POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

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Implications of future climate variability on food security:

A model-based assessment of climate-induced crop price volatility impacts

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1 Introduction

Sudden price changes of staple crops that are important to poor people, have frequently generated setbacks in improving food security [1]. Climate change could further accentuate these setbacks and slow down progress in the reduction of hunger and poverty [2,3].

Objective:

- to determine changes in the monetary accessibility of calories (hunger risk) in a historic baseline scenario and a future climate change (CC) scenario caused by international staple price volatility

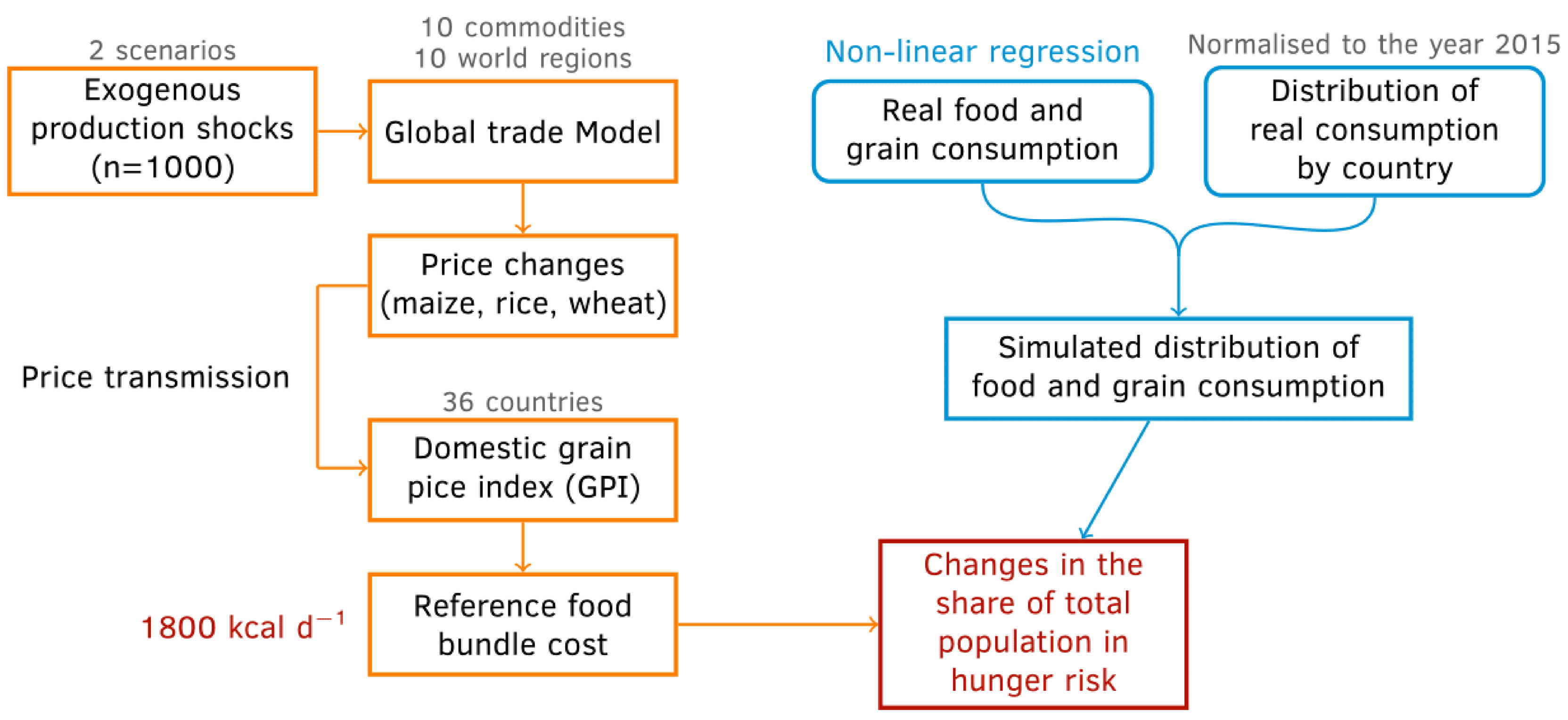


Fig. 1 *Model framework.*

2 Methods and Data

Frequency distributions of staple price shifts are computed by

- a global partial-equilibrium trade model and exogenous production shocks
- price changes are translated to domestic grain price indices in 36 countries via price transmission elasticities [4] (Fig. 1)

Changes in the monetary accessibility of calories are estimated by

- changing costs at the 1800 kcal threshold (MDER)
- a non-linear regression model between total consumption and both the share of food (Engel ratio) and grain expenditure (Fig. 2) and
- distributions of real total consumption

Data sources: FAOSTAT, FAPRI, FAO GIEWS, WFP VAM, Global Consumption Database (World Bank), Global Consumption and Income Project (GCIP)

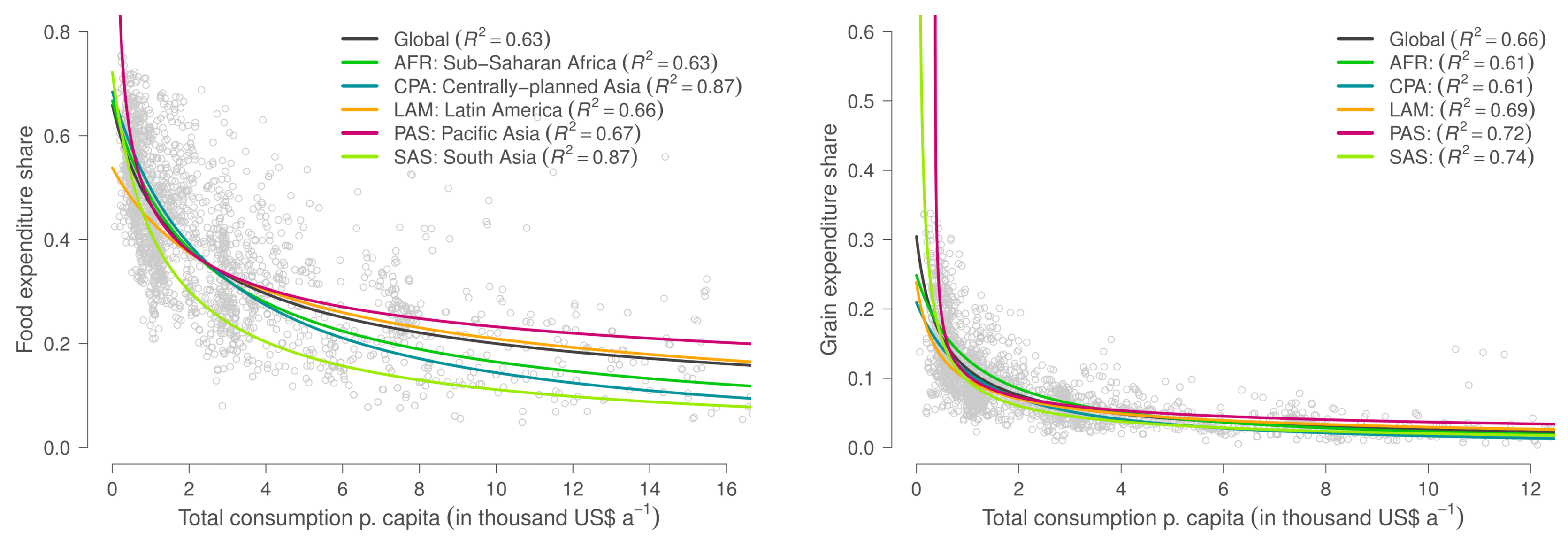
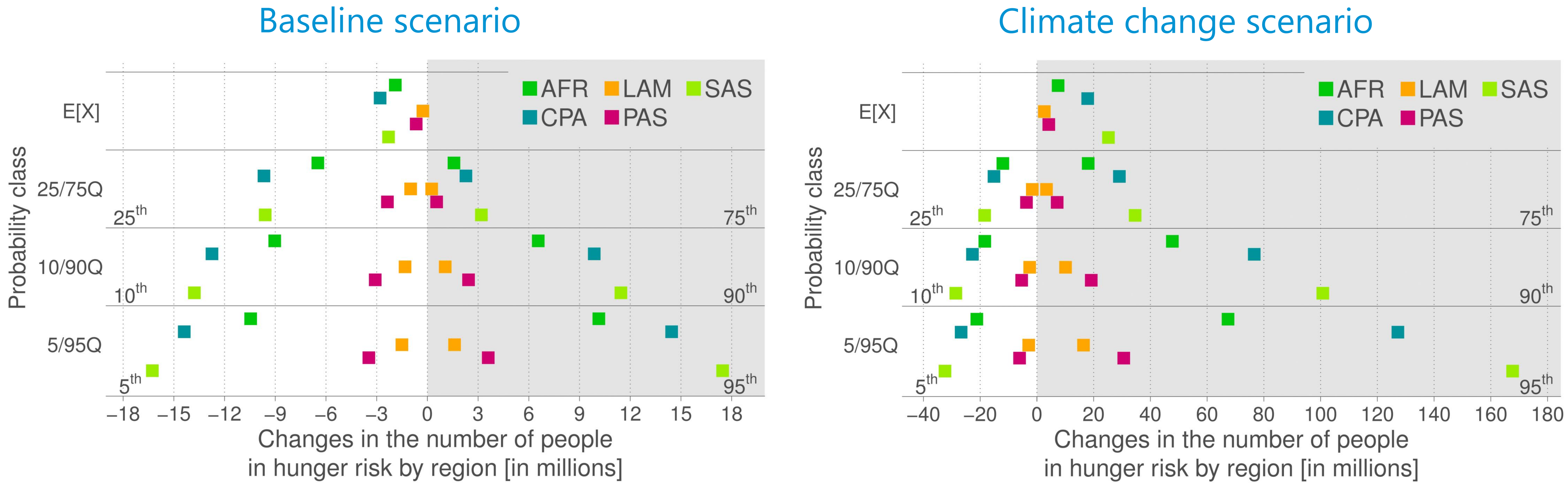


Fig. 2 *Global and regional regression models between the food expenditure share in total consumption (left) and the grain expenditure share in total consumption (right).*

Fig. 3 *Regional aggregates of changes in the number of people in hunger risk for the baseline (left) and the climate change scenario (right). By pairs, the data is divided into probability classes which correspond to the 25th and 75th, the 90th and 10th and the 5th and 95th quantiles (Q) of all simulated changes in hunger risk . E[X] is the expected value of the frequency distribution. Negative values indicate less people affected, while positive values (grey shading) depict people additionally affected by grain price changes.*



3 Results & Discussion

Future climate extremes may lead to additional hunger risk for

- > 92 million people every four years (75th Q) and
- > 400 million people every twenty years (95th Q).

High risks were particularly found

- in Sub-Saharan Africa, East and South Asia (Fig. 3)
- because of price volatility of maize and rice and
- their importance in the dietary energy supply in these regions.

High price transmission rates

- increased future risks, but reinforced positive effects of price changes for consumers in the baseline scenario

However, different effects for net consumers and producers of food are not considered at this stage.

4 Conclusion

Climate change could substantially increase risks related to stages of high integration between domestic and international markets. This could make it more difficult for policy-makers to decide to what extent it is desirable to allow for high degrees of market integration and price transmission. Hence, preventing supply side shocks through climate change mitigation, adaptation of farmers, and grain storage is key in avoiding food security risks in increasingly teleconnected markets.

References

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