

Global land use transitions and their drivers during 1960-2019

Karina Winkler, Richard Fuchs, Mark Rounsevell, and Martin Herold

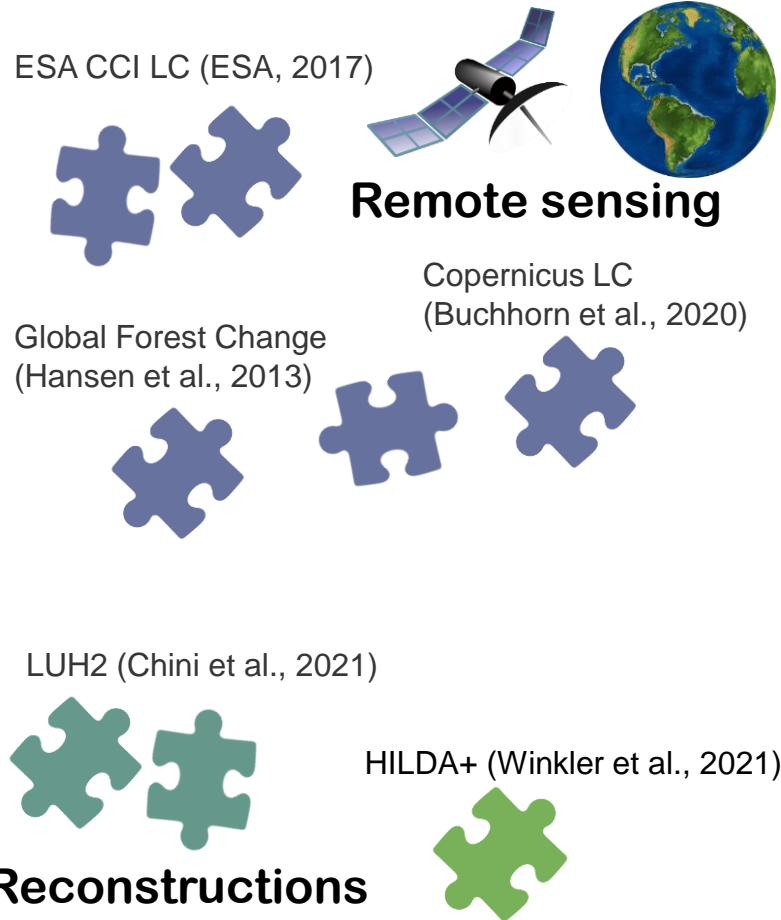


Background

- Understanding land use change is key
- Increasing data availability
- Spatial accuracy vs. long-time records

HILDA+ bridges the gap,
provides higher spatial, temporal
and thematic detail.

Winkler, K., Fuchs, R., Rounsevell, M., & Herold, M. (2021).
Global land use changes are four times greater than previously
estimated. *Nature Communications*, 12(1), 2501. 1103
<https://doi.org/10.1038/s41467-021-22702-2>

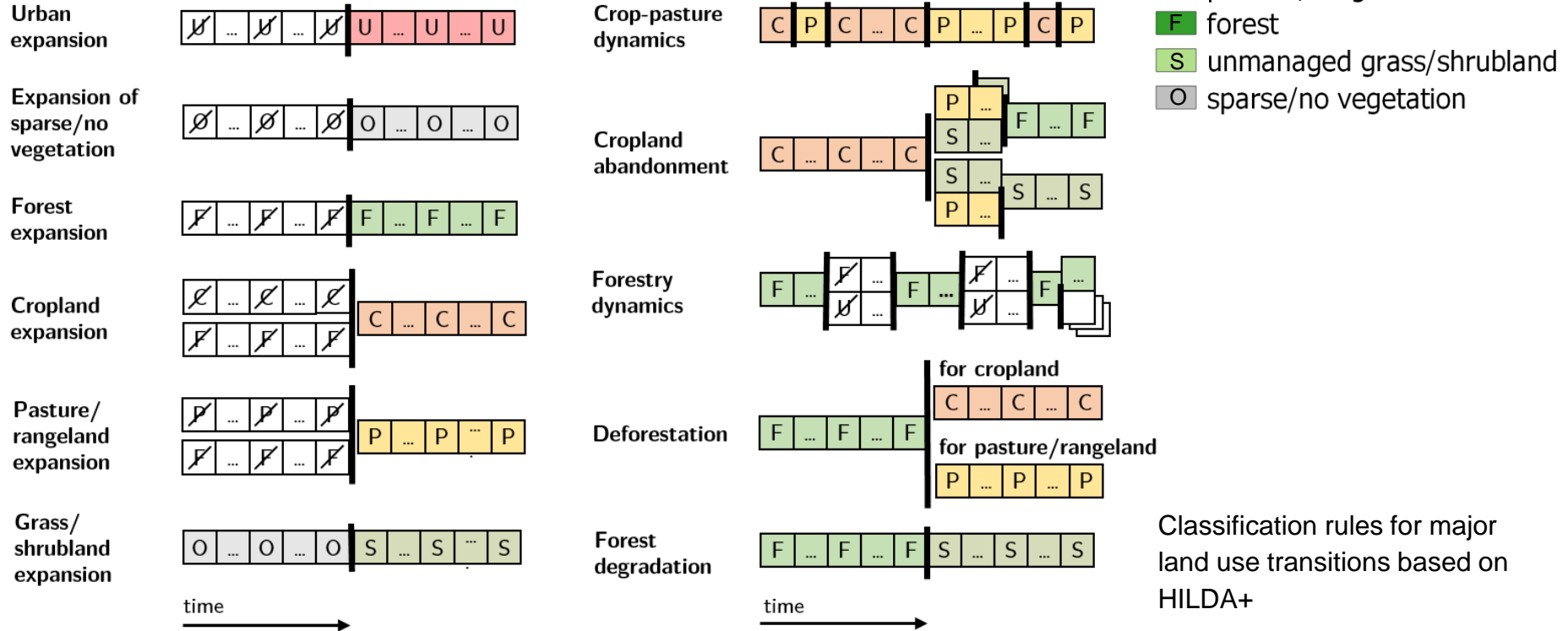


Research questions

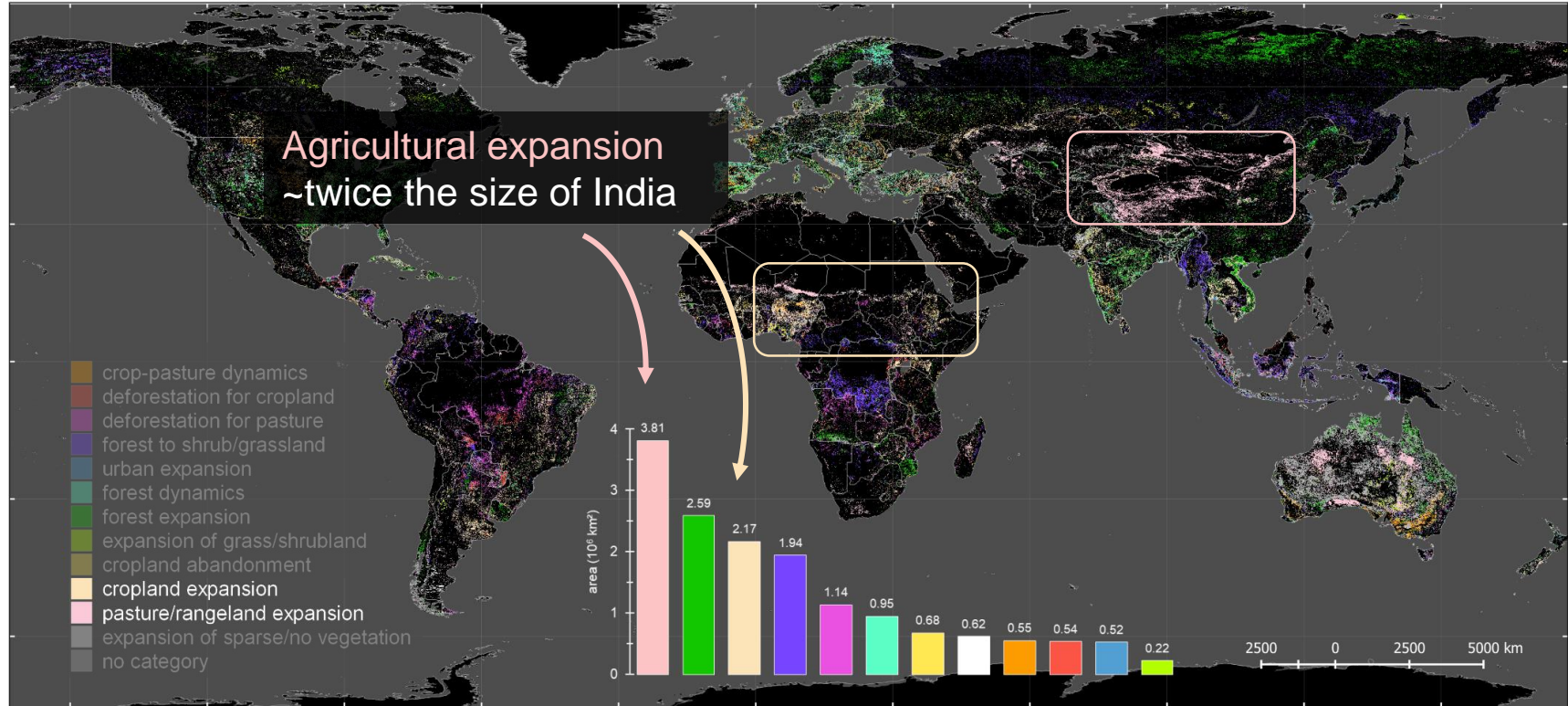
1. What are major land use transitions? Spatial and temporal patterns
2. What are the drivers? How do they differ by world region?



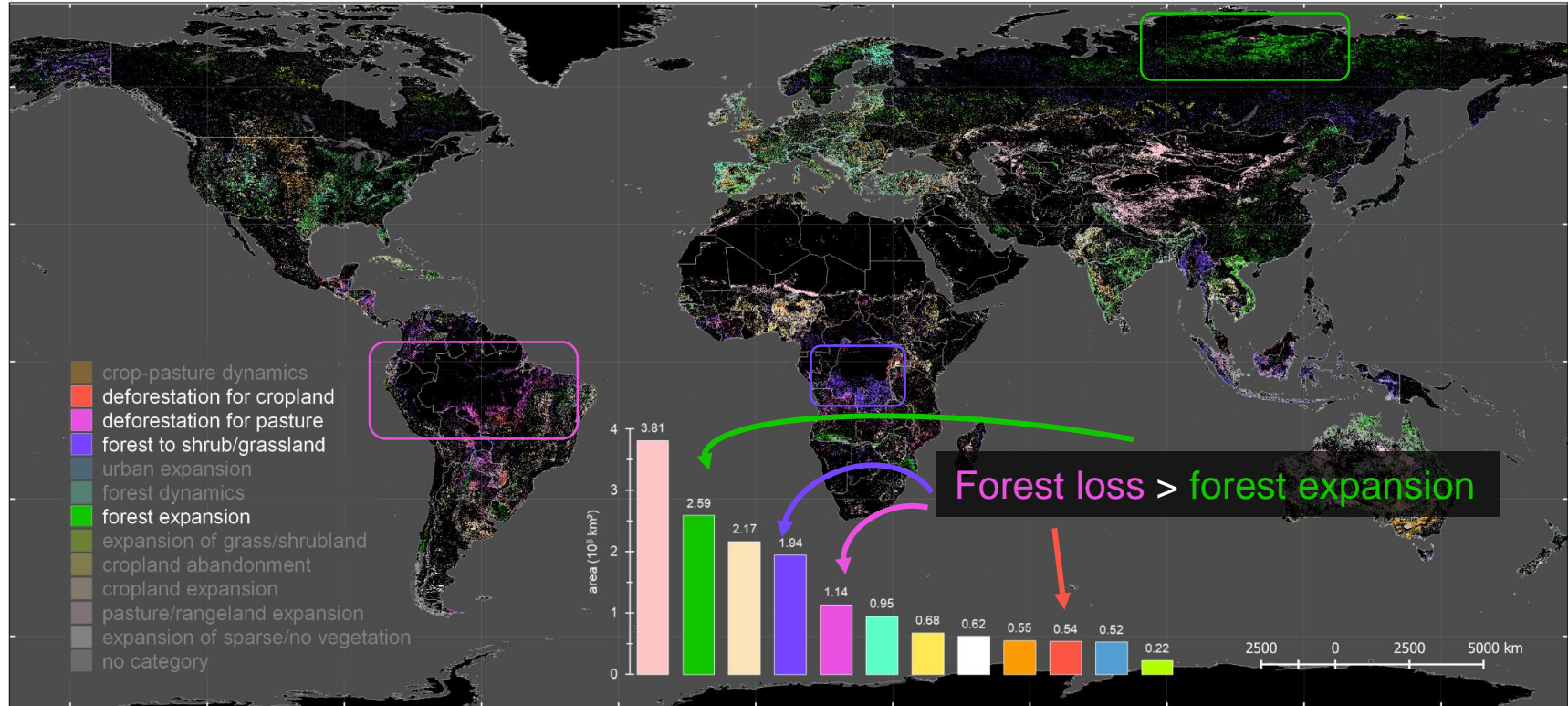
1. Land use transitions 1960-2019



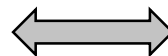
1. Land use transitions 1960-2019



1. Land use transitions 1960-2019



2. Drivers of land use change



INDIRECT

Economy

- Agr. exports
- Agr. Imports
- Cereal price
- Consumption
- Exchange rate
- FDI
- Forestry exports
- GDP
- Labour force
- Oil price
- Wage



Demography

- Age
- Birth rate
- Gini
- Life expectancy
- Migration
- Population
- Population density



Politics

- Conflicts
- Government effectiveness
- Military expenses
- Nature protection
- Political stability
- Subsidies



DIRECT

Production

- Biofuel production
- Crop diversity
- Livestock density
- Tractor
- Wood production
- Yield

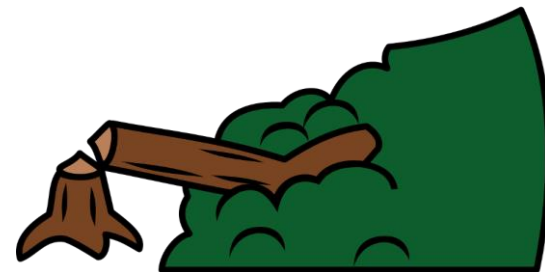


Environment

- Burned area
- Droughts
- Floods
- Precipitation
- Soil moisture
- SPEI12
- Temperature anomaly
- Temperature change
- Wildfires

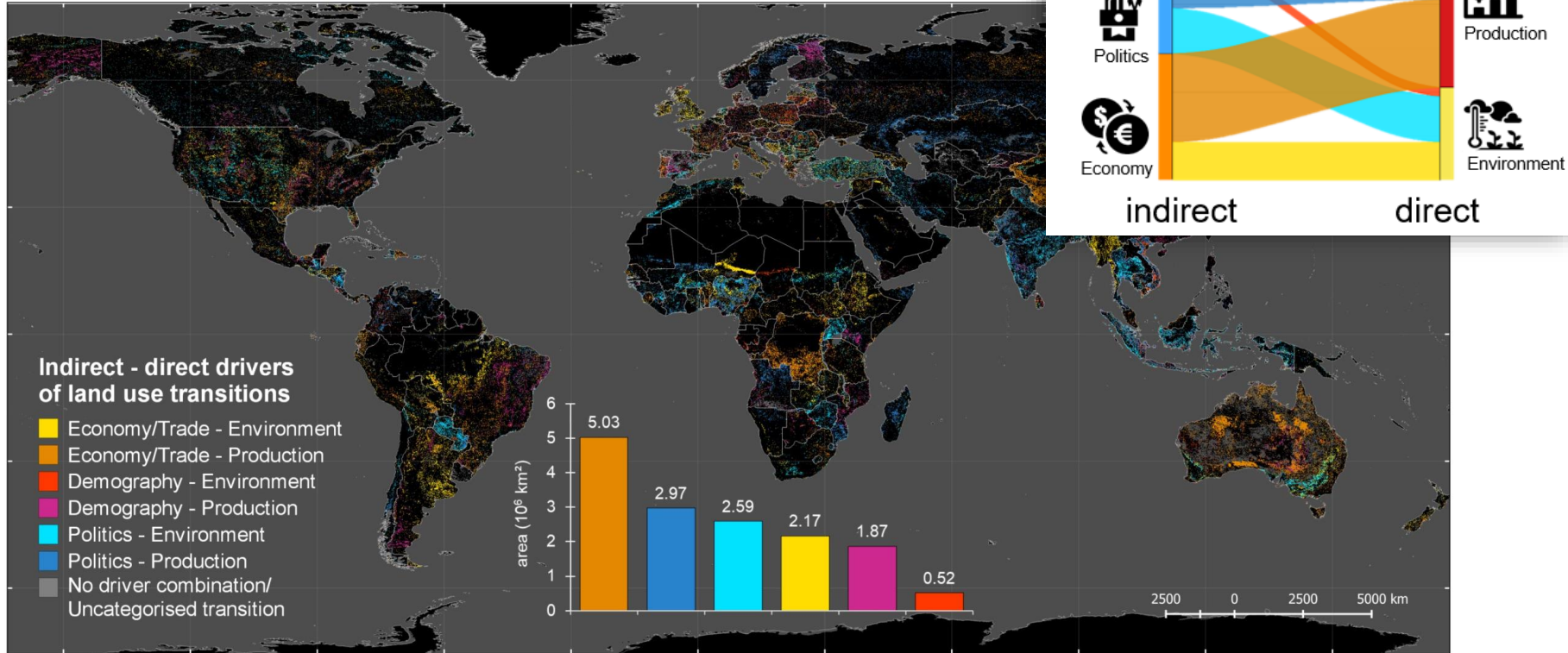


urbanisation
expansion of sparse/no vegetation
pasture/rangeland expansion
cropland expansion
crop-pasture dynamics
cropland abandonment
expansion of grass/shrubland
forest expansion
forestry dynamics
forest to shrub/grassland
deforestation for pasture/rangeland
deforestation for cropland



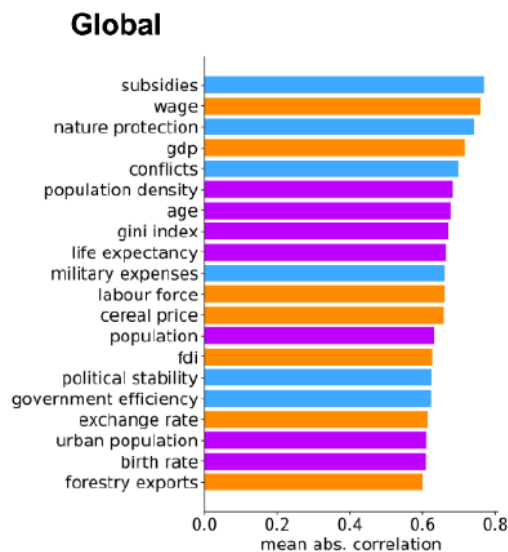
Driver groups and indicators

2. Drivers of land use change



2. Drivers of land use change

a) Indirect drivers

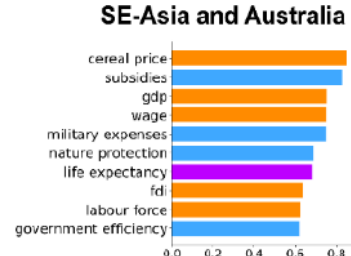
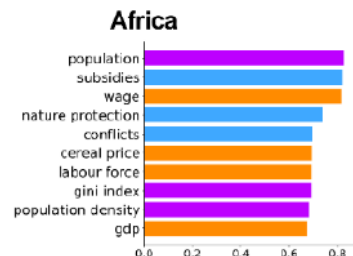
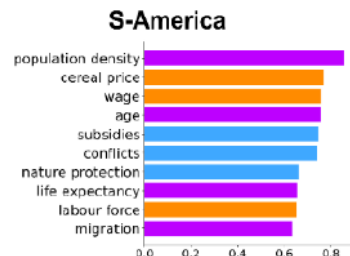
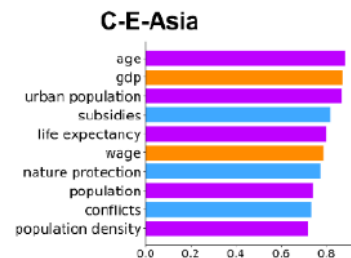
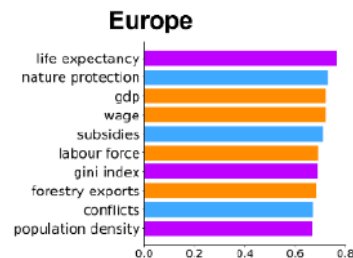
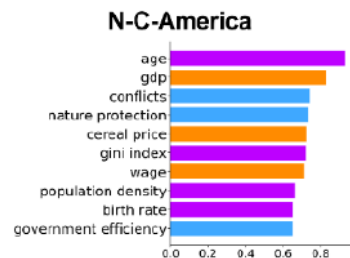


age

life expectancy

GDP

nature protection



population (density)

cereal price

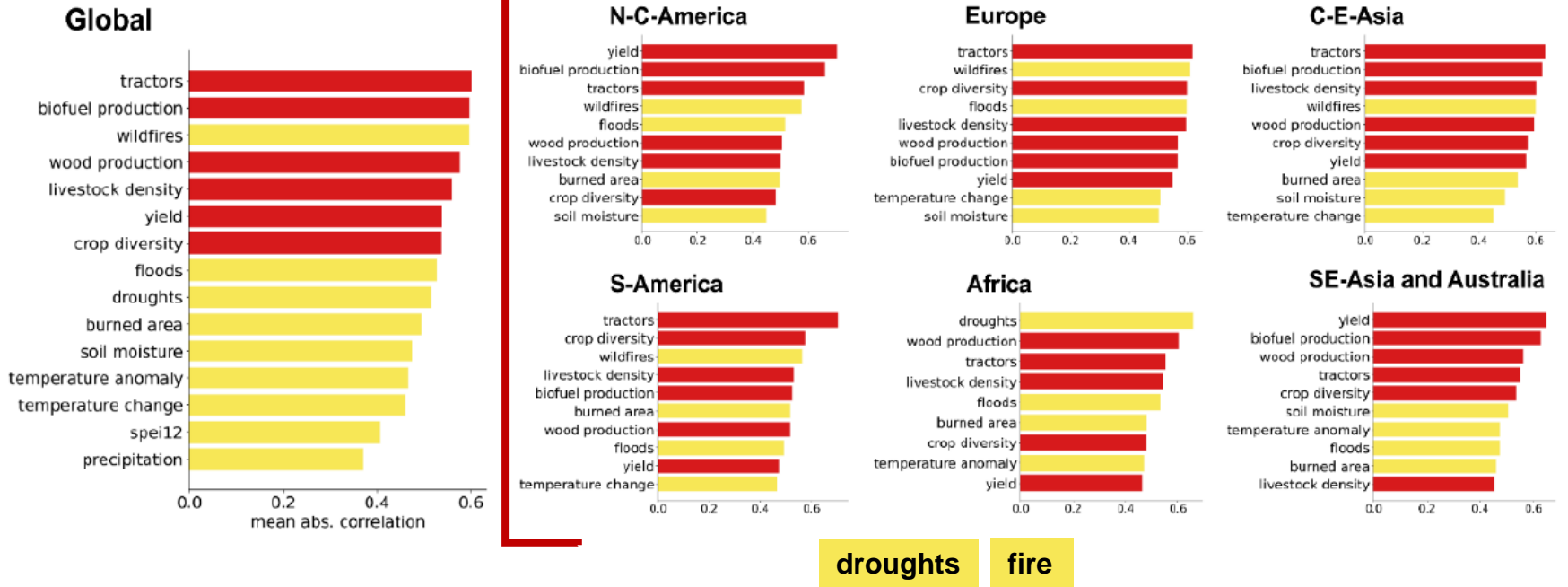
wage

subsidies

conflicts

2. Drivers of land use change

b) Direct drivers



► In a nutshell

- Agricultural expansion into non-forest areas as largest land use transitions
- N: forest expansion - S: deforestation, agricultural expansion
- Importance of indirect drivers (Economy, Politics, Demography)



Account for spurious correlation, interdependencies, endogeneity

Winkler et al. (in prep): Drivers of global land use transitions

karina.winkler@kit.edu

