Labour Outmigration, Farmland Fallowing, Livelihood Diversification and Technology Adoption in Nepal

Apsara Karki, PhD
Independent Researcher

Mani Nepal*, PhD
Lead Economist, ICIMOD

Randall Bluffstone PhD
Professor, Portland State University

10th WB Conference on Migration in South Asia
Nov 7-8, 2022, Kathmandu

Temporary International Migration from Low and Middle-Income Countries is Important

- In 2017, about **258 million temporary migrants** (~5% of labor force) (ILO, 2018)
- Approximately **$550 billion remittance** in 2019 (> FDI)
- Greatest total remittances to India, China, Mexico, Philippines and Egypt
- But, as a % of GDP, most is from Tonga, Haiti, Nepal, Tajikistan, and the Kyrgyz Republic

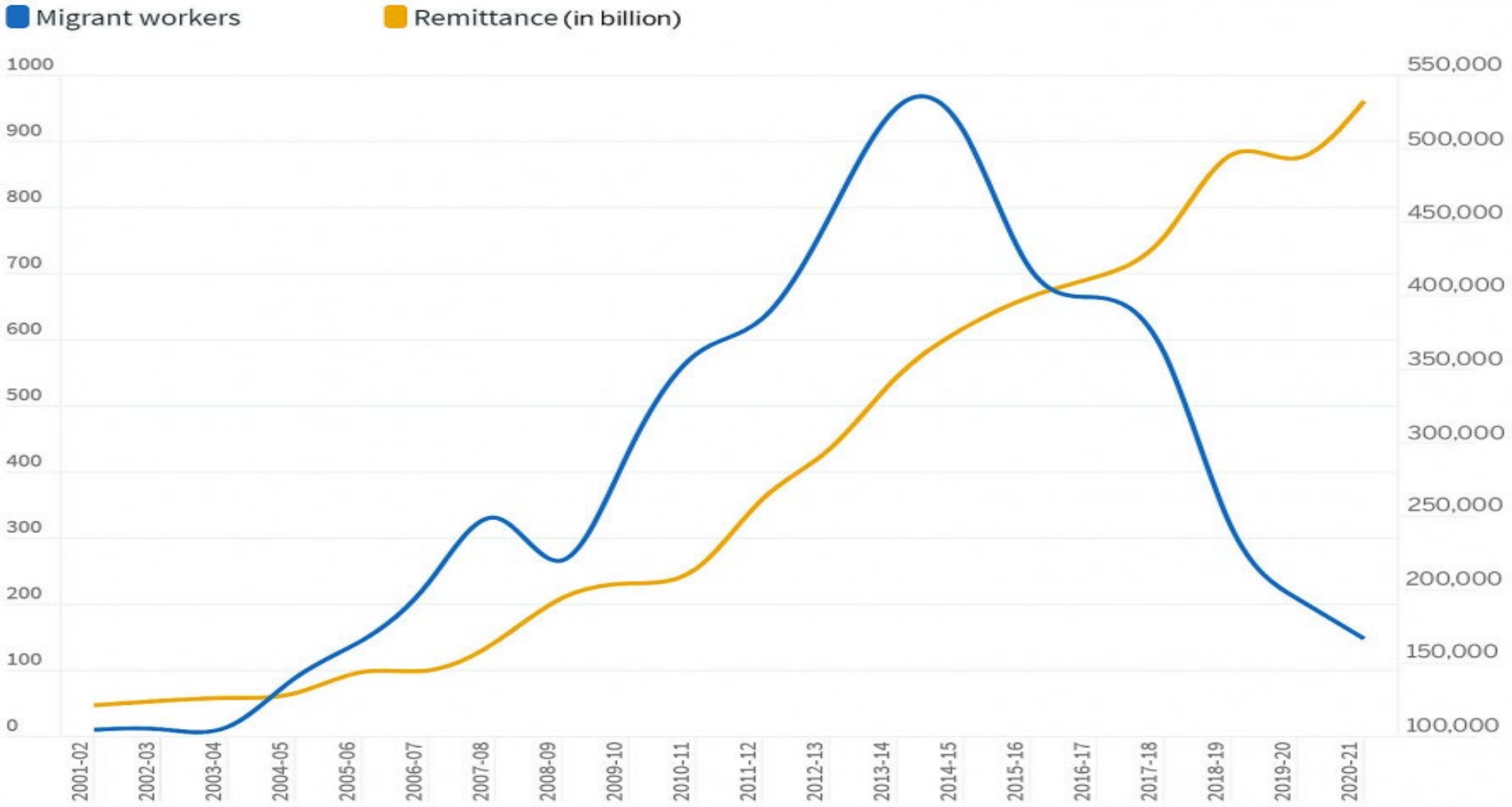
Relatively Limited Research on Agricultural System Effects of Migration

- Rozelle et al. (1999) – **migration decreases maize yields** in NE China, but losses partially offset by remittances.
- Böhme (2015) – **international migration increases stock of agricultural machinery** in Mexico, but not livestock
- Jokisch (2002) – **international migration does not affect fallowing** or agricultural investments in Ecuador.
- Karki Nepal (2016) – **no effect of remittances on child labor or education in Nepal**; **big effects on household expenditures.**
- Oldekop et al. (2018) – **migration increases reforestation** in Nepal

Key points on migration from Nepal

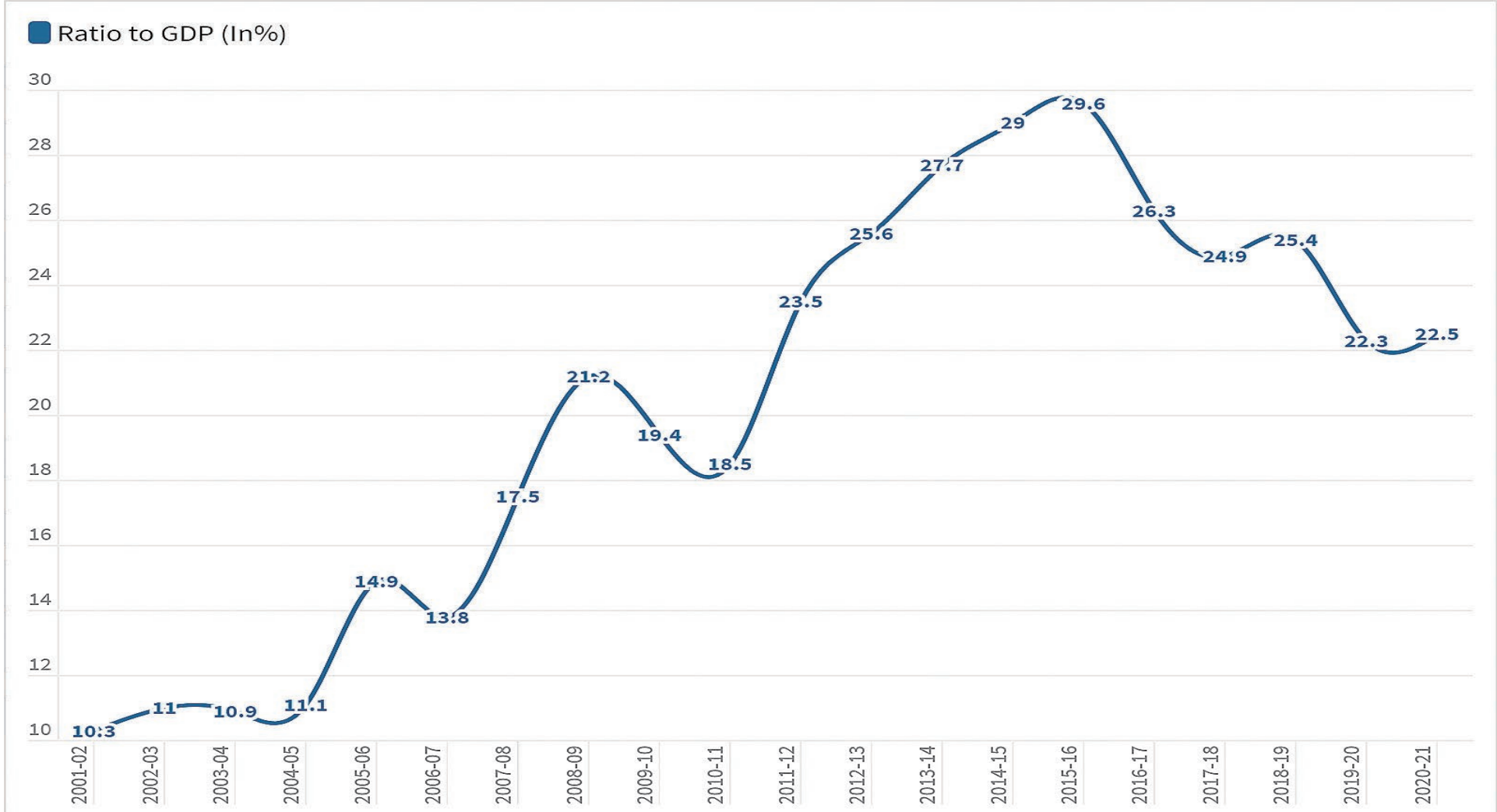
- **Open border** with India
- **Violent conflict** 1996 – 2006 generated internal and international migration => 17,000 deaths and over 200,000 people displaced.
- Approximately **40% of rural households have at least one temporary international migrant**
- Migrant remittances to Nepal are important
  - **~23 % of GDP** in 2020/2021, and greater % of HH income
  - **Third highest after Kyrgyz Republic (30%)**
  - **80% of total remittances came from foreign countries**

Trend of migrant workers & remittances



Source: Kathmandu Post May 3, 2022 (In billion Rs)

Remittance as percent of GDP



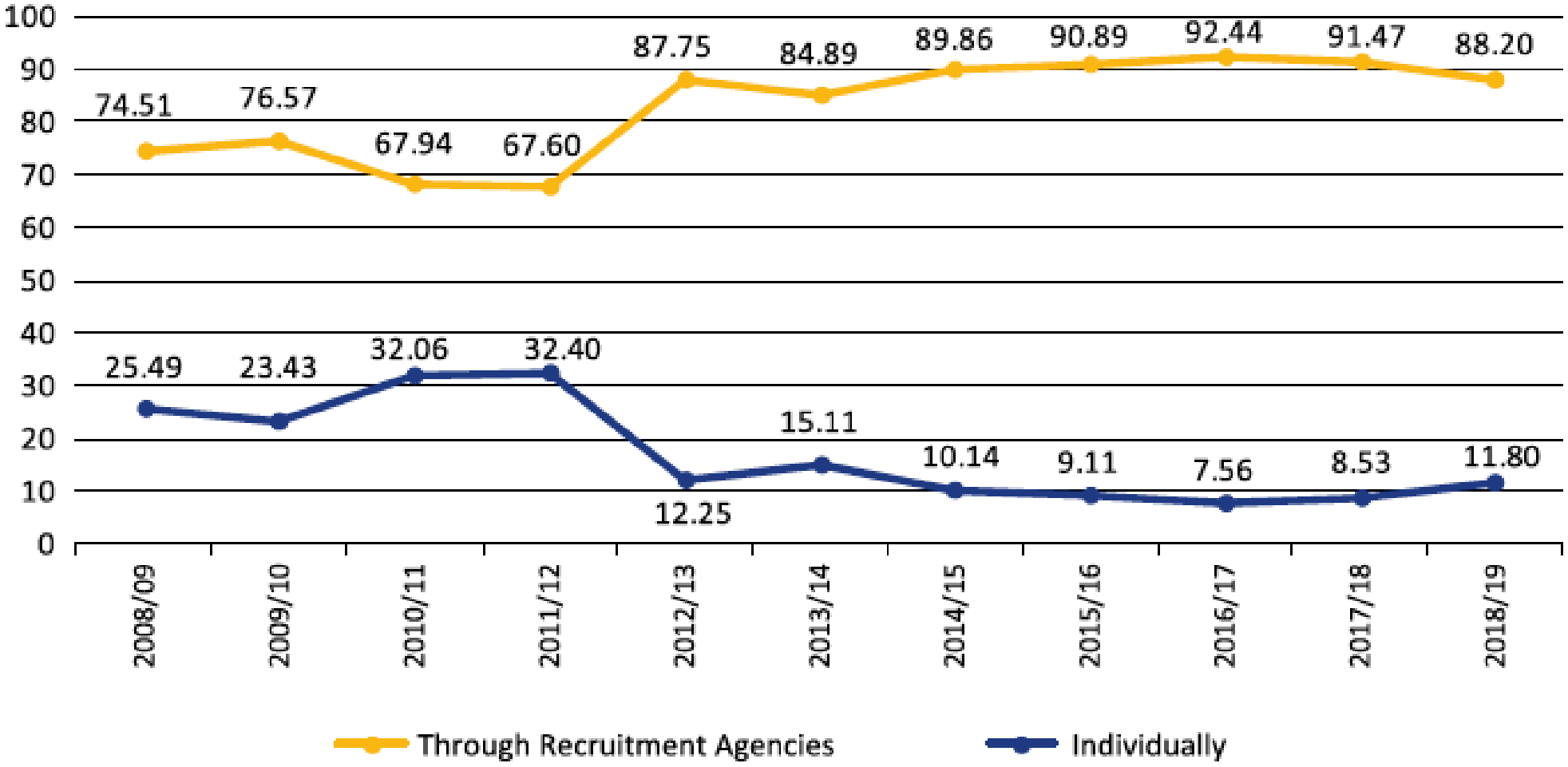
Source: Kathmandu Post May 3, 2022

Top six destinations for Nepali migrants

Place of destination	Male		Female		Total	
	No.	%	No.	%	No.	%
Qatar	71,322	30.2	3,702	1.6	75,024	31.76
United Arab Emirates	55,444	23.5	7,332	3.1	62,776	26.58
Saudi Arabia	44,493	18.8	1,587	0.7	46,080	19.51
Kuwait	14,417	6.1	1,578	0.7	15,995	6.77
Malaysia	9,828	4.2	171	0.1	9,999	4.23
Bahrain	4,198	1.8	435	0.2	4,633	1.96

Source: International Organization for Migration (2019)

Most Migrants are Recruited by Agencies



Source: International Organization for Migration (2019)

Research questions

Does international migration

- cause households to fallow agricultural land?
- incentivize households to adopt agricultural-intensification practices?
- support income diversification?

Methods & Data

Analytical framework

- **Non-separable household model due to missing markets** (e.g., labor, insurance, credit) in many areas, where consumption and production are linked. Most prices are shadow values.
- Households Max $U_h = U(F_h, Y_h)$, where F is food produced on-farm and Y is a vector of other goods, which are purchased by household h.
- **Households choose farm production technologies**, **yielding input demand** $X_{ih} = X(r_i, R_j, p, Z_h)$, where X_{ih} = i^{th} input used by h^{th} household; r_i = price of ith input; R_j is a price vector of other inputs; p = output price, and Z_h is a vector of household endowments.
- **Changing shadow prices alter the demand for inputs, including farmland**.
- We investigate how agricultural inputs and, more generally, livelihood strategies change due to temporary international migration.

Average Effect of the Treatment (Migration) on Treated (ATT)

$$ATT_{ij} = E(Y_i \mid T_i = 1) - E(Y_j \mid T_i = 1) \ \forall ij$$

ATT = Change in outcome

i = treated; j = untreated; Y=outcome; T=treatment indicator

Problem is that $E(Y_j \mid T_i=1)$ did not occur

Need to "construct" an appropriate counterfactual using $E(Y_j \mid T_j=0)$, which is observable

Identification strategies

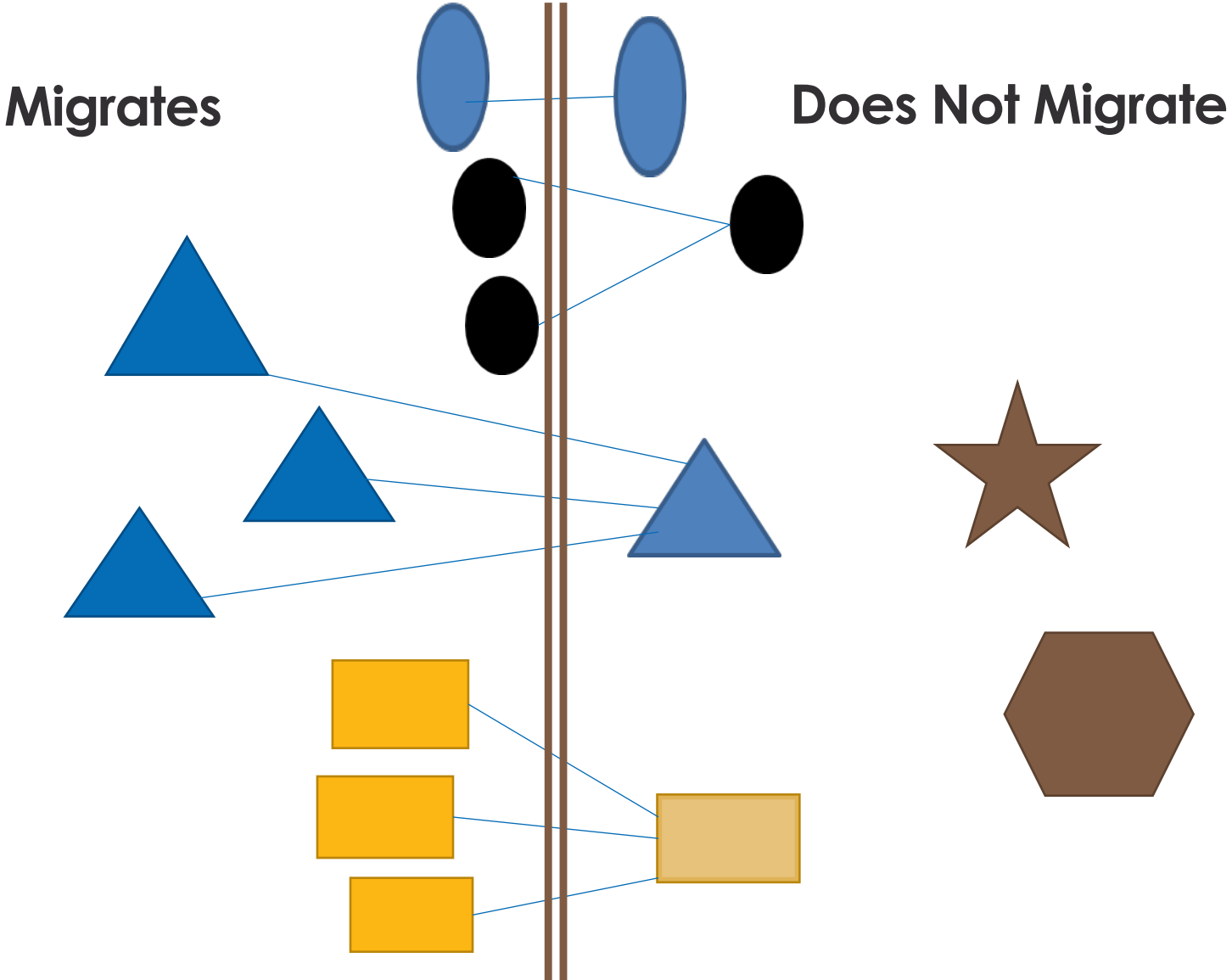
A. **Propensity score matching** (PSM) based on observables – compare only treatment & control observations "matched" based on a propensity score

- Kernel matching uses weighted average of all control observations to construct counterfactual
- Only overlapping distribution of observables (common support).
- Assumes treatment decision wholly based on observables

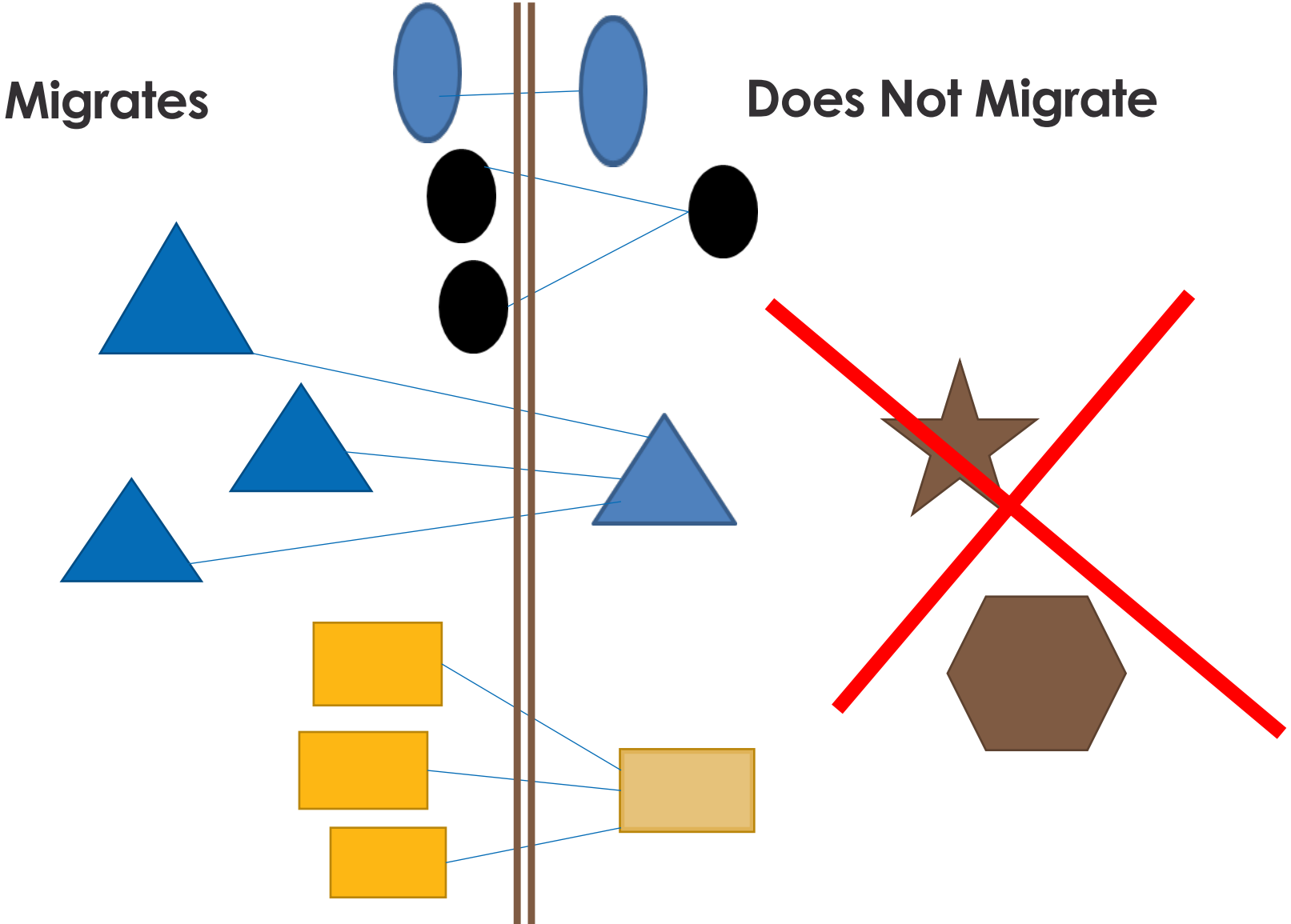
B. Include **district fixed effects** in regression (linear probability) models – capture time-invariant factors affecting the vector Y.

C. **Instrumental variables** – find instrument affecting decision to migrate that affects Y only through treatment

Avoiding Confounders to Identify Effects – Hold All Else Constant, except Whether Migration Occurred



Avoiding Confounders to Identify Effects – Hold All Else Constant, except Whether Migration Occurred



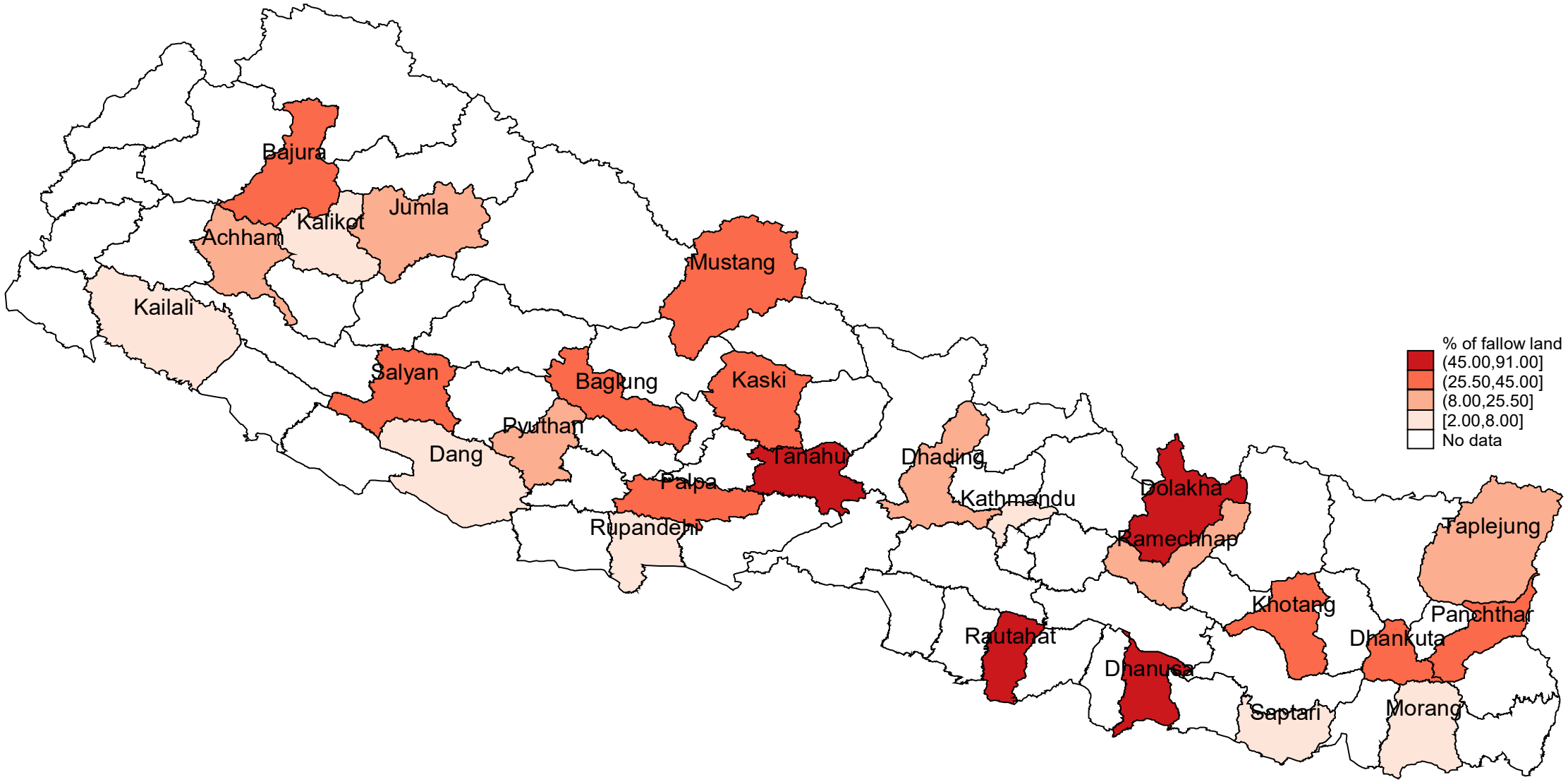
Data sources

- **Nepal National Climate Change Impact Survey 2016** (CBS Nepal, 5060 HHs)
- Outcome and treatment dummy variables based on recall during heavy period of migration in Nepal (previous 25 years)
- Multi-stage stratified random sampling from 26 of Nepal's 77 districts
- Respondents >= 45 years old, who had lived in their village for at least 25 years.
- Dropped households who were landless or who do not farm, leaving 3843 observations
- 81% of respondent male

Outcome variables & treatment

Variable	Definition	Mean	SD
Outcome Variables			
Fallow land	1 if household kept agriculture land fallow, 0 otherwise	0.31	0.46
Increased chemical fertilizer	1 if household increased chemical fertilizer, 0 otherwise	0.66	0.47
Irrigation	1 if household uses irrigation, 0 otherwise	0.30	0.46
Improved seeds	1 if household uses improved seeds, 0 otherwise	0.63	0.48
Agroforestry	1 if household uses agroforestry, 0 otherwise	0.14	0.35
Pond construction	1 if household invested in rainwater harvesting ponds, 0 otherwise	0.03	0.17
Intercropping	1 if household uses intercropping, 0 otherwise	0.62	0.49
Involved in Agribusiness	1 if household increased agribusiness, 0 otherwise	0.29	0.45
Off-farm work	1 if the household members are involved in off-farm work	0.42	0.49
Treatment: Out-migration	**1 if household sent a member out of country for work, 0 otherwise**	**0.40**	**0.49**

Fallowing pattern at district level

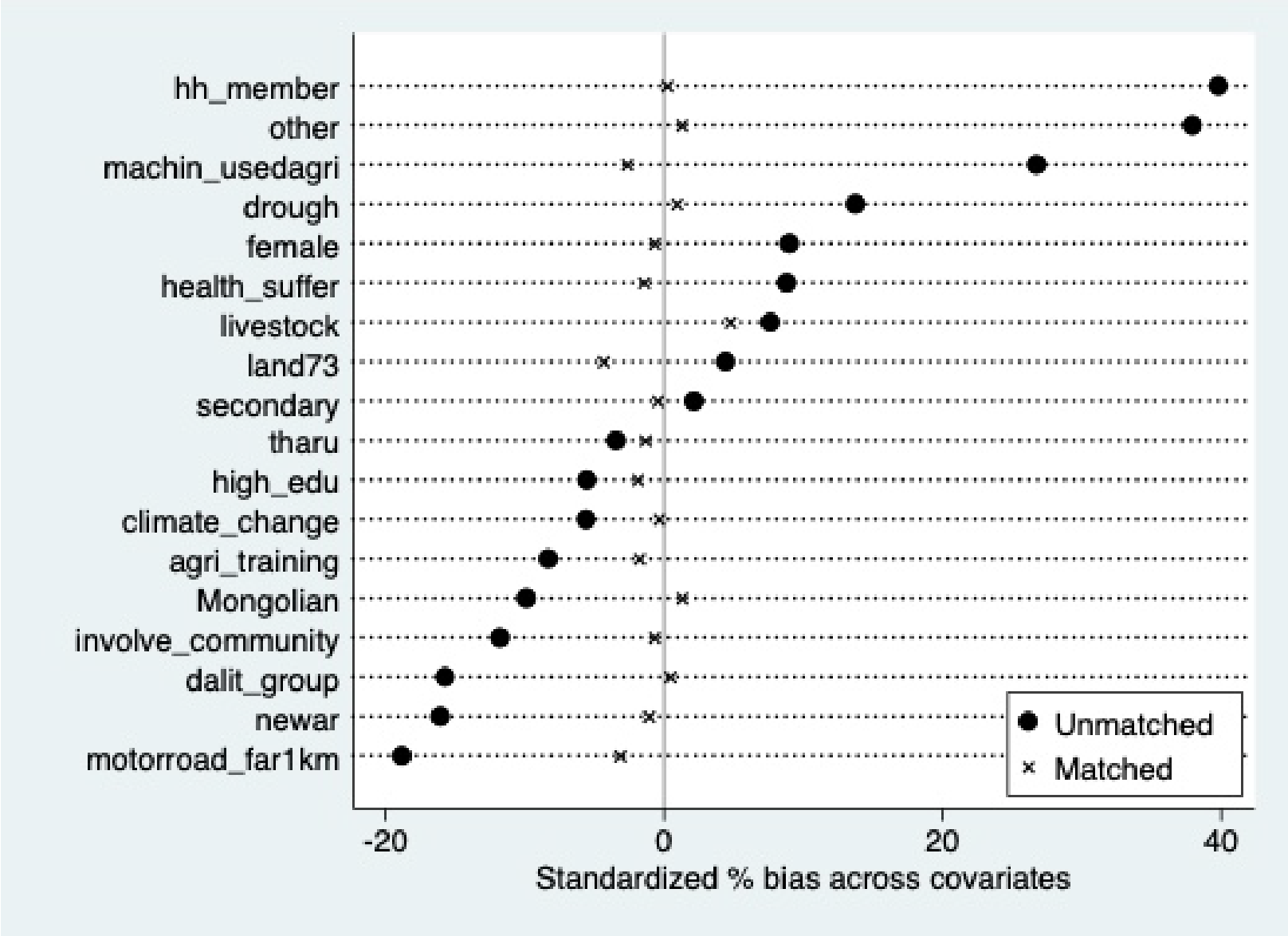


Controls

- Ethnic group
- Household size, literacy status of household head, education level of household head
- Landholding prior to survey, presence of health issues, whether HH has livestock, motorable road within 1 km, non-agricultural income sources, and savings
- Respondent had agricultural training, knows about climate change and is involved in community activities
- District fixed effects

Results

Reduced Bias Due to Matching



PSM quality results: sensitivity to unobservable

- Rosenbaum Bounds simulates the degree to which randomness of treatment assignment must be violated in order for results to be reversed
- Critical levels of hidden bias or sensitivity (Rosenbaum, 2002) gamma - Γ is a measure of difference in the odds of treatment assignment for observations with the same observed confounders, but that diverge on unobserved confounders
- Higher the value of **Γ** (minimum value 1) the lower the sensitivity to hidden bias. 1.30 is considered a cutoff for sensitive results. 1.0 means results are sensitive even with full randomization.

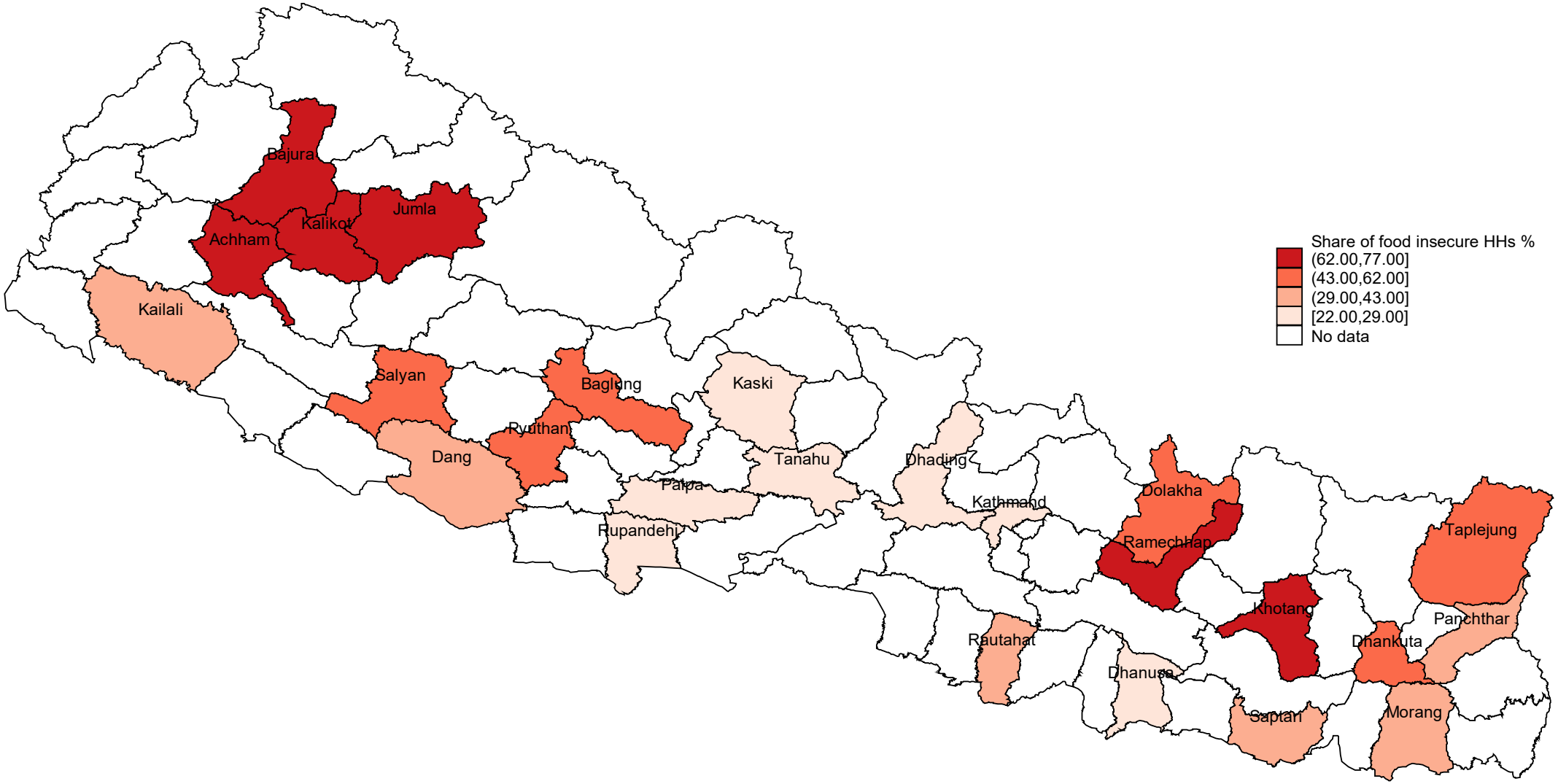
Propensity Score Matching ATT Results

	On Matched Observations				
Variable	Mean Matched Treated	Mean Matched Control	ATT	T-Stat	Rosenbaum Bounds Hidden Bias Critical Level (95% Significance)
Fallow	0.40	0.24	0.16	9.59***	1.6
Chemical Fertilizer	0.75	0.65	0.10	5.85***	1.2
Irrigation	0.37	0.30	0.07	4.16***	1.4
Improved seeds	0.71	0.61	0.10	5.64***	1.0
Rainwater harvesting Pond	0.04	0.02	0.02	2.68**	1.0
Agroforestry	0.14	0.15	-0.005	0.40	-
Intercropping	0.62	0.62	-0.002	0.09	-
Off-farm work	0.59	0.34	0.25	14.15***	4.2
Agribusiness	0.42	0.23	0.19	11.95***	Did not converge

LPM and IV Results (Treatment: Household has Migrant(s))

Outcomes	Model Type	Coefficient on Out-migration Variable	(SE)
Fallowing	LPM	0.07***	0.02
	IV	0.24*	(0.13)
Increased Chemical Fertilizer	LPM	-0.01	(0.02)
	IV	-0.20	(0.15)
Irrigation	LPM	-0.01	(0.02)
	IV	0.08	(0.13)
Improved Seeds	LPM	0.03*	(0.02)
	IV	0.23*	(0.12)
Rainwater Harvesting Pond	LPM	0.02**	(0.01)
	IV	0.08**	(0.03)
Adoption of Agroforestry	LPM	-0.02*	(0.01)
	IV	0.07	(0.07)
Intercropping	LPM	0.01	(0.02)
	IV	0.15	(0.17)
Increased Agribusiness	LPM	0.10***	(0.02)
	IV	0.07	(0.11)
Off-farm Work	LPM	0.19***	(0.02)
	IV	0.19*	(0.11)

Food insecurity across the sampled districts



Summary

- Perhaps not surprisingly, **international migration affects agricultural system** and **livelihood choices**
- Migration appears **to increase fallowing of agricultural land** by about **16% - 24%** compared with control mean of 24%.
- Migration in some respects increases agricultural intensification, including increase chemical fertilizer use by **10% vs 65%** at control mean and investment in irrigation by **7% vs. 30%** at control mean. Also, rainwater ponds and improved seeds.
- Biggest effects seem to be related to diversifying incomes.
  - **Agribusiness is 19%** more for treated households compared with control mean of 23%
  - **Off-farm work is 19% - 25%** more compared with 23% control mean

Implications and Caveats

- The tendency to fallow land is significant and we have linked it to temporary international migration. Unfortunately, cannot link to remittances (the survey does not have remittance information).
- Adjustments in agricultural production systems appear to be labor-saving substitutions and livelihood diversification
- Migrants may bring back financial resources, new perspectives or even materials that spur changes to household production systems and rural livelihoods
- Cannot say much about the degree to which household welfare improves with migration as preliminary results suggest some degree of food insecurity in remote districts


Thank you
Let's protect
the pulse.