

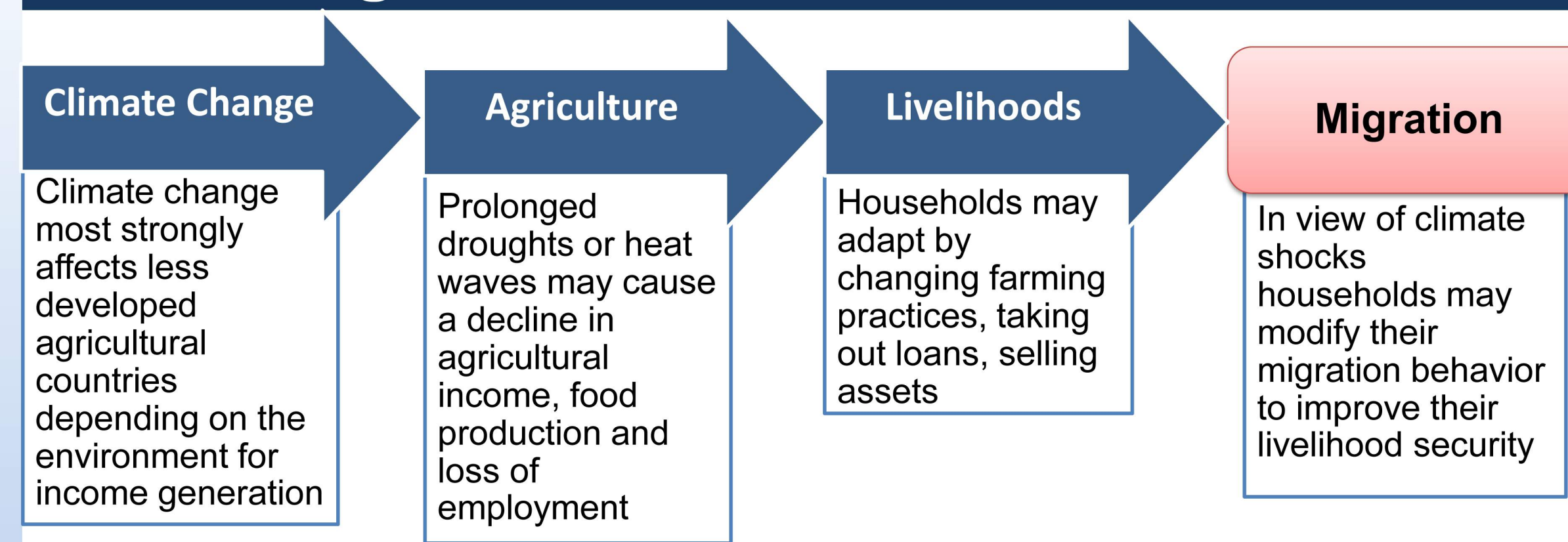
Climate and International Migration in Burkina Faso and Senegal:

Exploring the Agricultural Pathway

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Background and Research Questions



RESEARCH QUESTIONS

- Do adverse climatic conditions increase (climate driver mechanism) or decrease (climate inhibitor mechanism) international outmigration from Burkina Faso and Senegal?
- Is there empirical evidence for the agricultural pathway in the climate-migration association for Burkina Faso and Senegal?

Data and Methods

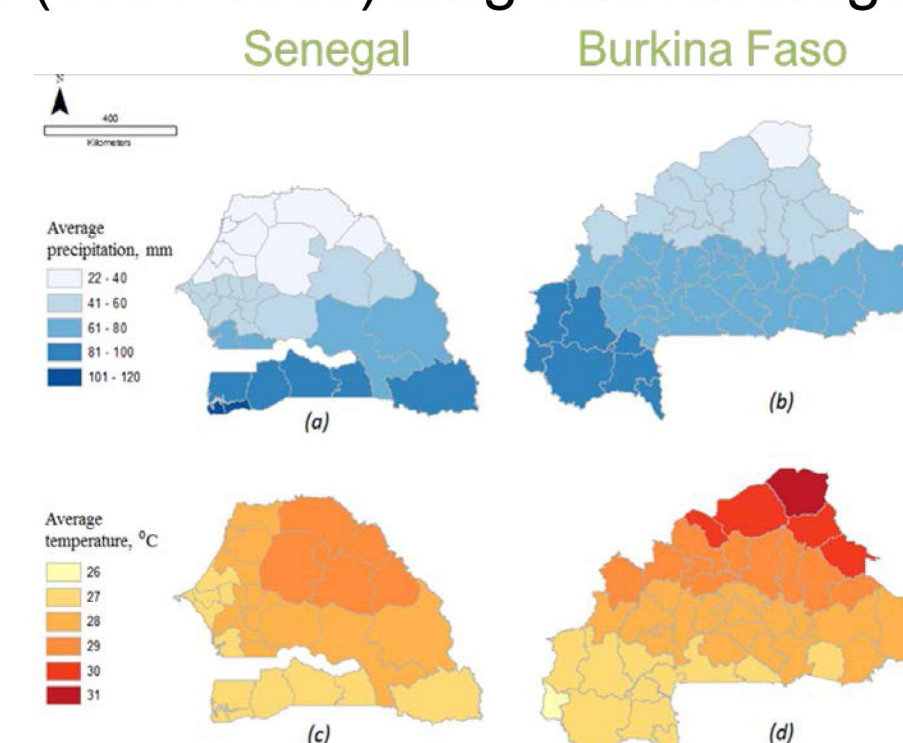
DATA WERE OBTAINED THROUGH TERRA POPULUS:

Individual and household census data for Burkina Faso (2006); Senegal (2002)	Monthly data on temperature and precipitation	Cropland information from Global Landscape Initiative (GLI)
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OUTCOME VARIABLE: Household-level international migration within the last 5 years

PREDICTOR VARIABLE:

Climate measures: heat wave, cold spell, drought, excessive precipitation, climate impact index, reflecting the percentage of months during the 6-year observation period when temperature/precipitation were more than 1 SD below/above the 30-year (1961-1990) long-term average



METHODS:

- Multi-level logit models
- Climate-agriculture interactions
- Geographically Weighted Regression (GWR) to explore spatial patterns in the climate-migration relationship

Beneficial and Inhibiting Effects of Climate on Migration

I. MULTI-LEVEL MODELS WITH CLIMATE EFFECTS

Effects of climate on the odds of international outmigration (odds ratios, reflect a 10% change)

	Burkina Faso		Senegal	
	b	sig.	b	sig.
Heat wave	0.80 *		1.13	
Cold snap	0.95		0.89	
Drought	1.01		0.72	
Excessive precipitation	0.98		3.84 **	
Climate impact index	0.78		1.21	

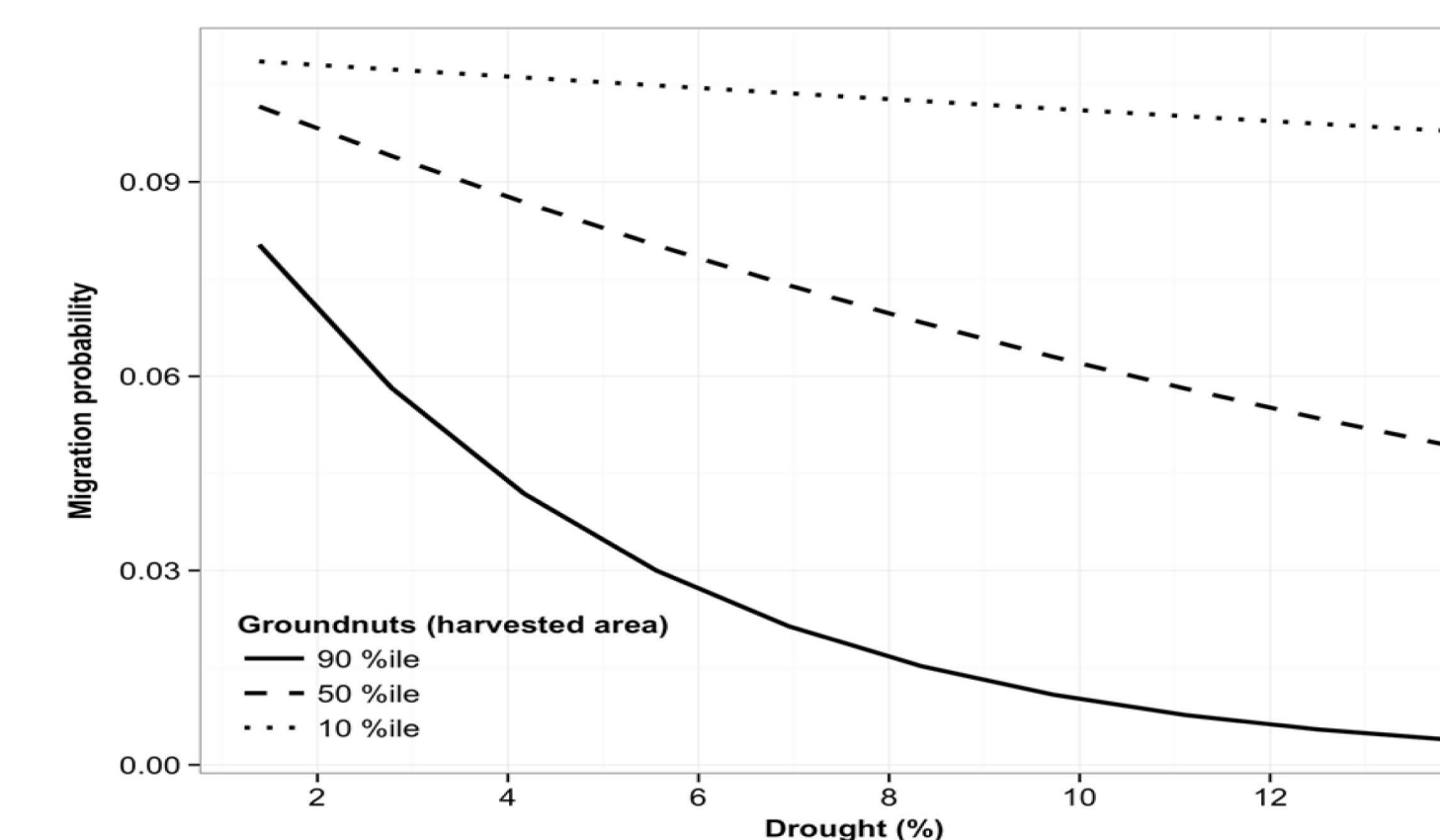
Base models predicting the odds of international migration from Burkina Faso and Senegal (odds ratios)

Variables	Burkina Faso		Senegal	
	b	sig.	b	sig.
Intercept	0.02	***	0.02	***
Head married	0.87	***	1.10	
Muslim	0.75	***	0.95	***
Age of head ^a	0.97	***	1.05	***
Primary education ^a	0.94	***	0.97	*
Child dep. ratio ^a	1.02	***	0.97	***
Retiree dep. ratio ^a	1.01		1.08	***
Employed in HH ^a	1.01	**	0.93	***
Persons in HH ^a	1.09	**	1.54	***
Home owner	2.07	***	1.63	***
Wealth index	1.02	**	1.39	***
Network density ^a	1.99	***	2.83	***
Urban land	0.97		0.65	*
Cotton/groundnuts	0.93		0.98	*
Baseline climate hot	1.30		1.30	
Baseline climate wet			0.75	
Model statistics				
Random intercept	1,451		1,573	
BIC	79,620		33,811	
N (households)	133,686		57,052	
N (provinces/departments)	45		31	

* p<0.05; ** p<0.01; *** p<0.001

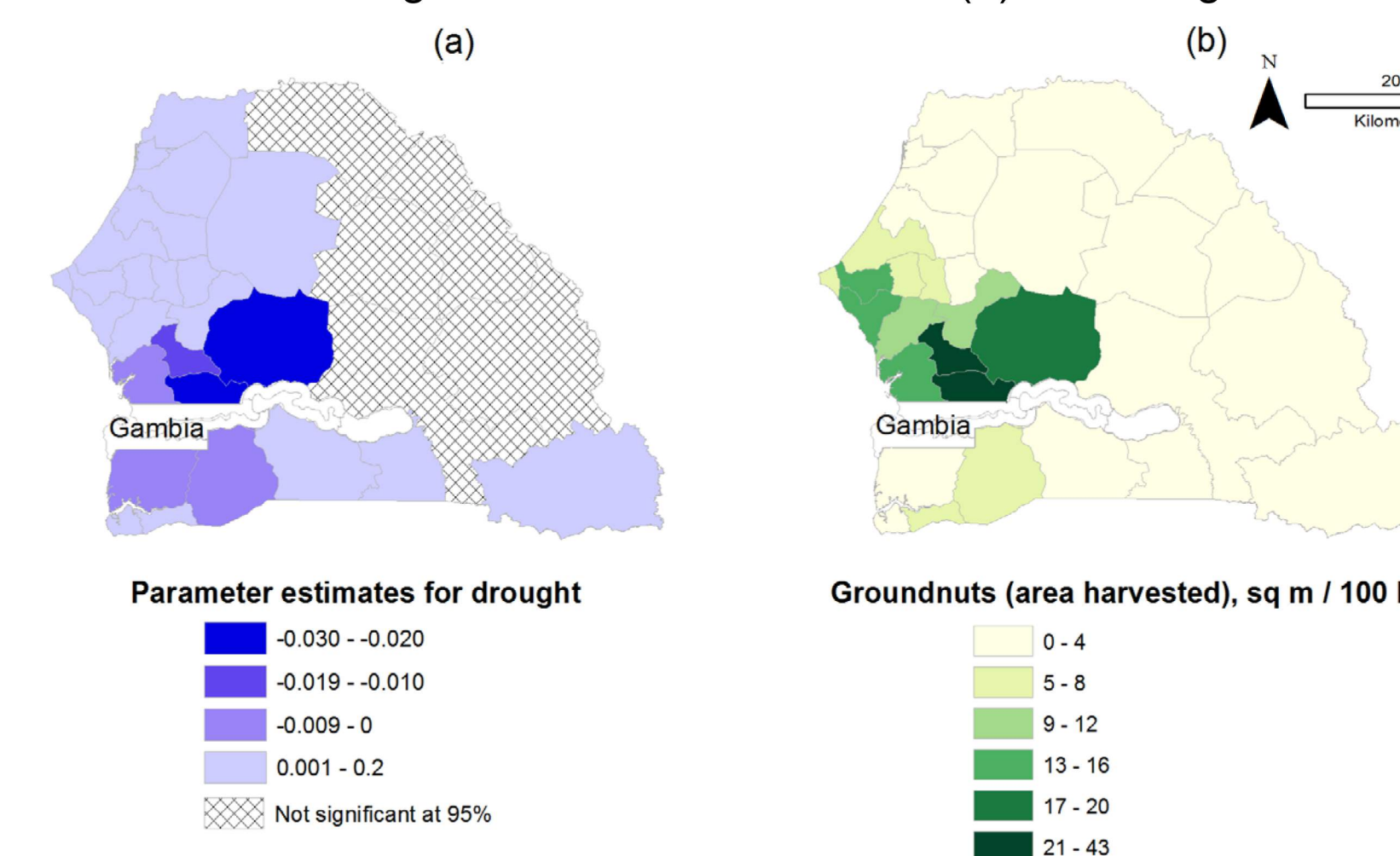
^a coefficients reflect an incremental change of 10 units;

II. INTERACTION BETWEEN DROUGHTS AND GROUNDNUTS HARVESTED AREA IN SENEGAL



III. SPATIAL PATTERNS FROM GWR

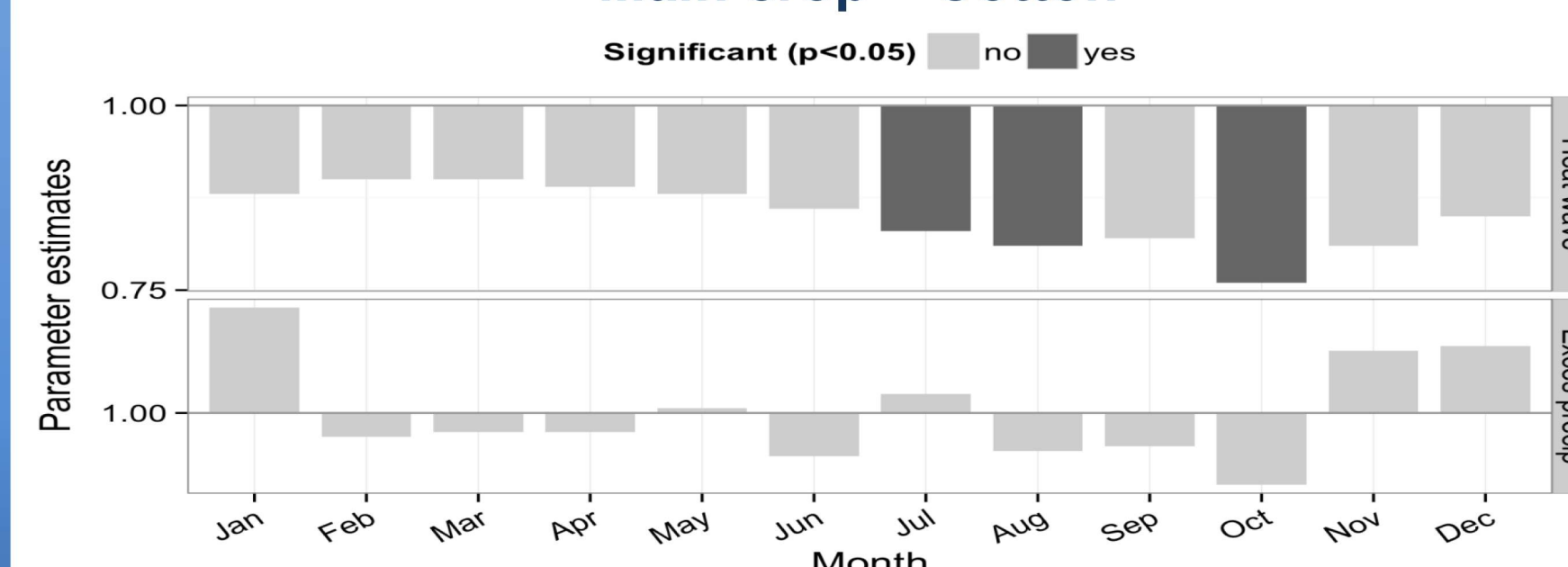
Local estimates of the impact of drought on international migration (a), and groundnuts harvested area (b) for Senegal



Seasonality of Climate Effects on Migration

Burkina Faso: 90% of labor force is employed in agriculture

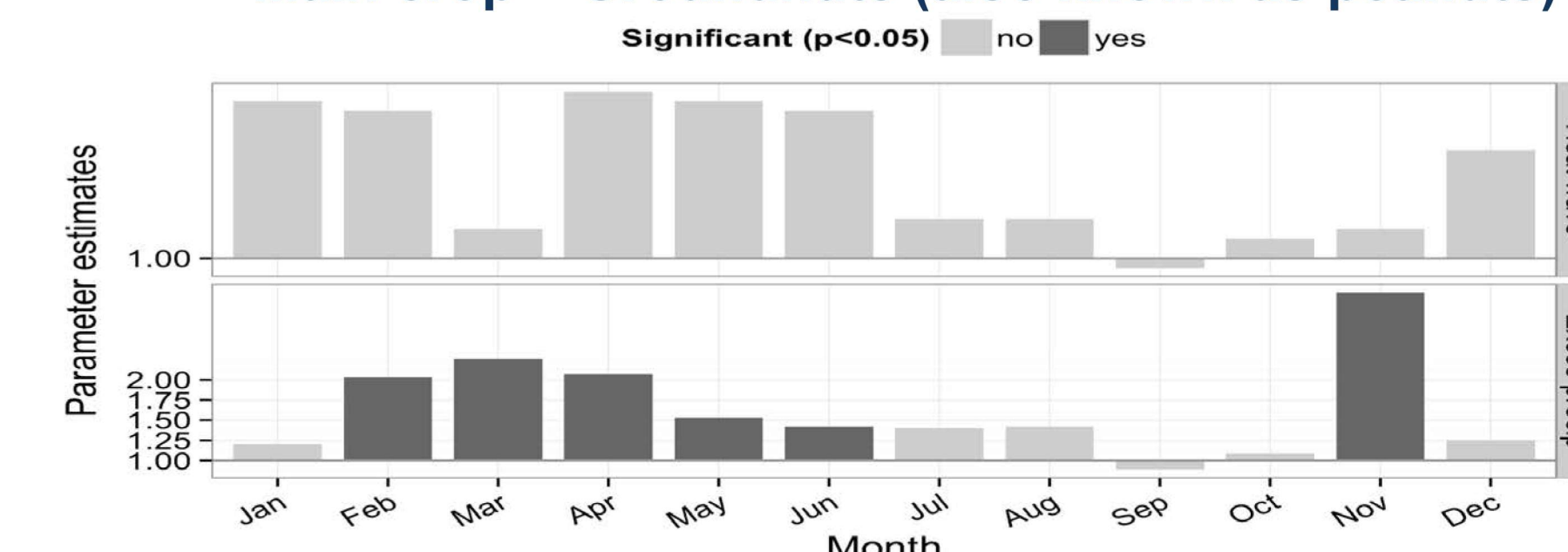
Main crop – Cotton



The inhibiting effect of an increase in heat waves on international migration from Burkina Faso is strongest during July – October, which overlaps with cotton growing season.

Senegal: 78% of labor force is employed in agriculture

Main crop – Groundnuts (also known as peanuts)



The largest beneficial effects of increased precipitation on international migration from Senegal are observed prior to the growing season months (5-month periods starting February to April).

Findings

MULTI-LEVEL MODELS:

Burkina Faso: a 10% increase in the number of months with heat waves leads to a 20% decline in the odds of an international move.
Senegal: a 10% increase in months with excessive precipitation leads to a 4 times higher probability of international migration.

CLIMATE-AGRICULTURE INTERACTIONS:

Senegal: the effect of droughts on international migration varies by the proportion of the department's area harvested with groundnuts, which is the main crop in the country.
Interactions were not significant for Burkina Faso.

GWR: The strongest negative effects of droughts on international migration emerge for departments in southwestern Senegal that are highly dependent on agricultural production and show the highest levels of area planted with groundnuts.

SEASONAL INFLUENCE OF CLIMATE CHANGE ON MIGRATION:

Burkina Faso: the inhibiting effect of heat waves on international migration is strongest during July-October, which coincides with cotton growing season.

Senegal: the beneficial effect of excessive precipitation on international migration is strongest prior to the growing season months of groundnuts, perhaps due to ecological memory effects.

Implications

OVERALL CONCLUSION:

Climate effects on international migration can be indirect in nature (through affecting agriculture). Among marginalized populations in rural Africa, adverse climate conditions inhibit international migration while beneficial climate conditions enable international moves.

IMPLICATIONS FOR AFFECTED POPULATIONS:

Adverse climatic conditions may trap people in place and such immobility is problematic when migration is viewed as a way of adaptation to climate change. Therefore, there is a need for channels of voluntary migration.

POSSIBLE SOLUTIONS:

Since agricultural dependence increases sensitivity to climate shocks, there is a need for more resilient crop varieties, the expansion of irrigation and educating farmers about alternative cropping techniques.