 3 types of good
  - 35 crops
  - 1 livestock sector
  - 1 outside good
- 2 factors of production
  - Labor
  - Land
    - Collection of 11,801 fields (1 degree)
    - No possibility to expand over non-agricultural land use

Adjustment margins

- Demand side
  - Demand for calories
  - Substitution between ag. products
- Supply side
  - Acreage change
    - No yield response
  - Substitution between crops for feed
- Trade

Data

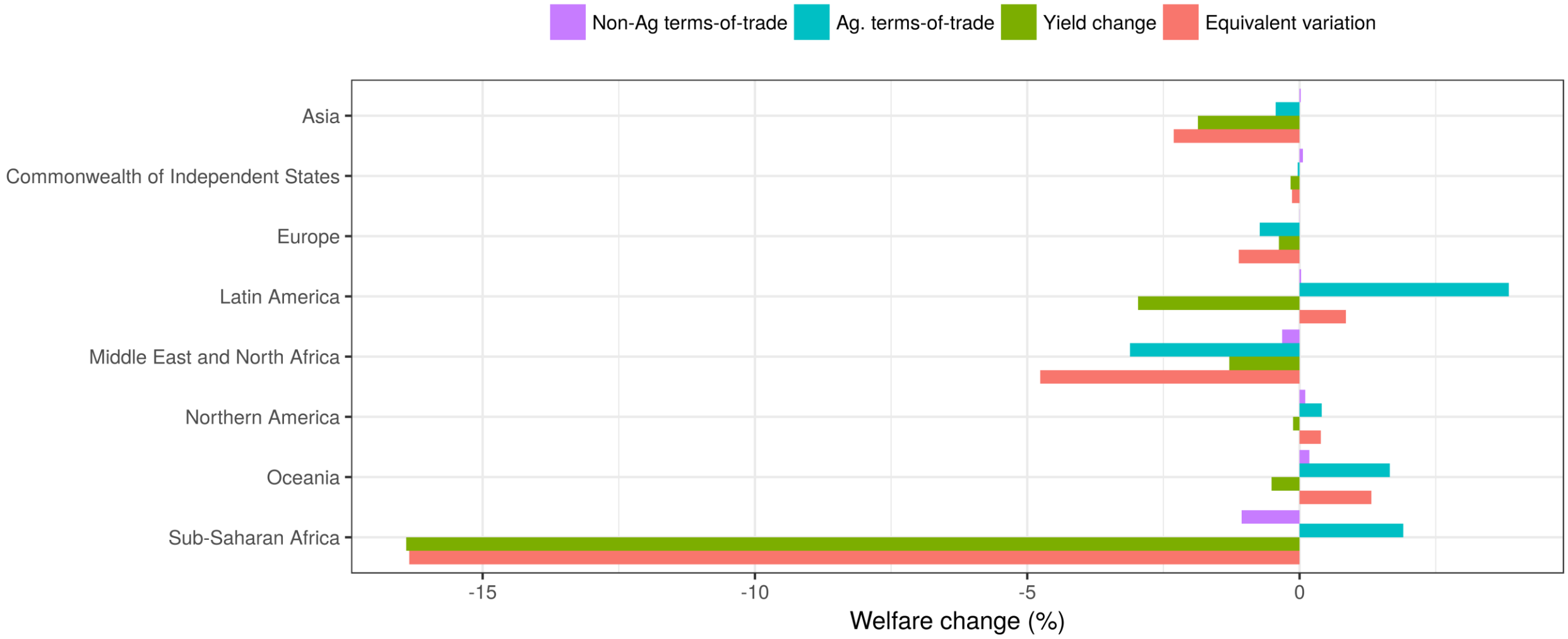
Initial situation

- 2011 base year
- Potential yields from the IIASA/FAO GAEZ project (High inputs, rain fed scen.)
- Value of production, feed, and trade from FAOSTAT
- Extent of agricultural land from Ramankutty and Foley for 2007
  - No extension over other land uses
- Other data from GTAP 9.2

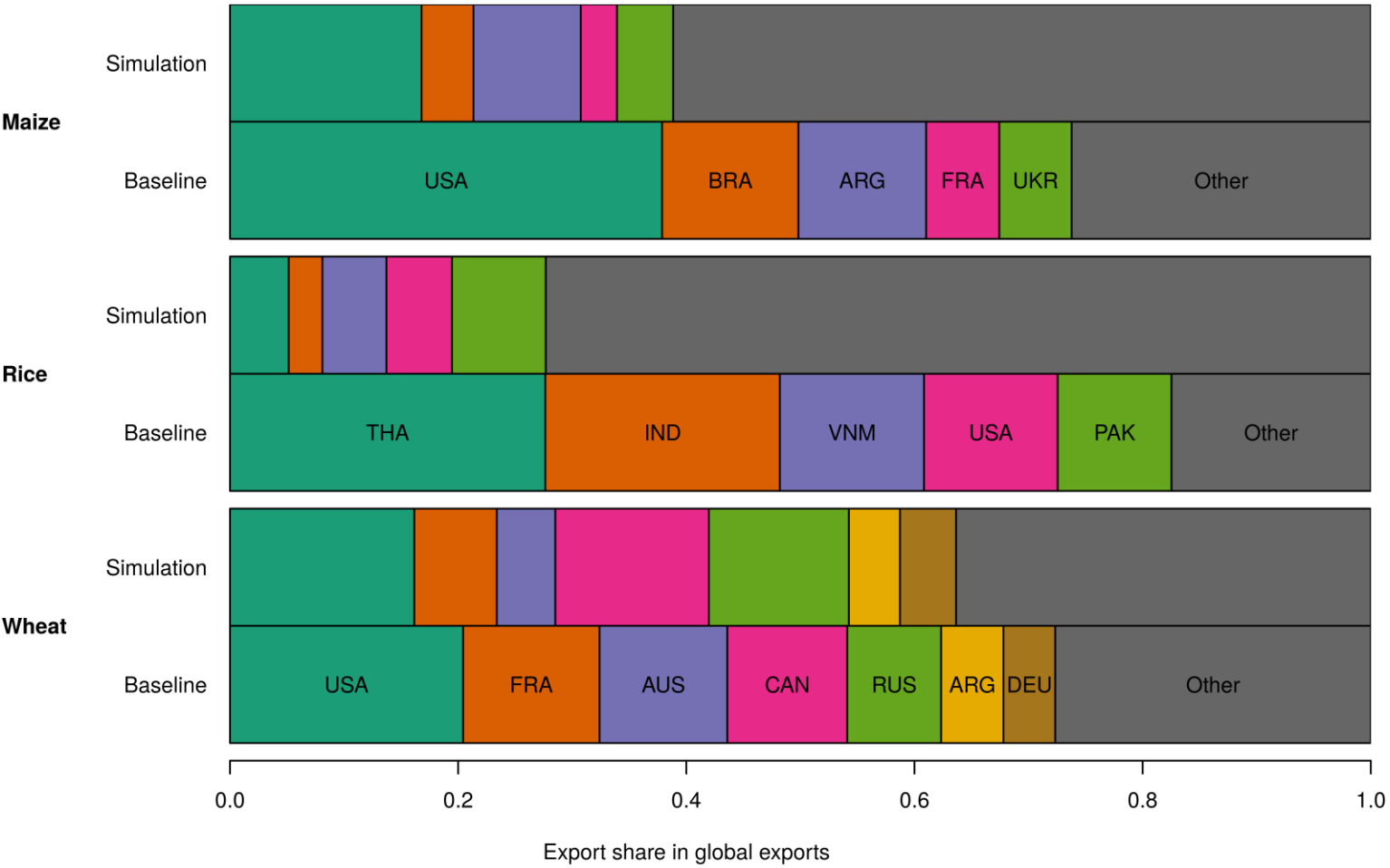
Climate change shock

- Scenario A1FI (close to RCP8.5) simulated with Hadley-CM3 GCM model
- For 2080s with CO2 fertilization

Welfare decomposition

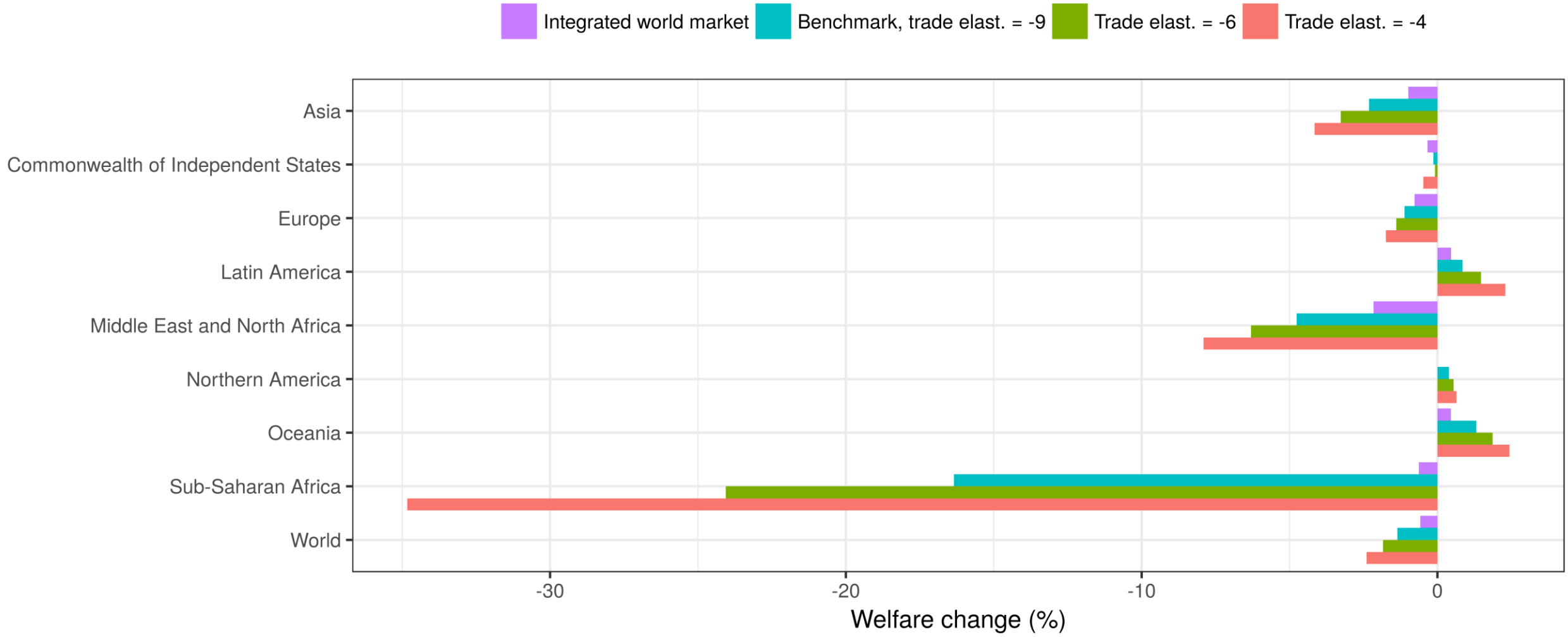


Changes in export shares

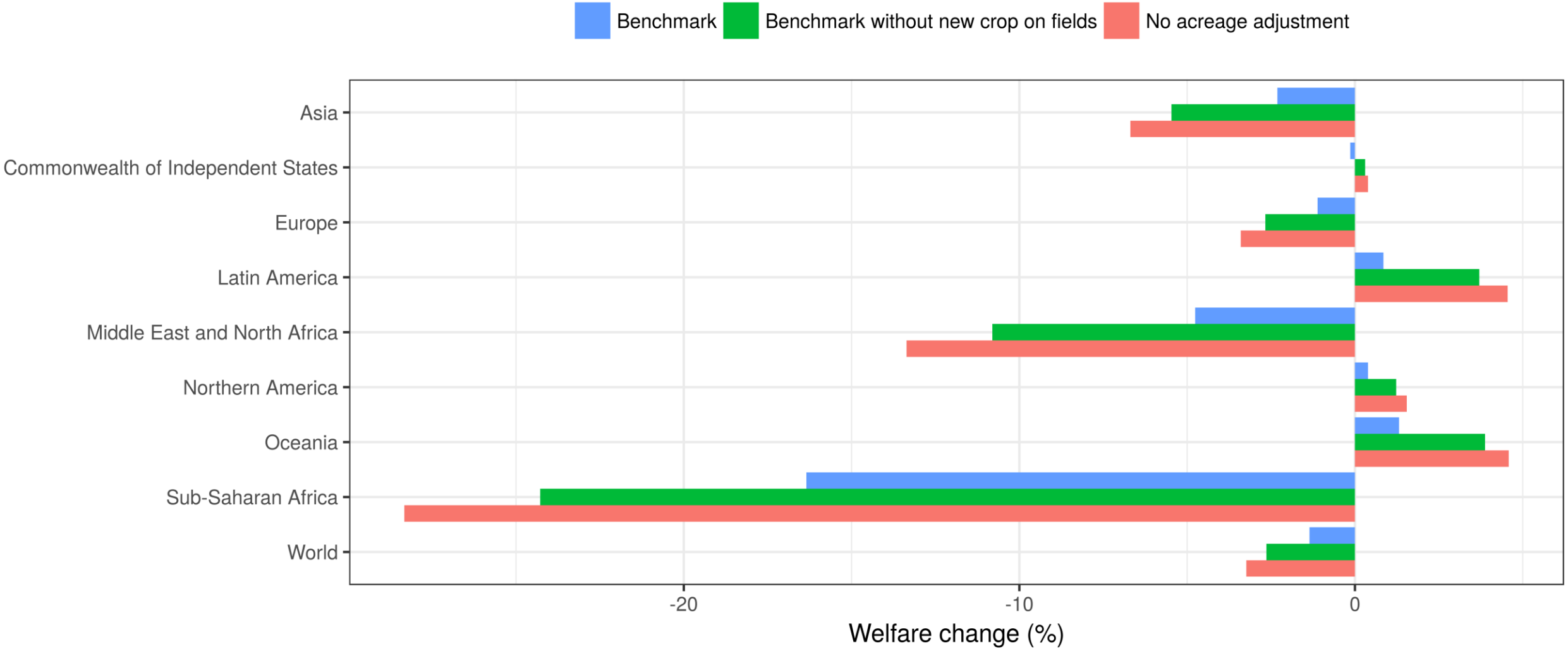


Global trade change	Global production change
+44%	+18%
+444%	+34%
+17%	-24%

Role of trade assumption



Role of land-use assumption



Take-home messages

- Role of international trade in adaption to climate change
  - Very high
  - Similar to acreage changes
  - Because demand-side adjustments are limited
- Role of international trade is a function of its flexibility
  - Prevalence of public policies that may impede these adjustments
  - Or even lead to maladaptative adjustments
  - For the new trade patterns to emerge, need of investments in new transport infrastructures that will have to been planned in advance.

THANK YOU

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Icons by Adam Schraff from the Noun Project

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