Development Mismatch? Evidence from Agricultural Projects in Pastoral Africa

Eoin McGuirk, Tufts University

Nathan Nunn, University of British Columbia

World Bank Land Conference
May 16, 2024

Introduction

- Local context is important for the success of development policies (Ferguson 1990, Ashraf et al. 2020, Lowes and Montero 2021)
  - Projects may be "matched" or "mismatched" with local pop.
- Development understood as: agriculture $\rightarrow$ manufacturing
  - Imperative to raise productivity of **crop agriculture**
  - Expand commercial agricultural land use (Bustos et al. 2016)

Introduction

- Local context is important for the success of development policies (Ferguson 1990, Ashraf et al. 2020, Lowes and Montero 2021)
  - Projects may be "matched" or "mismatched" with local pop.
- Development understood as: agriculture $\rightarrow$ manufacturing
  - Imperative to raise productivity of **crop agriculture**
  - Expand commercial agricultural land use (Bustos et al. 2016)
- However, for much of Africa's population (and land), the existing mode of subsistence is not crop agriculture (FAO 2018, McGuirk and Nunn, 2024)
- What happens when **agricultural** development projects are implemented in traditionally **pastoral** territories?

Transhumant Pastoralism in Africa

- Africa has a sizable pastoral population (FAO 2018)
  - $\sim$ 22% of pop. (268m) obtains majority of income from animals
  - $\sim$ 43% of land mass supports pastoralism

- Many pastoral groups are **transhumant** (seasonally migrant)
  - Rely on flexible, customary land use arrangements
  - Cooperation with sedentary agriculturalists...

Agricultural Projects and Farmer-Herder Conflict

'Nightmare' for Ethiopian pastoralists as foreign investors buy up land

Thinktank accuses Ethiopian government of stirring ethnic tensions as Suri displaced to make way for large plantations

Global development is supported by

BILL & MELINDA GATES *foundation*

About this content

David Smith, *Africa correspondent*

- *[T]he recent introduction of* **large-scale plantations** *"has not only* **made important grazing lands unavailable** *to the Suri and devastated their livelihoods, but disturbed political order between the Suri and other local ethnic groups,* **escalating violent conflicts.**"

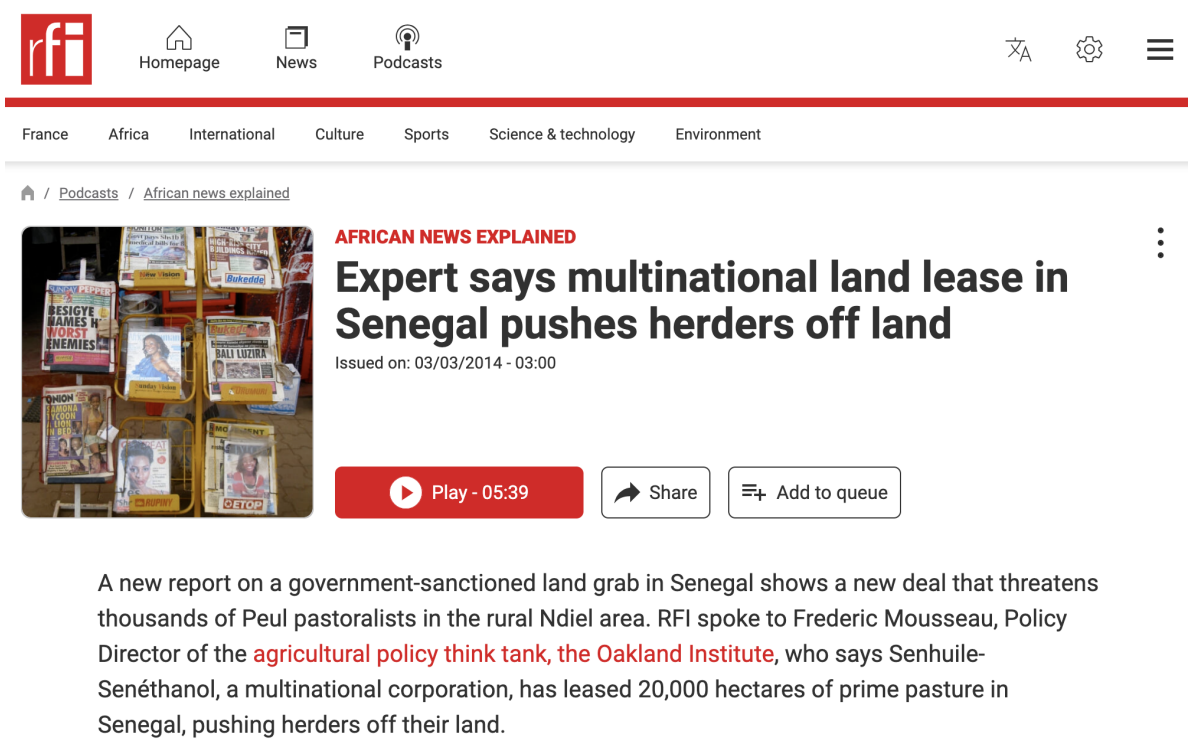
Agricultural Projects and Farmer-Herder Conflict

- *[T]he plantation exacerbated tensions between the Suri and another ethnic group, the Dizi, seen as collaborating with the government. The first episode of violence in February 2012, in which* **three Dizi police officers were killed, occurred over police marking land for expansions of the plantation**.

- *Government forces killed 54 unarmed Suri in a marketplace in retaliation.*

- *[T]he World Bank's support [...] implicates western funds in the coerced settlement of pastoral communities.*

Agricultural Projects and Farmer-Herder Conflict



Other high profile accounts:

- Ethiopia: Awash Valley Getachew 2001, Behnke & Kerven 2013
- Kenya: Tana River Delta Umar 2007, Nonow 2013
- Northern Ghana Soeters, Weesie & Zoomers 2017; FAO 2018

Development Mismatch: Perspectives

1. **State & donors: agricultural projects foster prosperity and peace**
   - Transhumant pastoralists are "at once baffling, unruly, threatening and backward" in need of civilizing Catley et al. 2013
   - TZ President Kikwete: "We have to do away with archaic ways of livestock farming" Mattee & Shem 2006
   - "NGOs have encouraged poor pastoralists to settle permanently ... to separate pastoral populations from their nomadic lifestyle, which is seen as primitive and irrational." Fratkin, Roth, & Nathan 2004

An Example

EDITION

AFRICA

Refugees turn Kenya's semi-arid land into farms

Refugees use drip irrigation to grow vegetables and trees in Kenya's semi-arid Turkana County

Andrew Wasike and Magdalene Mukami | 21.06.2019

Coronavirus

Pfizer/BioNTech vaccine data hacked from EU regulator

Turkey reports over 31,000 new COVID-19 infections

Health Canada

Development Mismatch: Counterpoints

2a. **Agricultural projects undermine existing THP system**

- History of projects blocking access to water, pasture Catley 2013
- Pastoralists in Africa are "neglected" by governments and "invisible" to international organizations FAO 2018

Development Mismatch: Counterpoints

2a. **Agricultural projects undermine existing THP system**

- History of projects blocking access to water, pasture Catley 2013
- Pastoralists in Africa are "neglected" by governments and "invisible" to international organizations FAO 2018

2b. **Agricultural projects not profitable relative to existing THP system**

- Pastoral Turkana healthier than recently sedentarized Turkana Campbell et al. 1999; also Rendille Fratkin, Roth, and Nathan 2004
- Pastoralism more profitable than sugar and cotton plantations created in Awash Valley in 1960s Behnke & Kerven, 2013
- High-profile failed projects Catley et al. 2013; cultural and institutional value of cattle Ferguson 1990; Quinlan et al. 2016

Development Mismatch: Counterpoints

2a. **Agricultural projects undermine existing THP system**

- History of projects blocking access to water, pasture Catley 2013
- Pastoralists in Africa are "neglected" by governments and "invisible" to international organizations FAO 2018

2b. **Agricultural projects not profitable relative to existing THP system**

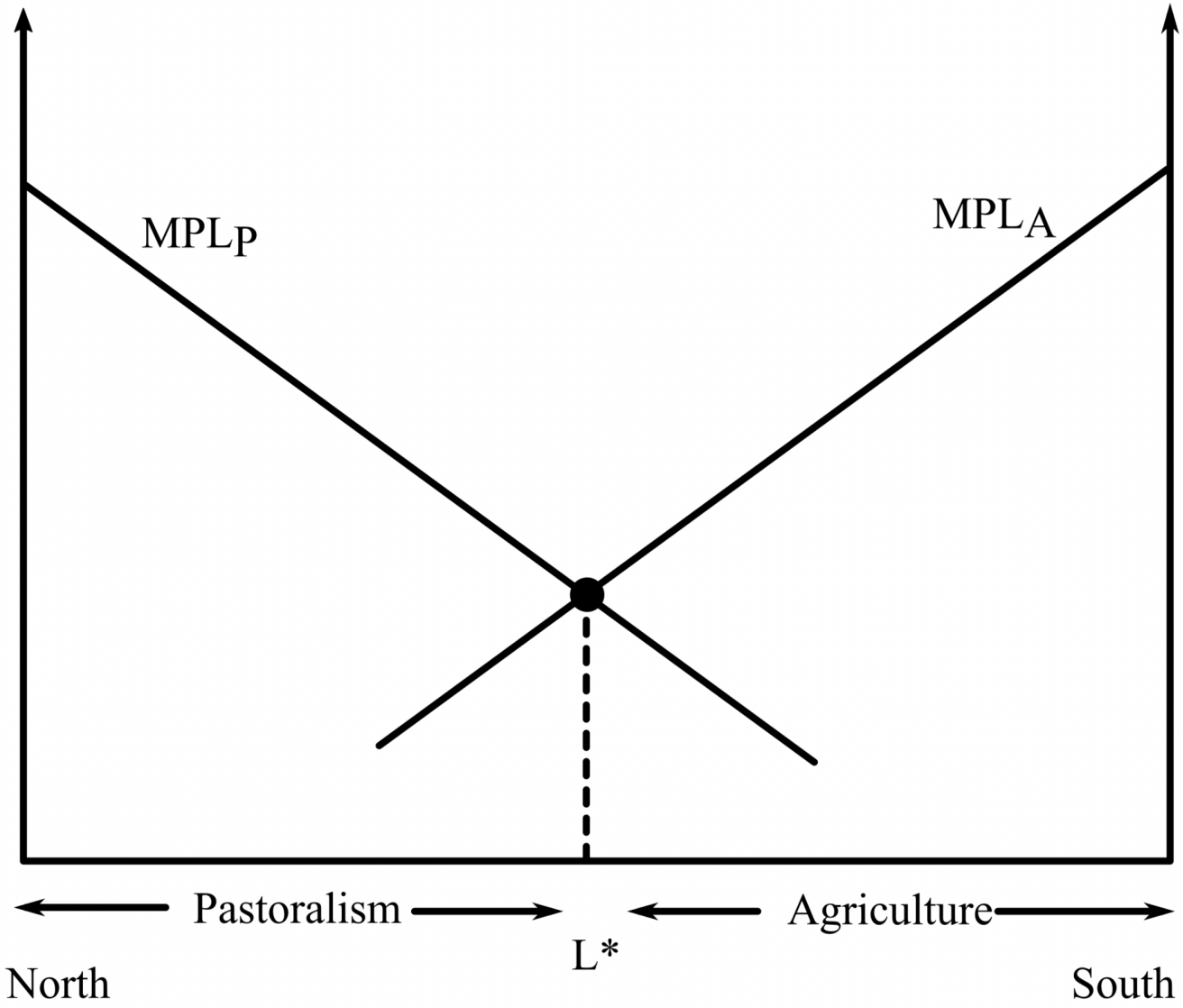
- Pastoral Turkana healthier than recently sedentarized Turkana Campbell et al. 1999; also Rendille Fratkin, Roth, and Nathan 2004
- Pastoralism more profitable than sugar and cotton plantations created in Awash Valley in 1960s Behnke & Kerven, 2013
- High-profile failed projects Catley et al. 2013; cultural and institutional value of cattle Ferguson 1990; Quinlan et al. 2016

- **Does the expansion of agriculture into pastoral territories lead to "peace and prosperity" or violence?**

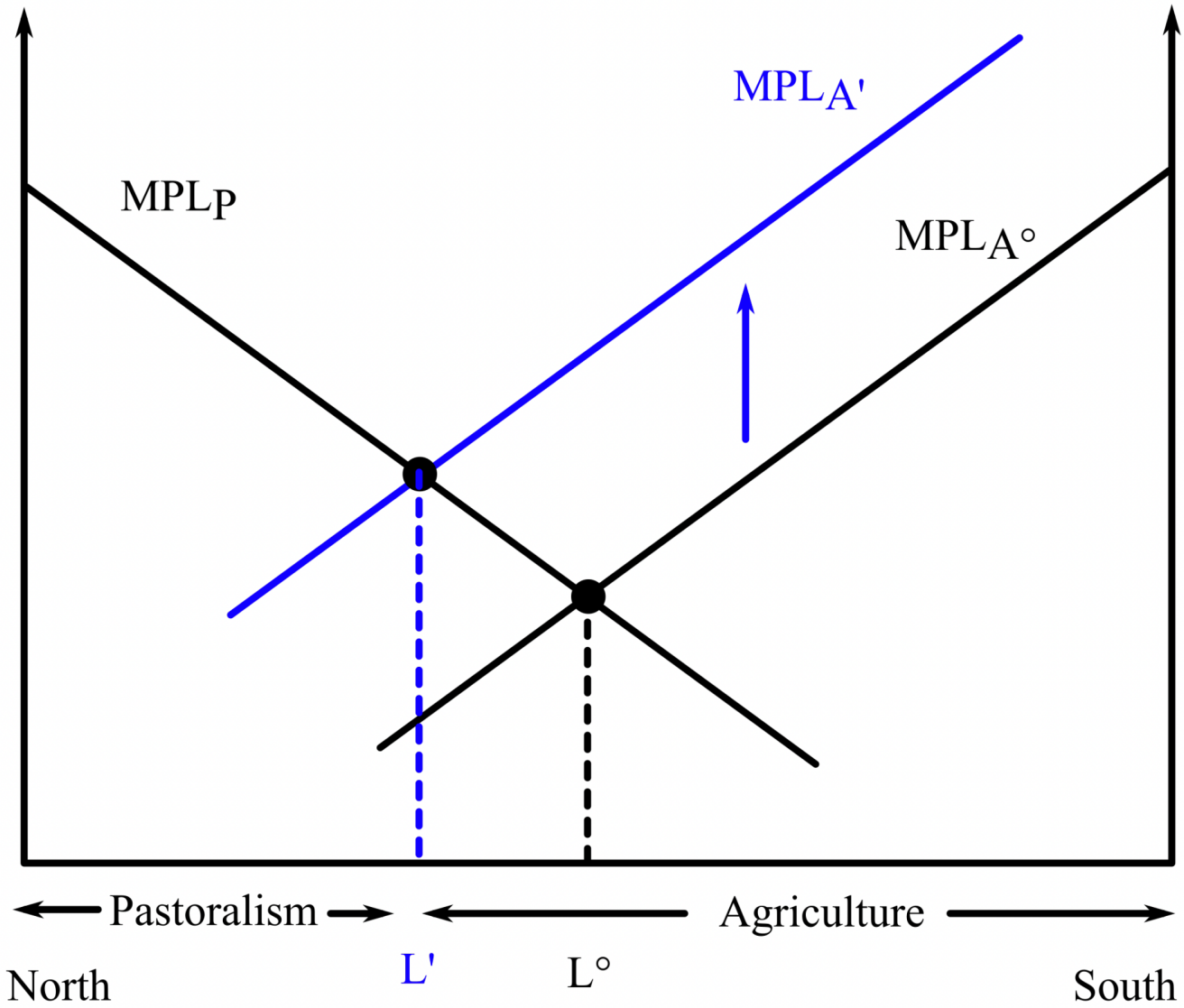
Outline

1. Introduction
2. **Economics of Land Use Conversions in Pastoral Africa**
3. Data
4. Estimating Effect of Agricultural Projects on Conflict
5. Development Outcomes
6. Political Economy
7. Conclusion

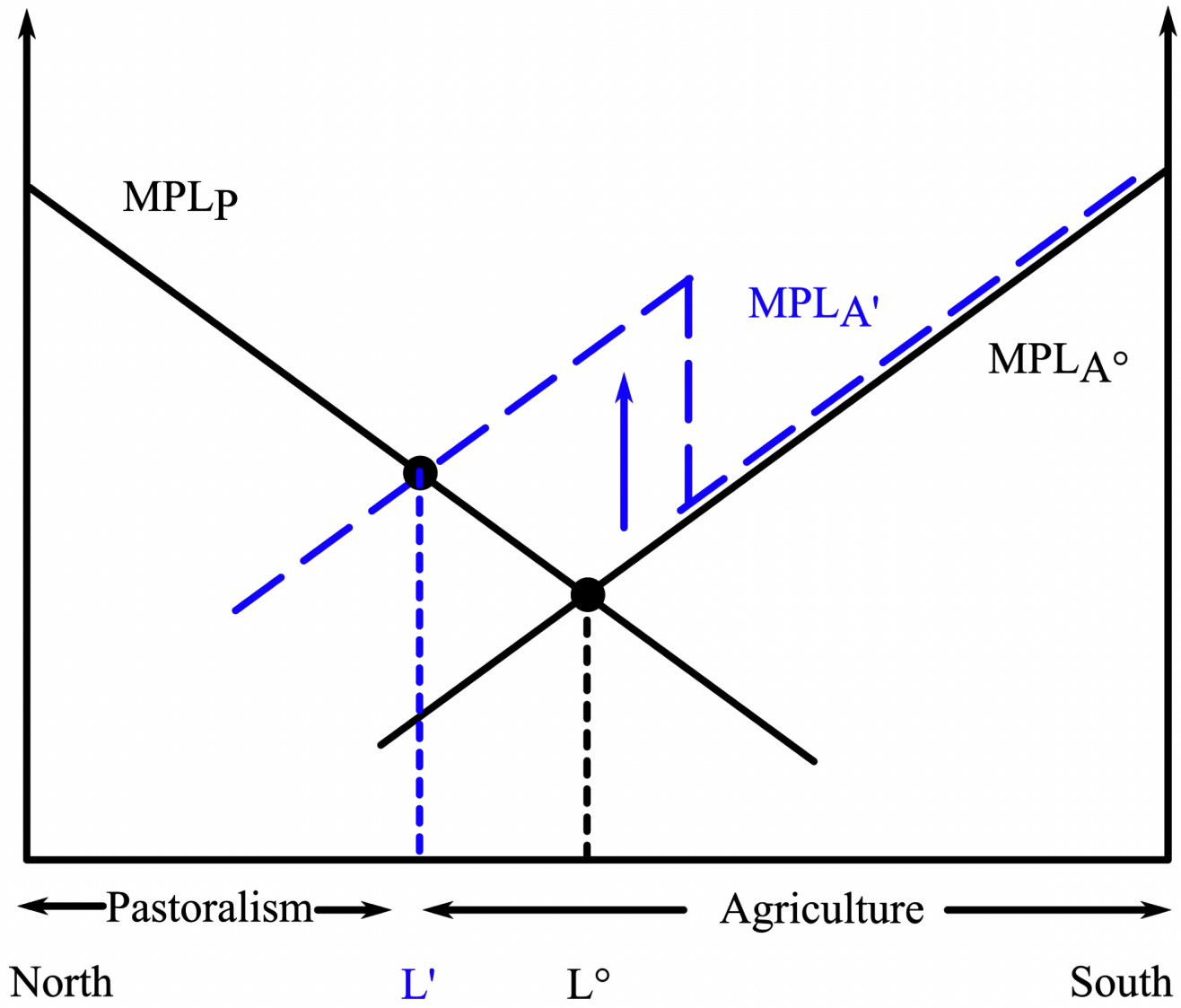
Economics of Land Use Conversions



Economics of Land Use Conversions



Economics of Land Use Conversions



Mismatch Frictions (Zambakari 2017, pp. 200-203)

1. Transhumant pastoralists are vulnerable to expropriation:
   - Pastoral communities traditionally access communal lands without resorting to formal titling
   - In these customary tenure regimes, "common lands are vulnerable to expropriation ... in the 'national interest'"

Mismatch Frictions (Zambakari 2017, pp. 200-203)

1. Transhumant pastoralists are vulnerable to expropriation:
   - Pastoral communities traditionally access communal lands without resorting to formal titling
   - In these customary tenure regimes, "common lands are vulnerable to expropriation ... in the 'national interest'"
2. Transhumant pastoralists are being evicted:
   - "The increasing marketization of land, characterized by rapid titling ... is followed by eviction of producers ... In this case, the victims have been ... agro-pastoral communities, nomads and other trans-boundary communities who move around seasonally."

Mismatch Frictions (Zambakari 2017, pp. 200-203)

1. Transhumant pastoralists are vulnerable to expropriation:
   - Pastoral communities traditionally access communal lands without resorting to formal titling
   - In these customary tenure regimes, "common lands are vulnerable to expropriation ... in the 'national interest'"

2. Transhumant pastoralists are being evicted:
   - "The increasing marketization of land, characterized by rapid titling ... is followed by eviction of producers ... In this case, the victims have been ... agro-pastoral communities, nomads and other trans-boundary communities who move around seasonally."

3. This is leading to violence:
   - "The ... victims of eviction and displacement have had to resort to violence in dealing with the state"
   - "The displacement caused by mechanized farming remains a major source of grievance and conflict."

Effects of agricultural projects in pastoral areas

1. ↑ Development & No Conflict (Pareto Improvement)
   - Project generates surplus; THP not worse off (compensated)
2. ↑ Development & ↑ Conflict
   - Project generates surplus; THP worse off (**not** compensated)

Effects of agricultural projects in pastoral areas

1. ↑ Development & No Conflict (Pareto Improvement)
   - Project generates surplus; THP not worse off (compensated)
2. ↑ Development & ↑ Conflict
   - Project generates surplus; THP worse off (**not** compensated)
3. No Development & No Conflict
   - Project unprofitable; THP not worse off
4. No Development & ↑ Conflict
   - Project unprofitable; THP worse off (unlikely, farmers can exit)

Effects of agricultural projects in pastoral areas

1. ↑ Development & No Conflict (Pareto Improvement)
   - Project generates surplus; THP not worse off (compensated)
2. ↑ Development & ↑ Conflict
   - Project generates surplus; THP worse off (**not** compensated)
3. No Development & No Conflict
   - Project unprofitable; THP not worse off
4. No Development & ↑ Conflict
   - Project unprofitable; THP worse off (unlikely, farmers can exit)

- **Prediction I: E(Conflict | Project) $>$ 0**
  - Since THP lack property rights, political power
- **Prediction II: E(Development | Project) $>$ 0**
  - Conditional on above, scenario [2] more likely than [4]

Outline

1. Introduction
2. Economics of Land Use Conversions in Pastoral Africa
3. **Data**
4. Estimating Effect of Agricultural Projects on Conflict
5. Development Outcomes
6. Political Economy
7. Conclusion

Data

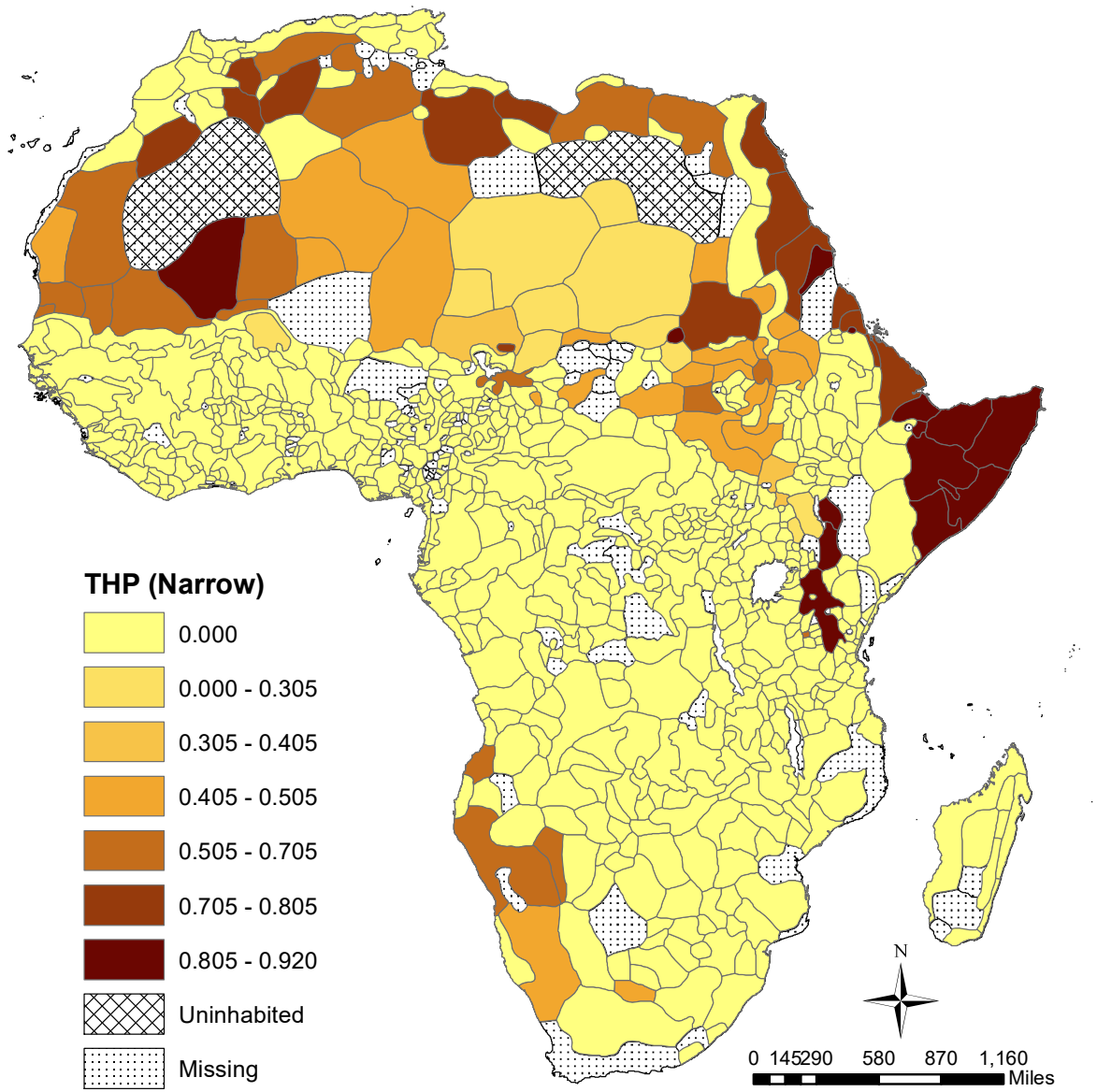
- Structure of panel data
  - 10,000 0.5 degree cells (55km $\times$ 55km) for each year
  - Cells i are nested within ethnic territories e Murdock 1959

Data

- Structure of panel data
  - 10,000 0.5 degree cells (55km $\times$ 55km) for each year
  - Cells i are nested within ethnic territories e Murdock 1959
- Conflict variables: $I(Conflict)_{it}$
  1. Uppsala Conflict Data Program (UCDP)
     - Covering **1989–2014**
     - Conflict event types: (i) Any; (ii) State; (iii) Non-state
  2. Armed Conflict Location & Event Data project (ACLED)
     - Covering **1997–2014**
- Transhumant Pastoralism (0-1 index) McGuirk & Nunn 2024

$$TranshumantPastoralism_e = Mobility_e \times Pastoralism_e$$

Transhumant Pastoralism



Data

- Agricultural development projects:
  - Geocoded World Bank development projects from AidData
  - 5,684 projects in 61,243 sites from 1995-2014
  - Information on sectors and categories

Data

- Agricultural development projects:
  - Geocoded World Bank development projects from AidData
  - 5,684 projects in 61,243 sites from 1995-2014
  - Information on sectors and categories
- Africa: 1,067 projects in 14,879 project sites
  1. **Agriculture:** 3,845 (26%)

Data

- Agricultural development projects:
  - Geocoded World Bank development projects from AidData
  - 5,684 projects in 61,243 sites from 1995-2014
  - Information on sectors and categories
- Africa: 1,067 projects in 14,879 project sites
  1. **Agriculture:** 3,845 (26%)
     i. **Crop Agriculture:** 3,801 (26%)
     ii. **Animal Production:** 592 (4%)
  2. **Non Agriculture:** 11,034 (74%)

Data

- Agricultural development projects:
  - Geocoded World Bank development projects from AidData
  - 5,684 projects in 61,243 sites from 1995-2014
  - Information on sectors and categories
- Africa: 1,067 projects in 14,879 project sites
  1. **Agriculture:** 3,845 (26%)
     i. **Crop Agriculture:** 3,801 (26%)
     ii. **Animal Production:** 592 (4%)
  2. **Non Agriculture:** 11,034 (74%)
- Timing: use year of "project initiation" on the ground
  - Earliest date possible Kilby 2013, 2015

Project Types Across Land Types

Project Type	(1) THP > 0	(2) THP $= 0$	(3) Difference
Agriculture	0.275	0.254	0.020
	(0.447)	(0.436)	(0.025)
Crop Agriculture	0.275	0.252	0.023
	(0.447)	(0.434)	(0.025)
Animal Production	0.069	0.036	0.033***
	(0.254)	(0.187)	(0.012)
Non-Agriculture	0.725	0.746	-0.020
	(0.447)	(0.436)	(0.025)
Observations	750	12,756	13,506

Agricultural Development Projects

Full description of WB aid project in Mali (from AidData):

> *The project would comprise: (a)* **construction of three polders, including land preparation, with a rice cultivated area of 13,300 ha***; (b) rehabilitation of five polders, including land preparation, with a rice cultivated area of 13,200 ha; (c) land preparation on 2,000 ha of an existing polder; (d) construction of buildings for the project; (e) establishment of a project authority, Operation Riz Mopti (ORM), including provision of farm machinery and technical assistance to ORM. The project authority will operate and maintain the polders, allocate land in the new polders, produce and distribute selected seeds, and provide credit and extension services in all areas mentioned above, plus in existing polders with a rice cultivated area of 2,700 ha; (f) establishment and operation of an agricultural research station; and (g) preparation of a feasibility study for a second rice project in the Mopti area.*

Outline

1. Introduction
2. Economics of Land Use Conversions in Pastoral Africa
3. Data
4. **Estimating Effect of Agricultural Projects on Conflict**
5. Development Outcomes
6. Political Economy
7. Conclusion

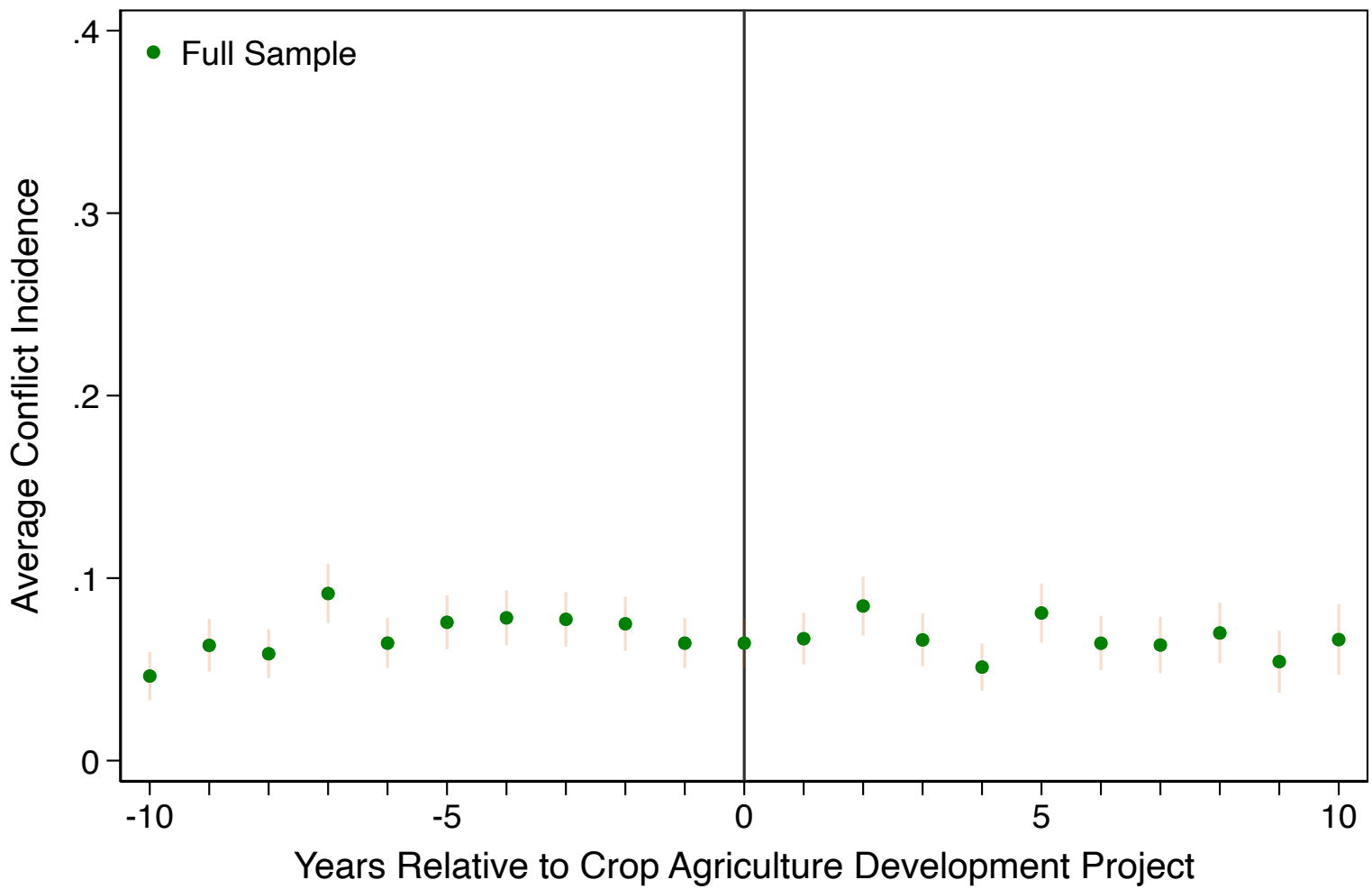
Empirical Approaches

Differencing: do agricultural development projects lead to conflict in traditionally pastoral areas?

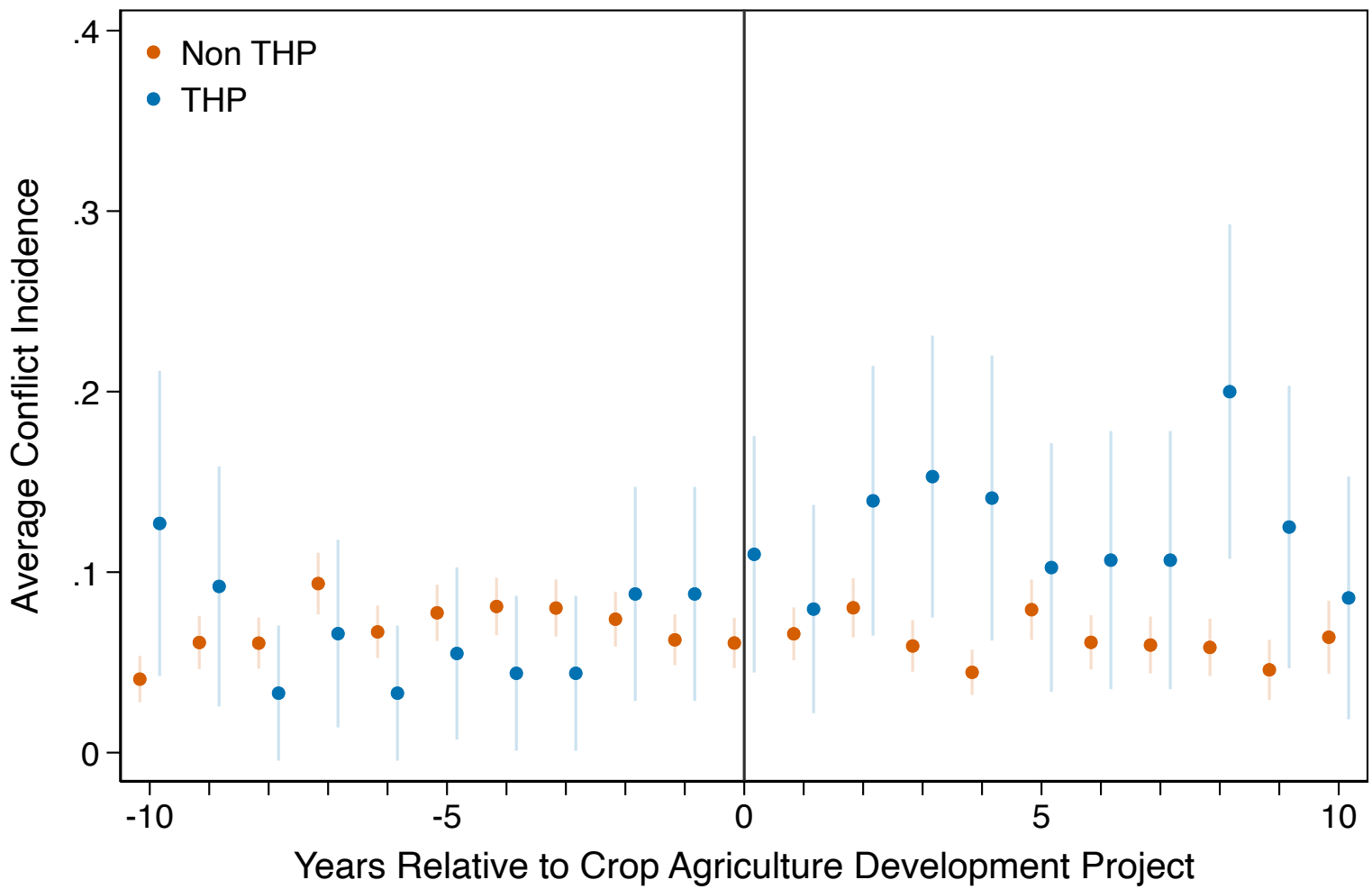
1. Raw data plots
2. Fixed effects
3. Event study plots

- Supporting evidence:
  - Examine supply shock in WB agricultural projects
  - Use satellite data on land use over time

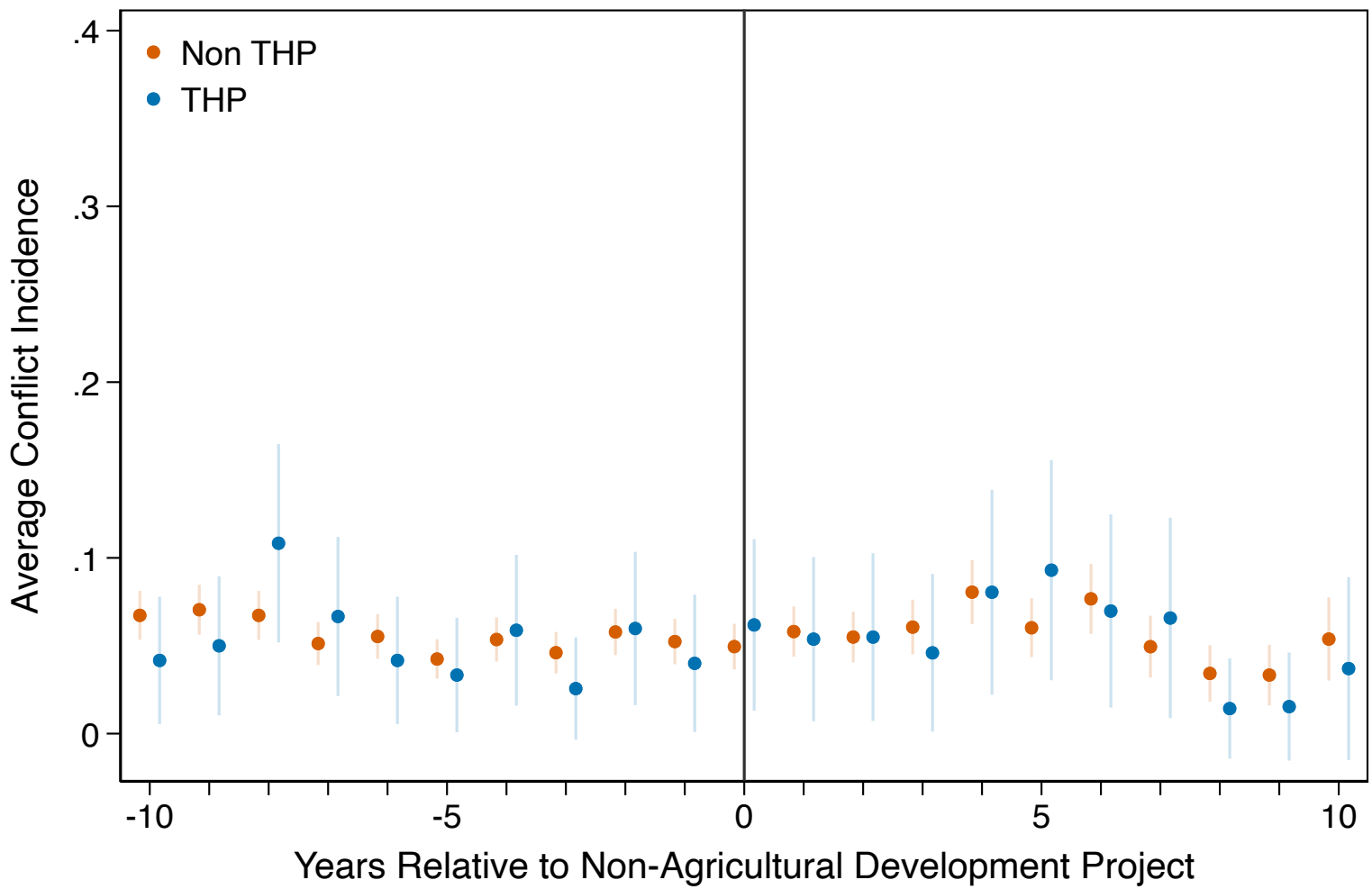
Differences in the Raw Data



Differences in the Raw Data



Differences in the Raw Data



Main Specification

$$y_{iet} = \beta_1 THP_e \times AgricultureProject_{it} + \beta_2 AgricultureProject_{it} + \lambda_t THP_e + \alpha_i + \alpha_{c(i)t} + \eta_{iet}$$

- $y_{iet} = 1$ if conflict occurs in cell i in ethnic territory e in year t
- THP_e measures Transhumant Pastoral index of ethnic group e
- $AgricultureProject_{it} = 1$ if WB project in cell i by year t
- THP X Year FE; Cell FE; Country X Year FE
- Parameter of interest: β_1

Differential Effect of Agricultural Projects on Conflict in THP Territories

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Agricultural Project	0.0968***	0.1079***	0.0947**	0.0924**
	(0.0359)	(0.0309)	(0.0378)	(0.0373)
Agricultural Project	-0.0165***	-0.0164***	-0.0032	-0.0033
	(0.0061)	(0.0052)	(0.0079)	(0.0078)
Additional Calculations				
Total Effect in Median THP Area	0.0420	0.0489	0.0542	0.0526
p-value	[0.05]	[0.01]	[0.02]	[0.02]
Dep. Var. Mean	0.0312	0.0225	0.0651	0.0647
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,813	8,813	8,813	8,813
Country-Years	980	980	882	882
Observations	176,260	176,260	158,634	158,634

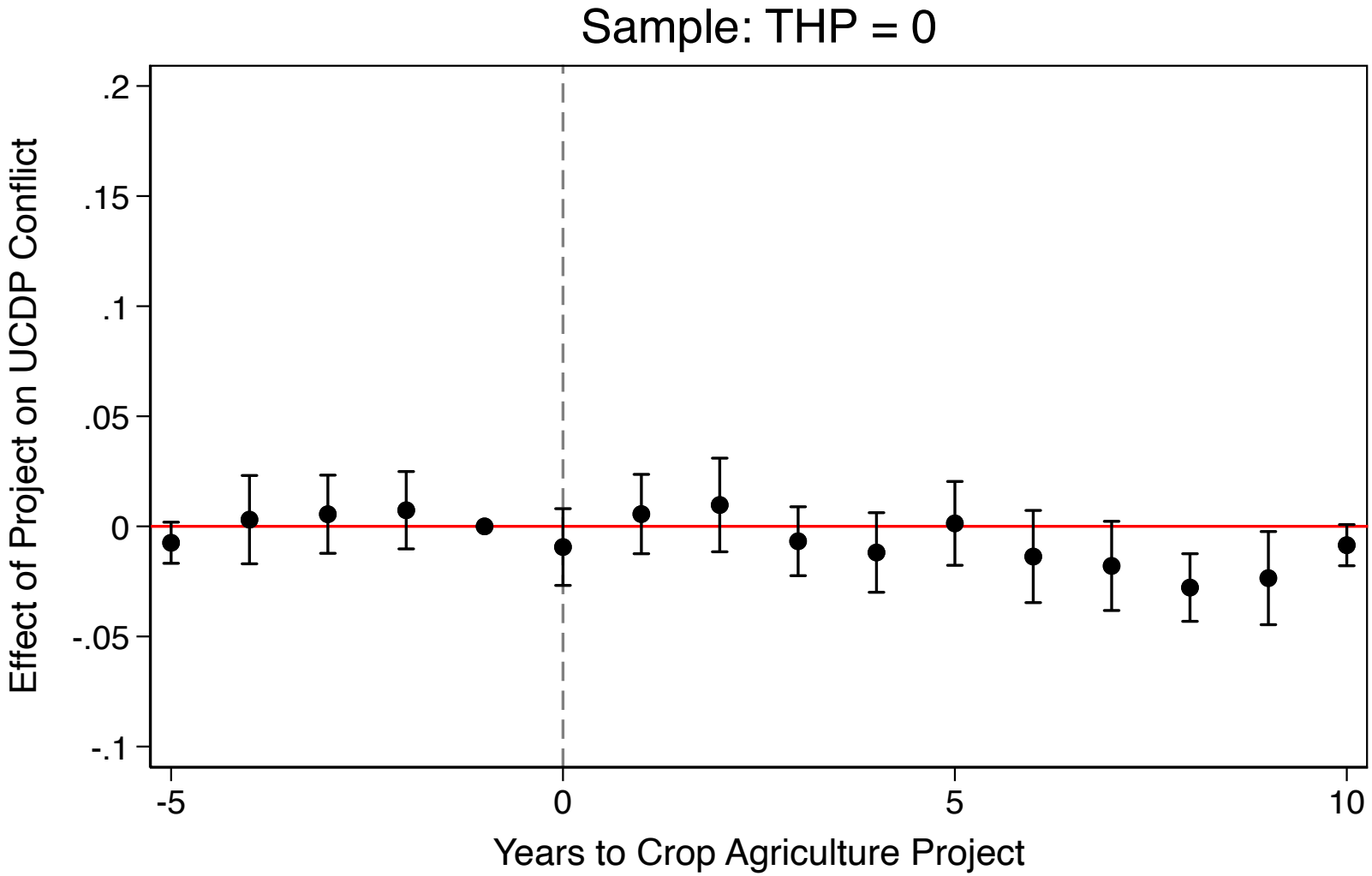
Crop Agriculture Vs. Animal Production Projects

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project	0.1294***	0.1363***	0.1076***	0.1049***
	(0.0375)	(0.0350)	(0.0403)	(0.0397)
Crop Agriculture Project	-0.0153**	-0.0161***	-0.0011	-0.0013
	(0.0064)	(0.0054)	(0.0086)	(0.0085)
Transhumant Pastoral × Animal Production Project	-0.1344**	-0.1173***	-0.0514	-0.0500
	(0.0571)	(0.0411)	(0.0495)	(0.0493)
Animal Production Project	-0.0077	-0.0026	-0.0022	-0.0017
	(0.0107)	(0.0091)	(0.0146)	(0.0146)
Additional Calculations				
(THP × Crop Ag.) + (THP × Animal Prod.)	-0.0050	0.0189	0.0563	0.0549
p-value	[0.92]	[0.53]	[0.27]	[0.28]
Total Crop Ag. Effect in Median THP Area	0.0630	0.0663	0.0640	0.0621
p-value	[0.00]	[0.00]	[0.01]	[0.01]
Dep. Var. Mean	0.0312	0.0225	0.0651	0.0647
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,813	8,813	8,813	8,813
Country-Years	980	980	882	882
Observations	176,260	176,260	158,634	158,634

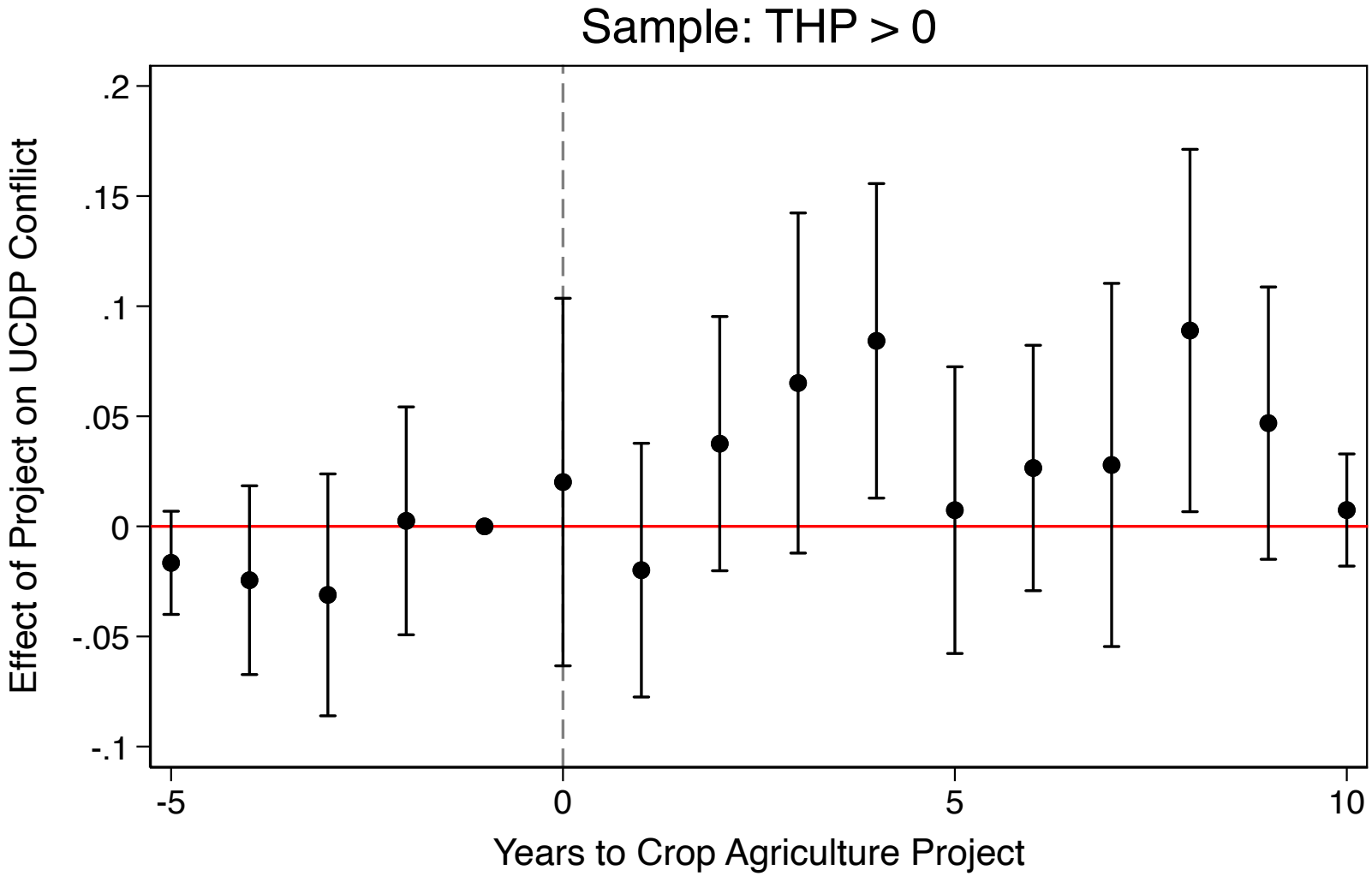
Differencing Against Non-Agricultural Projects

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project	0.1279***	0.1343***	0.1045***	0.1018**
	(0.0372)	(0.0348)	(0.0403)	(0.0398)
Crop Agriculture Project	-0.0135**	-0.0149***	-0.0005	-0.0007
	(0.0062)	(0.0053)	(0.0084)	(0.0084)
Transhumant Pastoral × Animal Production Project	-0.1356**	-0.1190***	-0.0554	-0.0538
	(0.0565)	(0.0412)	(0.0502)	(0.0500)
Animal Production Project	-0.0066	-0.0019	-0.0017	-0.0012
	(0.0107)	(0.0091)	(0.0146)	(0.0146)
Transhumant Pastoral × Non-Agricultural Project	0.0105	0.0151	0.0381	0.0365
	(0.0220)	(0.0164)	(0.0283)	(0.0277)
Non-Agricultural Project	-0.0134***	-0.0087**	-0.0055	-0.0057
	(0.0051)	(0.0044)	(0.0069)	(0.0069)
Additional Calculations				
Total Crop Ag. Effect in Median THP Area	0.0639	0.0663	0.0627	0.0609
p-value	[0.00]	[0.00]	[0.01]	[0.01]
THP × Crop Agriculture = THP × Animal Production (p-value)	0.001	0.000	0.034	0.037
THP × Crop Agriculture = THP × Non-Agricultural Aid (p-value)	0.005	0.001	0.182	0.191
Dep. Var. Mean	0.0312	0.0225	0.0651	0.0647
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,813	8,813	8,813	8,813
Country-Years	980	980	882	882
Observations	176,260	176,260	158,634	158,634

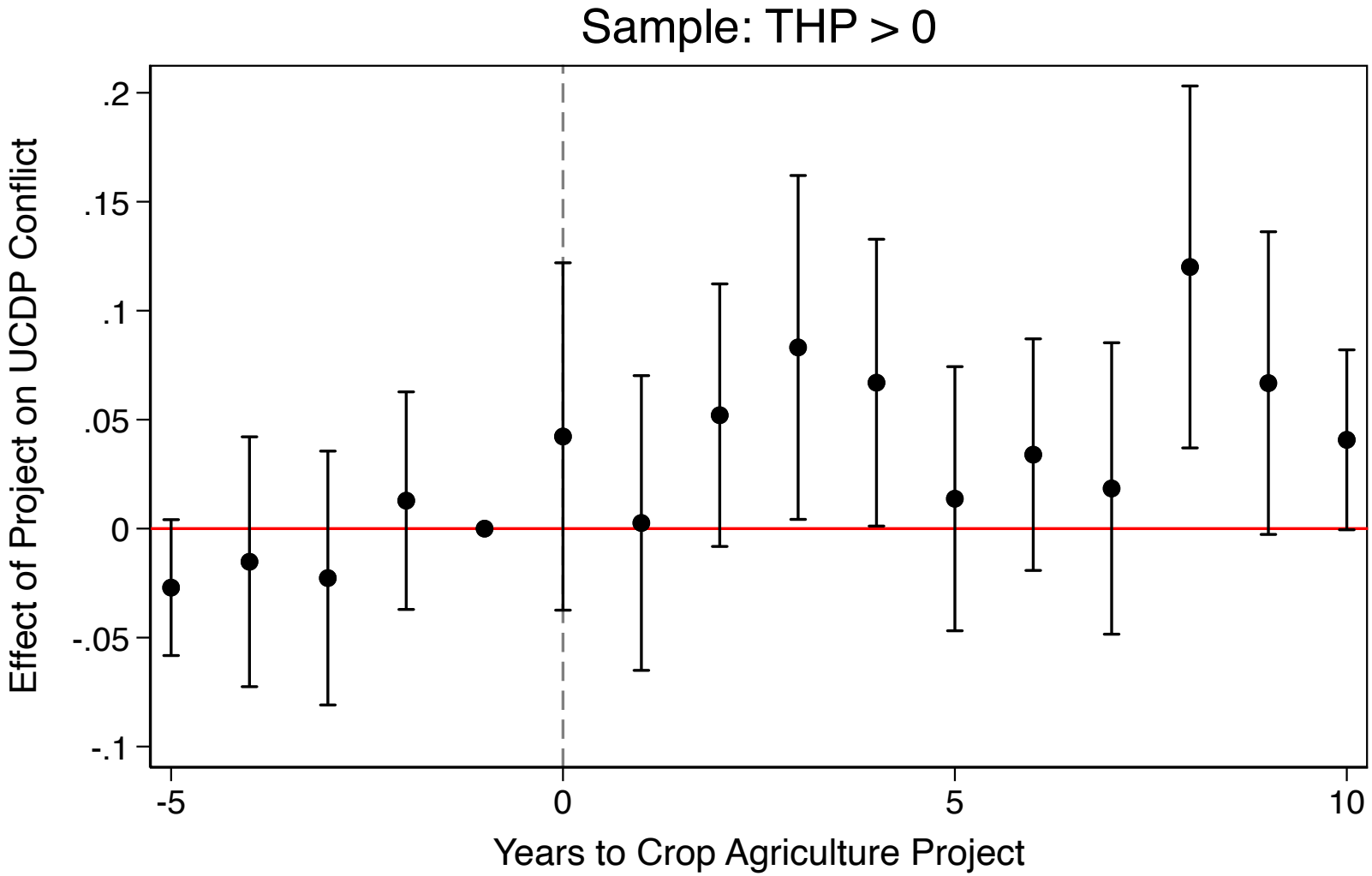
Event Study Plot: Non-THP Sample



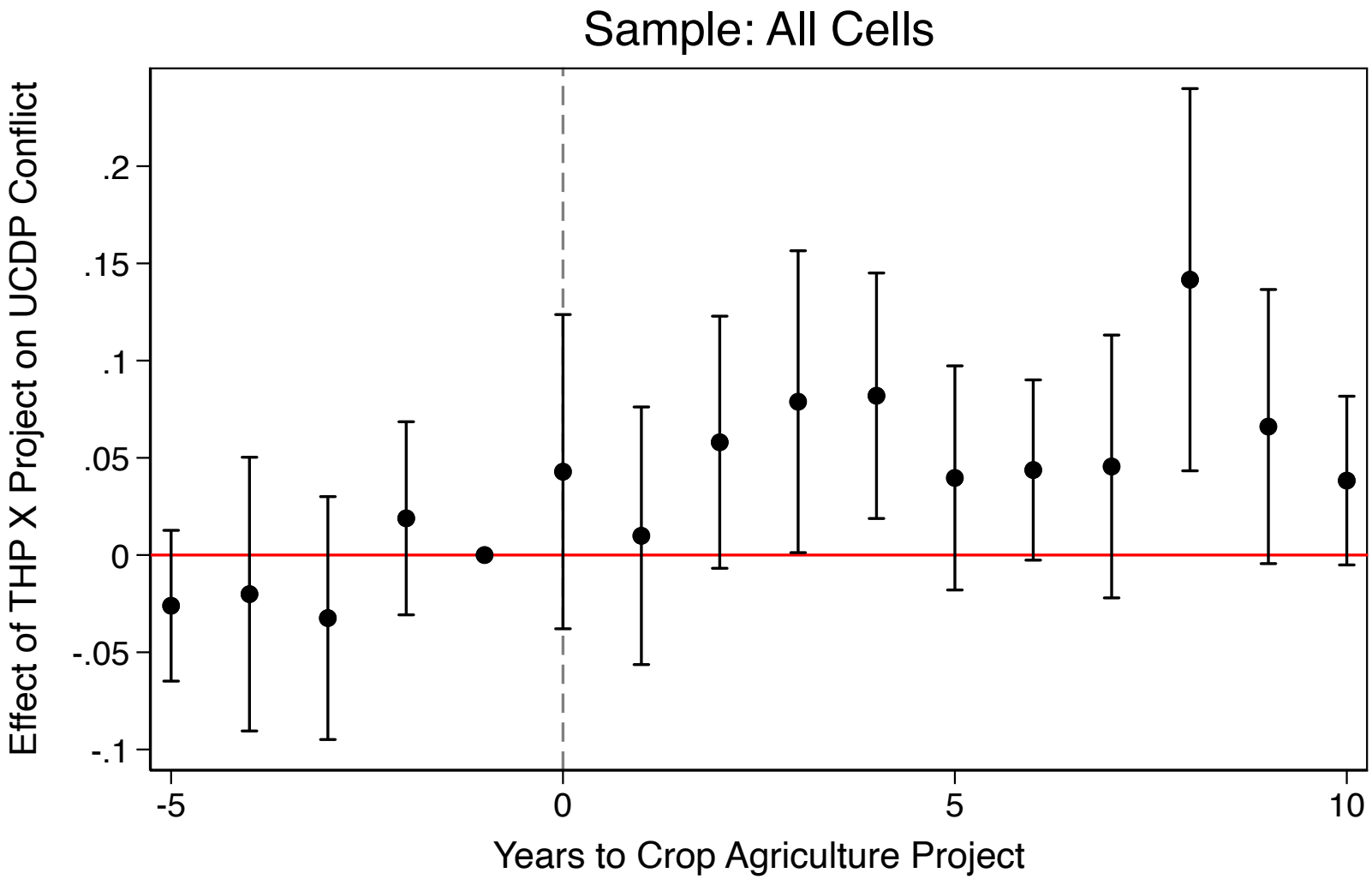
Event Study Plot: THP Sample



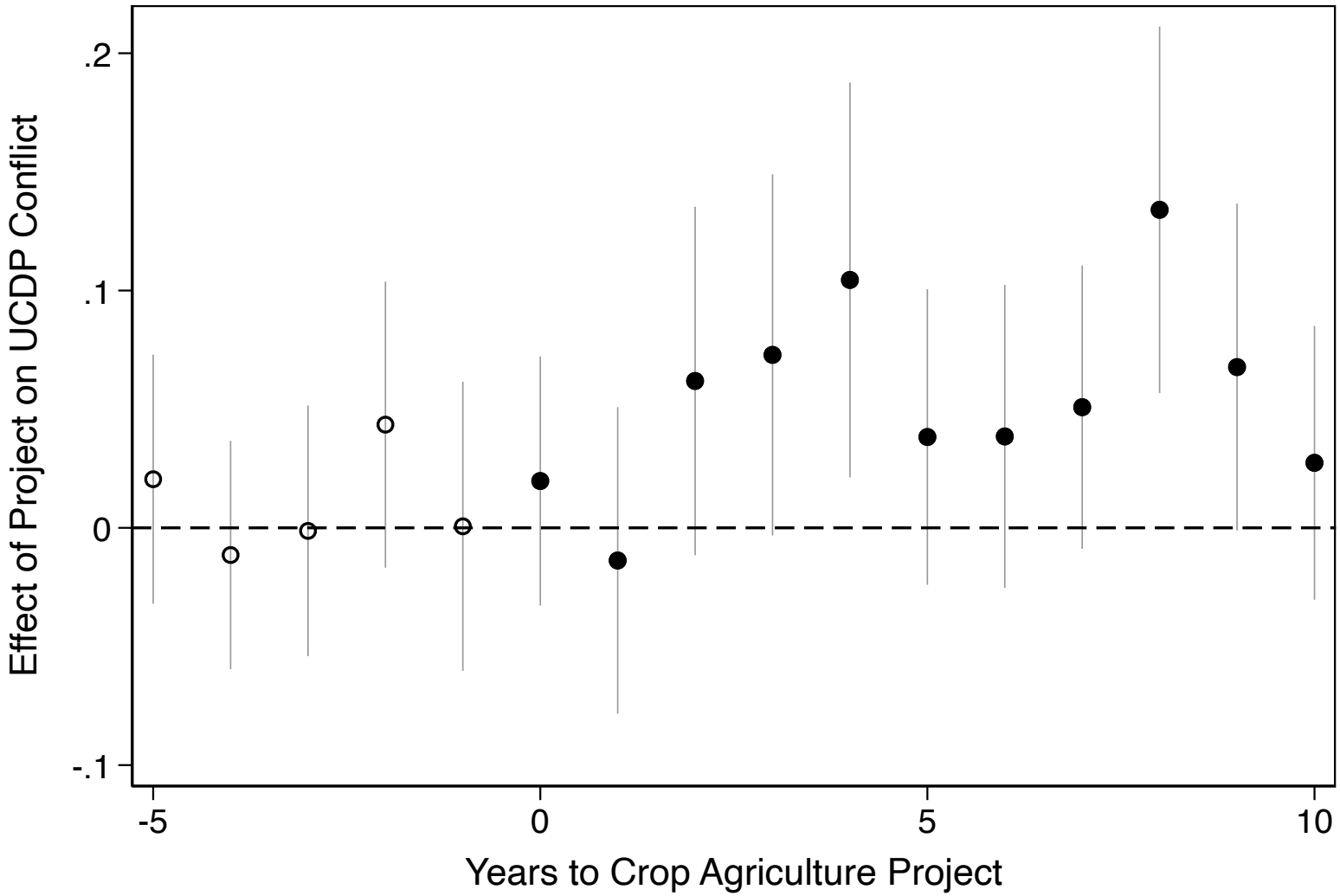
Event Study Plot: THP Sample with Controls



Event Study Plot: Full Sample with Controls



Event Study Plot: Callaway & Sant'Anna (2021) Estimator



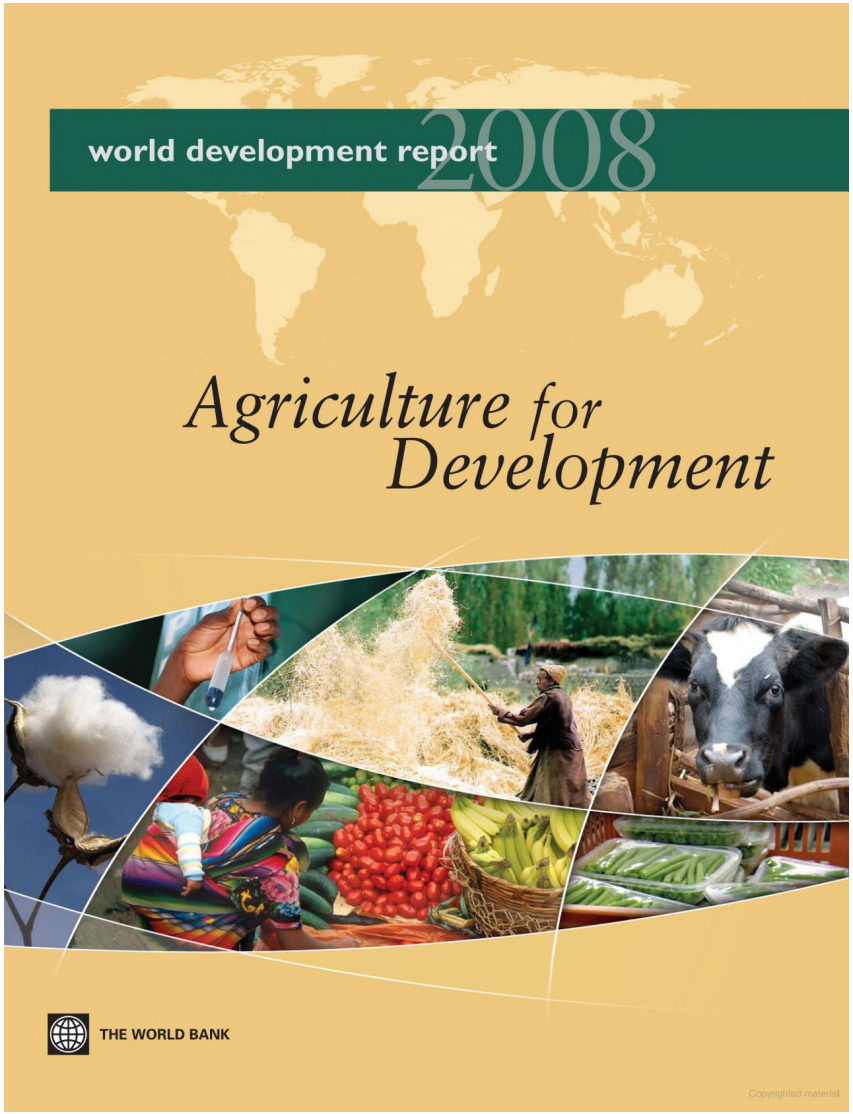
Examining the 2006 Cohort

- How to identify (arbitrarily) shifting interests from year to year at the WB?

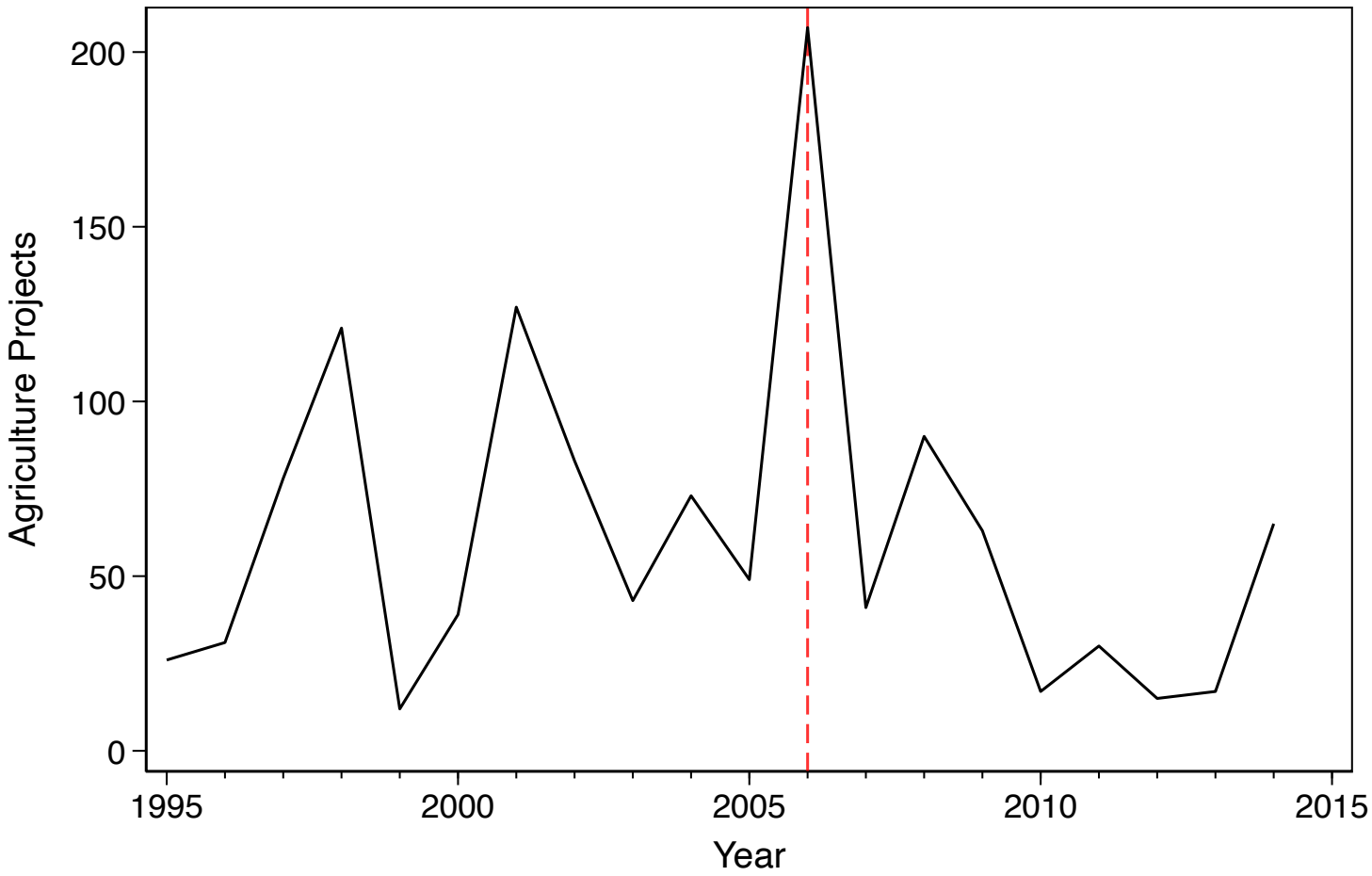
Examining the 2006 Cohort

- How to identify (arbitrarily) shifting interests from year to year at the WB?
- Annual *World Development Reports* attract attention to Bank activities in specific sectors
  - Topics vary from year-to-year
- Does this correlate with investment in related projects?
- Approach: projects are initiated 2.1 years before "transaction date"

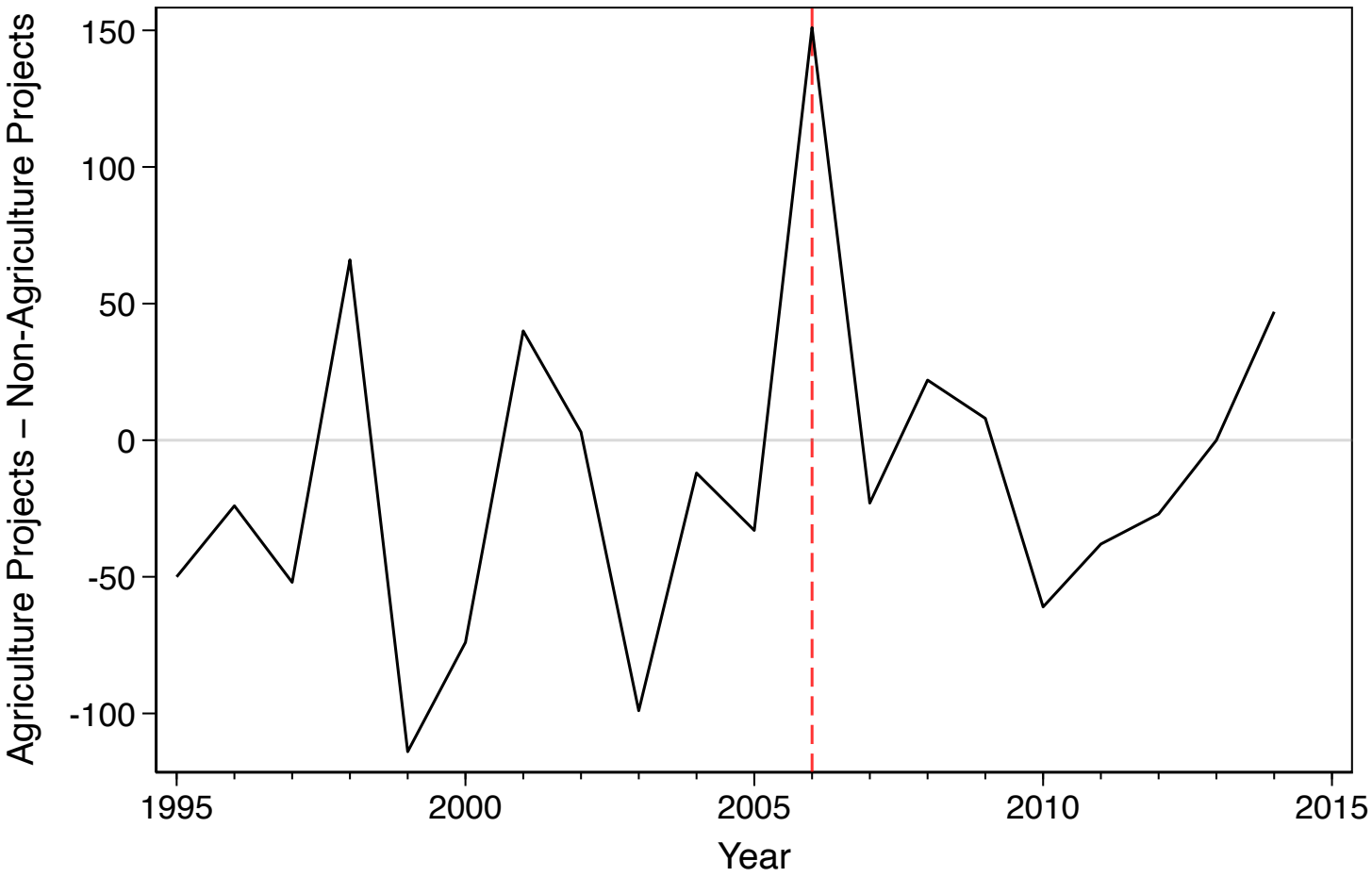
WDR on Agriculture



WDR on Agriculture and Agriculture Projects



WDR on Agriculture and Agriculture Projects

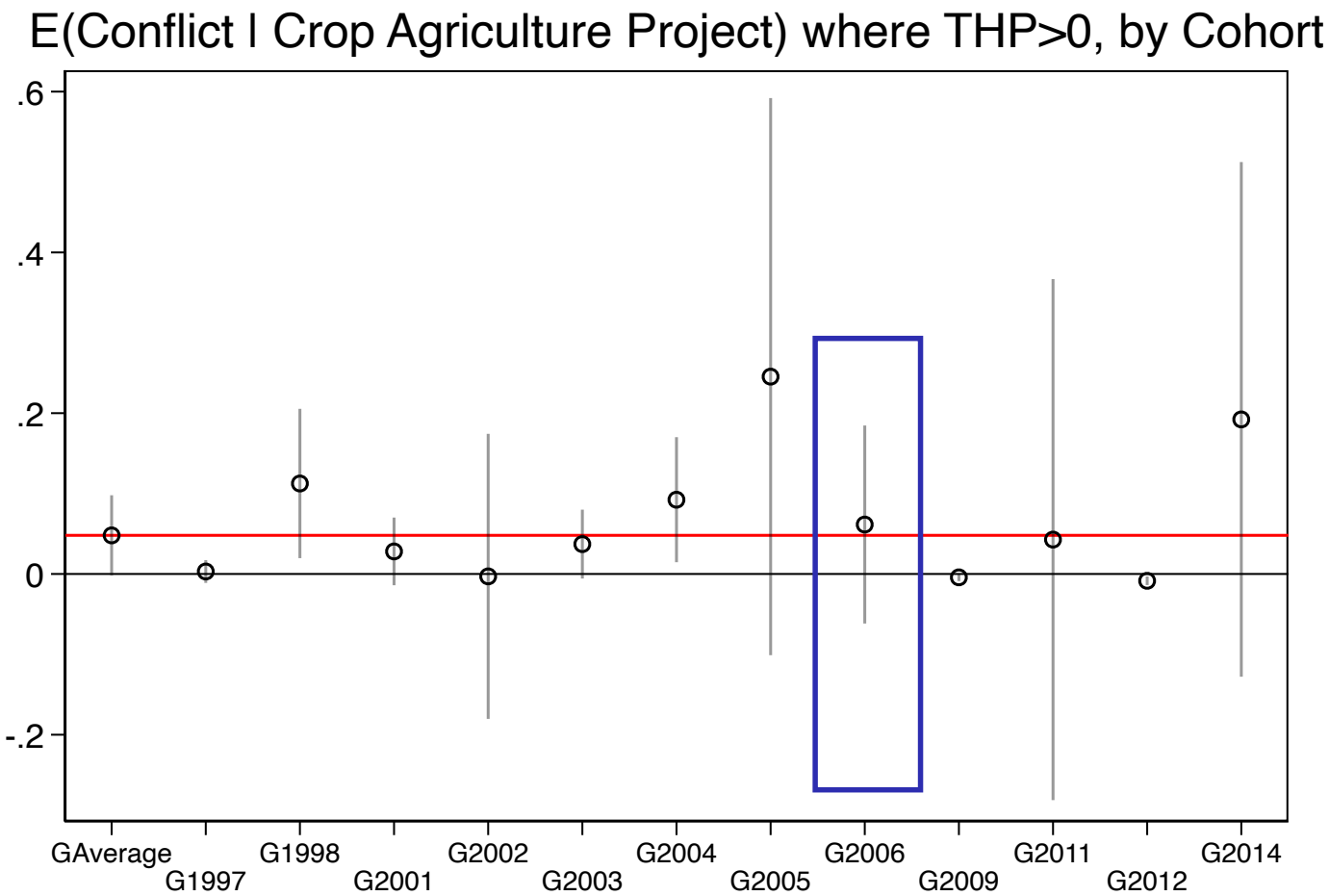


Examining the 2006 Cohort

- **Supply shock**: surfeit of ag. projects initiated in 2006
- Estimating the effect of 2006 cohort relative to others
  - If similar, suggests demand effects not driving main results

Examining the 2006 Cohort

- **Supply shock**: surfeit of ag. projects initiated in 2006
- Estimating the effect of 2006 cohort relative to others
  - If similar, suggests demand effects not driving main results



Land Use Data

- Replace WB project data with ISAM-HYDE land use data
  Meiyappan & Jain 2012
- Measures land use at cell-year level for: 1990, 2000, 2010
- Does an increase in agricultural land cover lead to violence in THP areas relative to other areas?

$$\begin{aligned} y_{iet} &= \gamma_1 THP_e \times AgricultureLandCover_{it} \\ &\quad + \gamma_2 AgricultureLandCover_{it} + \alpha_i + \alpha_{c(i)t} + \eta_{iet} \end{aligned}$$

- Controls: Shrub, Forest, Urban, Barren (and interactions)
- Omitted: Pasture, Savanna, Grassland

Land Coverage Data
(omitted: pasture, savanna, grassland)

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Agriculture Land Cover	0.0055	0.0048	0.0138**	0.0135*
	(0.0035)	(0.0030)	(0.0070)	(0.0070)
Agriculture Land Cover	-0.0035**	-0.0029**	-0.0017	-0.0014
	(0.0014)	(0.0013)	(0.0020)	(0.0020)
Additional Calculations				
Total Agriculture Effect in Median THP Area	-0.0002	-0.0000	0.0066	0.0067
p-value	[0.93]	[1.00]	[0.08]	[0.08]
Dep. Var. Mean	0.0288	0.0209	0.0553	0.0549
Other Land Controls	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,808	8,808	8,808	8,808
Country-Years	1,029	1,029	686	686
Observations	184,968	184,968	123,312	123,312

Jihadist Conflict

Can this mechanism explain extremist-religious violence?

- Among THP groups:
  - 56.5% are Muslim and 27.8% are Christian
- Among non-THP groups:
  - 24.6% are Muslim and 48.4% are Christian

Jihadist Conflict

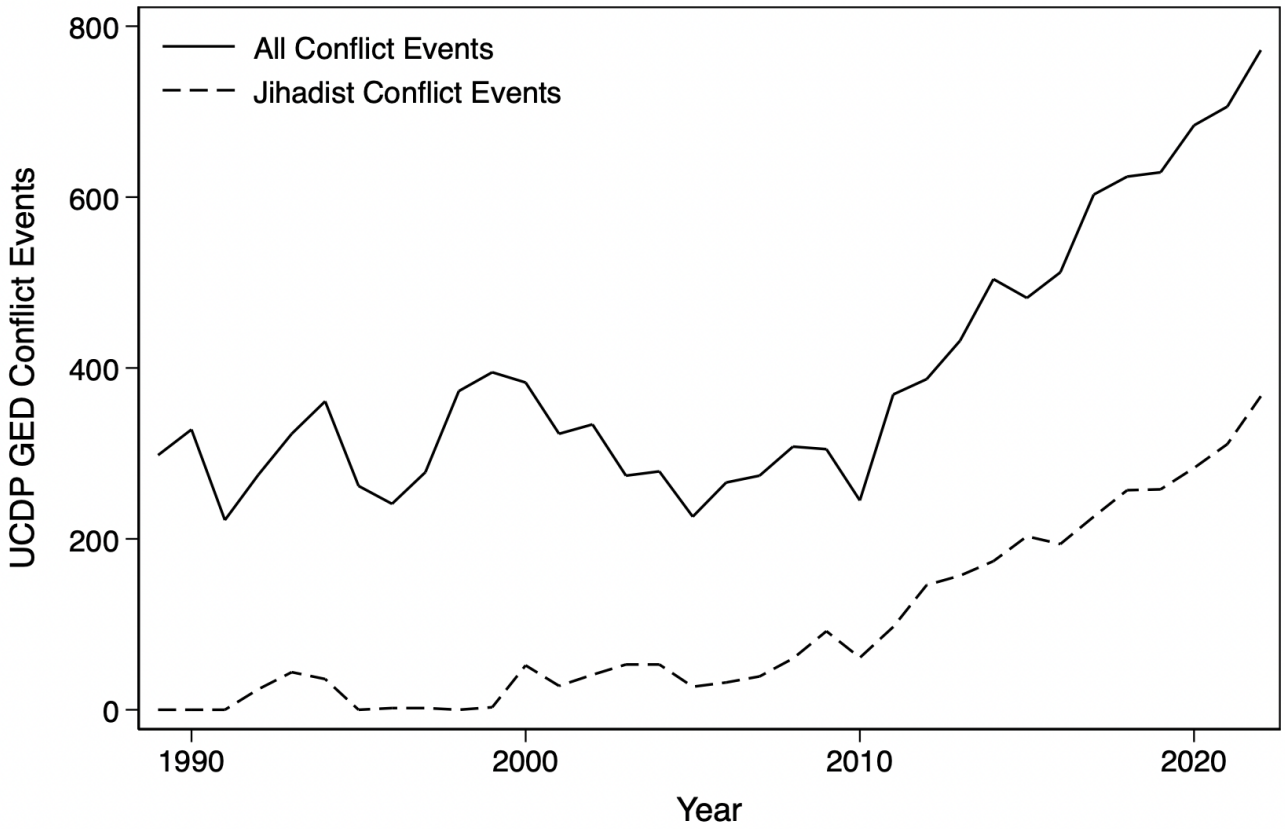


Figure: Total jihadist and non-jihadist conflicts over time in Africa

Jihadist Conflict

	(1) I(Jihadist)	(2) I(Jihadist)	(3) I(Non Jihadist)	(4) I(Non Jihadist)
Transhumant Pastoral × Crop Agriculture Project	0.0246***	0.0184**	0.1022***	0.0814**
	(0.0086)	(0.0092)	(0.0364)	(0.0382)
Crop Agriculture Project	-0.0071**	-0.0068	-0.0055	-0.0172
	(0.0030)	(0.0082)	(0.0062)	(0.0245)
Muslim population % in 2020 × Crop Agriculture Project		0.0034		0.0284
		(0.0104)		(0.0290)
Christian population % in 2020 × Crop Agriculture Project		0.0003		0.0072
		(0.0089)		(0.0337)
Additional Calculations				
Total Crop Ag. Effect in Median THP Area	0.0078	0.0043	0.0563	0.0320
p-value	[0.09]	[0.63]	[0.01]	[0.31]
Dep. Var. Mean	0.0058	0.0060	0.0258	0.0275
All Aid Controls	Yes	Yes	Yes	Yes
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,813	8,028	8,813	8,028
Country-Years	980	980	980	980
Observations	176,260	160,560	176,260	160,560

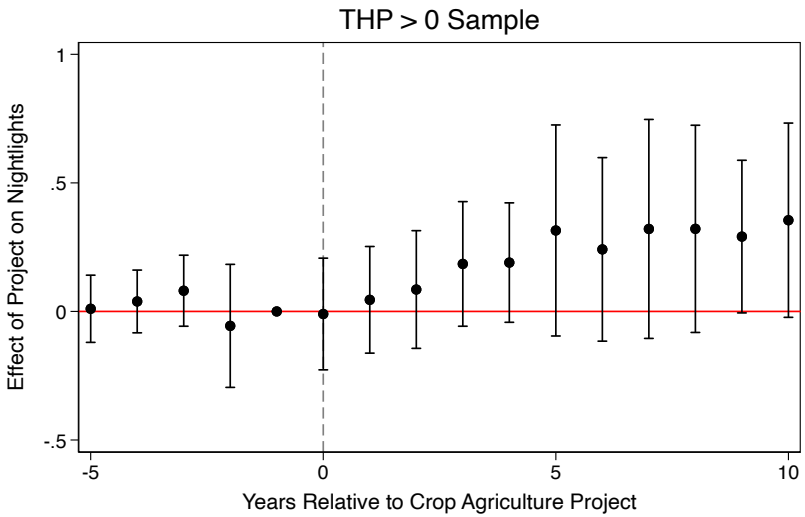
Outline

1. Introduction
2. Economics of Land Use Conversions in Pastoral Africa
3. Data
4. Estimating Effect of Agricultural Projects on Conflict
5. **Development Outcomes**
6. Political Economy
7. Conclusion

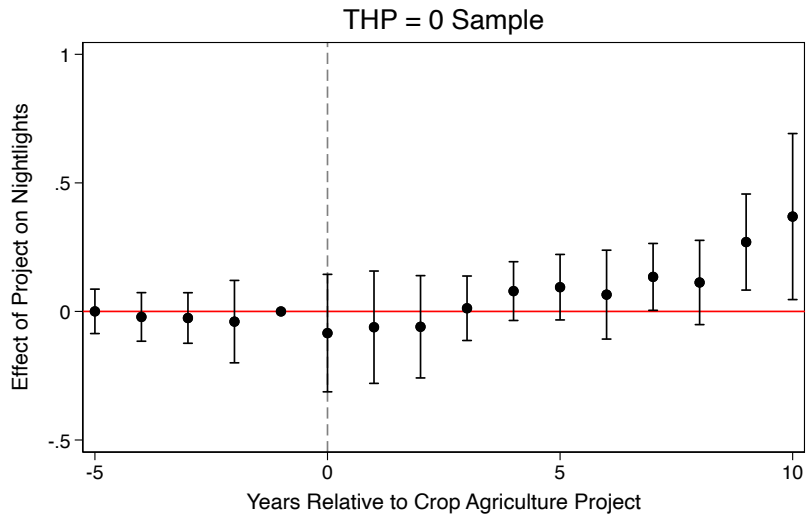
Development Outcomes

	Nightlights: Any		Nightlights: Mean	
	(1)	(2)	(3)	(4)
Transhumant Pastoral × Crop Agriculture Project	0.0071	0.0250	0.3623**	0.3787*
	(0.0332)	(0.0299)	(0.1737)	(0.1972)
Crop Agriculture Project	0.0250***	0.0167*	0.0839*	0.0623
	(0.0091)	(0.0091)	(0.0476)	(0.0524)
Transhumant Pastoral × Animal Production Project		-0.0950*		-0.1451
		(0.0487)		(0.1384)
Animal Production Project		0.0226		0.1173*
		(0.0164)		(0.0643)
Transhumant Pastoral × Non-Agricultural Project		0.0266		0.0928*
		(0.0366)		(0.0553)
Non-Agricultural Project		0.0301***		0.0088
		(0.0076)		(0.0216)
Additional Calculations				
Total Crop Ag. Effect in Median THP Area	0.0294	0.0319	0.3031	0.2914
p-value	[0.14]	[0.07]	[0.01]	[0.03]
THP × Crop Agriculture = THP × Animal Production (p-value)		0.042		0.092
THP × Crop Agriculture = THP × Non-Agricultural Aid (p-value)		0.970		0.194
Dep. Var. Mean	0.3483	0.3483	0.3500	0.3500
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,813	8,813	8,813	8,813
Country-Years	931	931	931	931
Observations	167,447	167,447	167,447	167,447

Development Outcomes



(a) THP Cells



(b) Non-THP Cells

Figure: **Effect of Crop Agriculture Project on Nightlight Luminosity**

Outline

1. Introduction
2. Economics of Land Use Conversions in Pastoral Africa
3. Data
4. Estimating Effect of Agricultural Projects on Conflict
5. Development Outcomes
6. **Political Economy**
7. Conclusion

Political Economy

1. Political power and conflict:
   - What happens to estimates when THP groups have more political power?

2. Political power and projects:
   - What aid projects are developed when THP groups have more political power?

1. Does Political Representation Matter?

- In absence of power-sharing, minority groups in opposition have powerful incentives to fight Mueller & Rohner 2018
- THP groups tend to be in the minority, lack political power
- **Are the effects muted when THP groups have more political power?**

1. Does Political Representation Matter?

- In absence of power-sharing, minority groups in opposition have powerful incentives to fight Mueller & Rohner 2018
- THP groups tend to be in the minority, lack political power
- **Are the effects muted when THP groups have more political power?**
- Link *Ethnic Power Relations* dataset to Murdock ethnic groups
  - *THP Power Share*$_{c,t-1}$ = share of national political power held by pastoral groups in country-year

Heterogeneity by THP Share of Political Power in Year t-1

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project × THP Power Share (t-1)	-0.1830*	-0.1981**	0.0389	0.0363
	(0.1035)	(0.0984)	(0.1704)	(0.1699)
Transhumant Pastoral × Crop Agriculture Project	0.1548***	0.1652***	0.0980*	0.0982*
	(0.0483)	(0.0448)	(0.0560)	(0.0560)
Transhumant Pastoral × THP Power Share (t-1)	-0.2724***	-0.2559**	-0.5037***	-0.5051***
	(0.1052)	(0.1038)	(0.1802)	(0.1798)
Crop Agriculture Project × THP Power Share (t-1)	0.0580	0.0670	0.0286	0.0184
	(0.0575)	(0.0516)	(0.0912)	(0.0901)
Crop Agriculture Project	-0.0173**	-0.0196***	-0.0075	-0.0071
	(0.0084)	(0.0072)	(0.0110)	(0.0110)
Additional Calculations				
THP × Crop Ag. when THP Power at 10th pctile	0.1548	0.1652	0.0980	0.0982
p-value	[0.00]	[0.00]	[0.08]	[0.08]
THP × Crop Ag. when THP Power at 90th pctile	0.0993	0.1052	0.1098	0.1092
p-value	[0.01]	[0.00]	[0.02]	[0.02]
Dep. Var. Mean	0.0310	0.0228	0.0627	0.0624
All Aid Controls	Yes	Yes	Yes	Yes
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	7,927	7,927	7,927	7,927
Country-Years	733	733	662	662
Observations	154,901	154,901	139,530	139,530

Heterogeneity by THP Share of Political Power at Initiation

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project × THP Power at Initiation	-0.2320*	-0.2604**	0.0370	0.0429
	(0.1246)	(0.1169)	(0.1836)	(0.1831)
Transhumant Pastoral × Crop Agriculture Project	0.1729***	0.1857***	0.1230**	0.1212**
	(0.0572)	(0.0531)	(0.0590)	(0.0589)
Crop Agriculture Project × THP Power at Initiation	0.0456	0.0543	-0.1098	-0.1198
	(0.0513)	(0.0448)	(0.0879)	(0.0876)
Crop Agriculture Project	-0.0170**	-0.0186***	0.0035	0.0039
	(0.0078)	(0.0067)	(0.0106)	(0.0106)
Additional Calculations				
THP × Crop Ag. when THP Power at 10th pctile	0.1729	0.1857	0.1230	0.1212
p-value	[0.00]	[0.00]	[0.04]	[0.04]
THP × Crop Ag. when THP Power at 90th pctile	0.1026	0.1068	0.1341	0.1342
p-value	[0.00]	[0.00]	[0.00]	[0.00]
Dep. Var. Mean	0.0312	0.0228	0.0629	0.0626
All Aid Controls	Yes	Yes	Yes	Yes
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	7,927	7,927	7,927	7,927
Country-Years	760	760	684	684
Observations	158,540	158,540	142,686	142,686

2. Political Power and Project Selection

- When / where are crop agriculture projects more likely to be paired with pastoral projects?

	Sample: Crop Agriculture Project = 1					
	New Animal Production Project			New Non-Agriculture Project		
	(1)	(2)	(3)	(4)	(5)	(6)
THP Power Share	-0.0227	-0.0619		0.1274	0.1504	
	(0.0468)	(0.0636)		(0.0830)	(0.0944)	
Transhumant Pastoral × THP Power Share		0.1608**	0.0740*		-0.0944	-0.2488**
		(0.0799)	(0.0409)		(0.1211)	(0.1133)
Dep. Var. Mean	0.0189	0.0189	0.0189	0.0165	0.0165	0.0165
Country FE × Year FE	No	No	Yes	No	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes
Cells	1,210	1,210	1,208	1,210	1,210	1,208
Country-Years	587	587	557	587	587	557
Observations	14,800	14,800	14,770	14,800	14,800	14,770

Outline

1. Introduction
2. Economics of Land Use Conversions in Pastoral Africa
3. Data
4. Estimating Effect of Agricultural Projects on Conflict
5. Development Outcomes
6. Political Economy
7. **Conclusion**

Conclusions

- Agricultural projects in traditionally pastoral areas lead to conflict
  - Contributes to extremist-religious (jihadist) conflict
- Effects are closer to zero when THP groups have political power
  - Partly due to reallocation of pastoral projects
  - Suggests power-sharing conducive to peace
- Projects also contribute to economic development, suggesting winners and losers
- Mismatched projects increases salience of ethnic identity; matched projects increase salience of national identity
- Development "mismatch" and importance of local context

Data: Measuring Transhumant Pastoralism

Variable construction involves three steps:

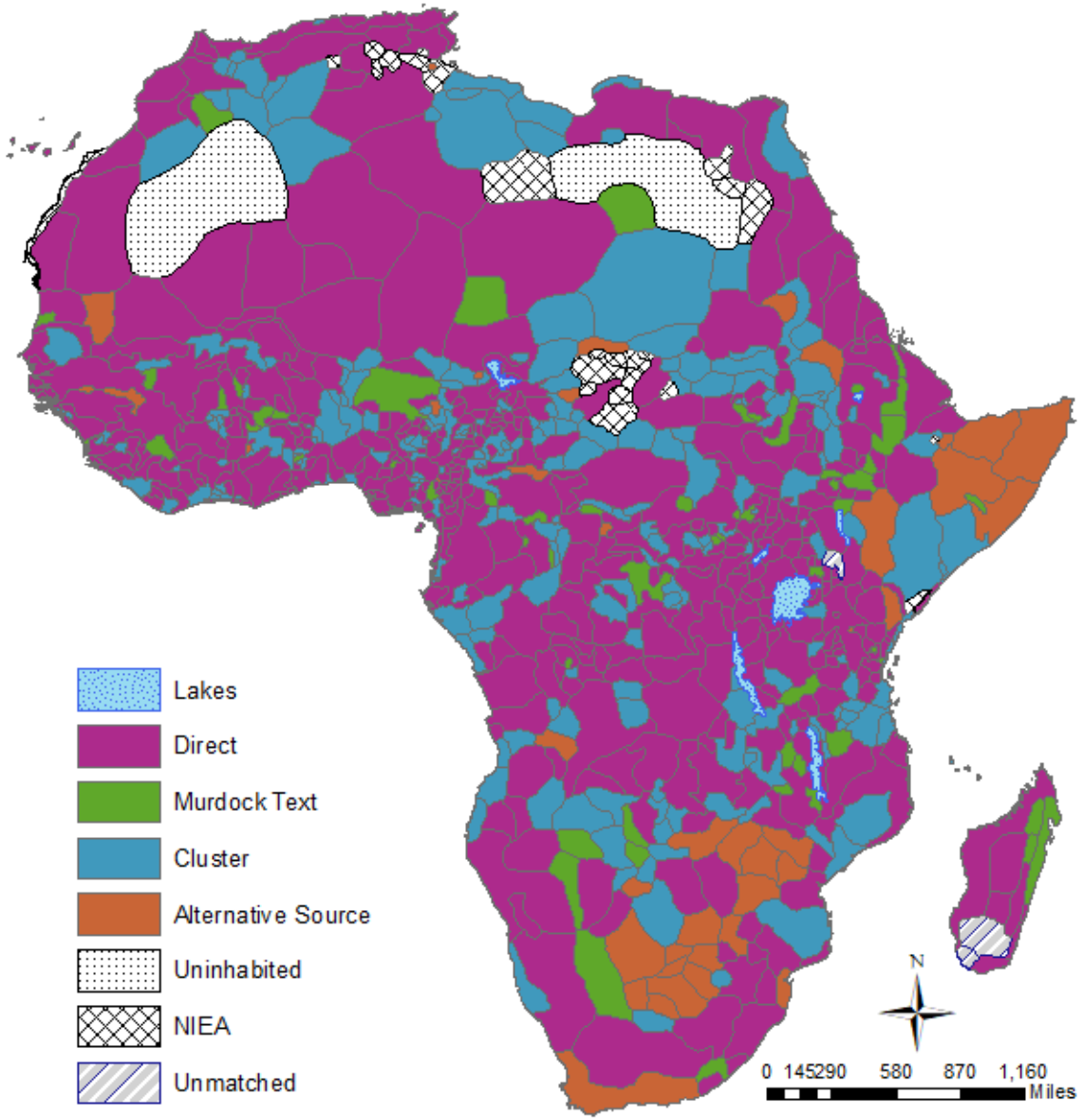
1. Measure 'mobility' using information on pre-colonial mobility of ethnic groups from *Ethnographic Atlas*
   - nomadic or fully migratory
   - semi-nomadic

2. Measure 'pastoralism' using the index of pastoralism (animal-herding intensity) from Becker (2020).
   - Share of subsistence from animals $\times$ primary animal is a herding animal

3. Use the measures of 'mobility' and 'pastoralism' to create a measure of 'transhumant pastoralism':

$$TranshumantPastoralism_e = Mobility_e \times Pastoralism_e$$

Data: Measuring Transhumant Pastoralism



Summary Statistics

	Cell-Year Level Variables					
	Mean	SD	Count	Min	Median	Max
UCDP: I(Any Conflict), 0/1	0.03	0.17	176,260	0.00	0.00	1.00
I(State Conflict), 0/1	0.02	0.15	176,260	0.00	0.00	1.00
I(Nonstate Conflict), 0/1	0.01	0.12	176,260	0.00	0.00	1.00
I(Jihadist Conflict), 0/1	0.01	0.08	176,260	0.00	0.00	1.00
I(Non-Jihadist Conflict), 0/1	0.03	0.16	176,260	0.00	0.00	1.00
ACLED: I(Any Conflict), 0/1	0.07	0.25	158,634	0.00	0.00	1.00
I(State Conflict), 0/1	0.04	0.20	158,634	0.00	0.00	1.00
I(Nonstate Conflict), 0/1	0.06	0.25	158,634	0.00	0.00	1.00
Agricultural Project	0.10	0.29	176,260	0.00	0.00	1.00
Crop Agriculture Project	0.09	0.29	176,260	0.00	0.00	1.00
Animal Production Project	0.02	0.13	176,260	0.00	0.00	1.00
Non-Agricultural Project	0.17	0.37	176,260	0.00	0.00	1.00
Agriculture Land Cover	7.65	13.74	140,928	0.00	1.87	99.03
Forest Land Cover	9.48	23.21	140,928	0.00	0.00	99.89
Barren Land Cover	26.50	41.43	140,928	0.00	0.00	100.00
Urban Land Cover	0.12	0.57	140,928	0.00	0.00	22.39
Grass Land Cover	6.17	14.48	140,928	0.00	0.43	96.05
Pasture Land Cover	29.12	27.93	140,928	0.00	22.27	100.00
Savanna Land Cover	15.54	23.49	140,928	0.00	0.00	99.80
Water Land Cover	1.03	4.98	140,928	0.00	0.00	58.98
Nighttime Luminosity	0.35	1.95	167,447	0.00	0.00	61.26

Summary Statistics

	Ethnic Group Level Variables					
	Mean	SD	Count	Min	Median	Max
Transhumant Pastoralism, 0-1	0.08	0.22	712	0.00	0.00	0.92
EPR: Political Power, 0-5 (Average)	2.12	1.02	413	0.00	2.00	5.00
Muslim population % in 2020	0.29	0.38	663	0.00	0.06	1.00
Christian population % in 2020	0.45	0.35	663	0.00	0.46	1.00
Segmentary Lineage	0.50	0.25	690	0.02	0.48	0.98
EA: Jurisdictional Hierarchy, 0-4	1.29	0.97	685	0.00	1.00	4.00
EA: High Gods, 0/1	0.31	0.46	712	0.00	0.00	1.00

Summary Statistics

Variable	(1) THP > 0	(2) THP $= 0$	(3) Difference
UCDP: I(Any Conflict), 0/1	0.023	0.037	-0.014***
	(0.151)	(0.190)	(0.002)
I(State Conflict), 0/1	0.017	0.027	-0.011***
	(0.128)	(0.162)	(0.002)
I(Nonstate Conflict), 0/1	0.009	0.019	-0.009***
	(0.097)	(0.135)	(0.001)
I(Jihadist Conflict), 0/1	0.006	0.005	0.001
	(0.078)	(0.074)	(0.001)
I(Non-Jihadist Conflict), 0/1	0.017	0.032	-0.015***
	(0.130)	(0.177)	(0.002)
ACLED: I(Any Conflict), 0/1	0.041	0.084	-0.042***
	(0.199)	(0.277)	(0.003)
I(State Conflict), 0/1	0.026	0.053	-0.027***
	(0.160)	(0.224)	(0.002)
I(Nonstate Conflict), 0/1	0.041	0.083	-0.042***
	(0.198)	(0.276)	(0.003)
Agricultural Project	0.034	0.142	-0.108***
	(0.182)	(0.350)	(0.005)
Crop Agriculture Project	0.034	0.141	-0.107***
	(0.182)	(0.348)	(0.005)
Animal Production Project	0.005	0.028	-0.023***
	(0.069)	(0.165)	(0.002)
Non-Agricultural Project	0.053	0.259	-0.206***
	(0.225)	(0.438)	(0.006)
Observations	77,100	99,160	176,260

Summary Statistics

Variable	(1) THP $>$ 0	(2) THP $=$ 0	(3) Difference
Agriculture Land Cover	2.581	11.591	-9.010***
	(6.840)	(16.243)	(0.255)
Forest Land Cover	1.083	16.012	-14.928***
	(6.782)	(28.724)	(0.422)
Barren Land Cover	55.004	4.321	50.683***
	(45.265)	(18.273)	(0.774)
Urban Land Cover	0.053	0.170	-0.117***
	(0.473)	(0.634)	(0.012)
Grass Land Cover	4.254	7.656	-3.402***
	(9.645)	(17.187)	(0.289)
Pasture Land Cover	24.238	32.924	-8.685***
	(30.151)	(25.433)	(0.605)
Savanna Land Cover	5.068	23.693	-18.625***
	(13.777)	(26.107)	(0.432)
Water Land Cover	0.449	1.476	-1.028***
	(3.348)	(5.915)	(0.100)
Nighttime Luminosity	0.148	0.507	-0.360***
	(0.858)	(2.476)	(0.037)
Observations	77,100	99,160	176,260

Summary Statistics

Variable	(1) THP > 0	(2) THP $= 0$	(3) Difference
EPR: Political Power, 0-5 (Average)	1.907	2.179	-0.272**
	(1.196)	(0.958)	(0.118)
Muslim population % in 2020	0.565	0.246	0.319***
	(0.478)	(0.337)	(0.039)
Christian population % in 2020	0.278	0.484	-0.205***
	(0.361)	(0.339)	(0.037)
Segmentary Lineage	0.476	0.509	-0.033
	(0.191)	(0.257)	(0.025)
EA: Jurisdictional Hierarchy, 0-4	1.555	1.240	0.315***
	(0.852)	(0.980)	(0.100)
EA: High Gods, 0/1	0.704	0.227	0.477***
	(0.458)	(0.419)	(0.042)
Observations	125	587	712

Controlling for Ethnic Characteristics in THP Territories

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project	0.1270***	0.1348***	0.1043**	0.0992**
	(0.0399)	(0.0369)	(0.0415)	(0.0407)
Crop Agriculture Project	-0.0093	-0.0105	0.0393*	0.0356*
	(0.0163)	(0.0127)	(0.0205)	(0.0205)
Jurisdictional Hierarchy × Crop Agriculture Project	-0.0061	-0.0061	-0.0221***	-0.0215***
	(0.0059)	(0.0050)	(0.0078)	(0.0077)
Segmentary Lineage × Crop Agriculture Project	-0.0074	-0.0081	-0.0230	-0.0187
	(0.0194)	(0.0156)	(0.0291)	(0.0292)
High Gods: Active, Not Supportive × Crop Agriculture Project	0.0255*	0.0285**	-0.0054	-0.0105
	(0.0154)	(0.0127)	(0.0318)	(0.0317)
High Gods: Active, Supportive × Crop Agriculture Project	0.0270**	0.0263**	0.0158	0.0186
	(0.0123)	(0.0107)	(0.0191)	(0.0190)
Additional Calculations				
Total Crop Ag. Effect in Median THP Area	0.0675	0.0711	0.1024	0.0956
p-value	[0.02]	[0.01]	[0.00]	[0.00]
Dep. Var. Mean	0.0308	0.0215	0.0668	0.0664
THP × Year FE	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	7,943	7,943	7,943	7,943
Country-Years	960	960	864	864
Observations	158,860	158,860	142,974	142,974

Controlling for Ethnicity FE × Country FE × Year FE

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project	0.1010***	0.1104***	0.0536	0.0521
	(0.0309)	(0.0281)	(0.0374)	(0.0374)
Crop Agriculture Project	0.0025	-0.0014	0.0053	0.0047
	(0.0056)	(0.0044)	(0.0074)	(0.0074)
Additional Calculations				
Total Crop Ag. Effect in Median THP Area	0.0636	0.0654	0.0377	0.0362
p-value	[0.00]	[0.00]	[0.10]	[0.11]
Dep. Var. Mean	0.0304	0.0220	0.0635	0.0632
Ethnic Group FE × Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,618	8,618	8,618	8,618
Country-Years	980	980	882	882
Observations	172,360	172,360	155,124	155,124

Controlling for Lagged DVs

	(1) UCDP I(Any)	(2) UCDP I(State)	(3) ACLED I(Any)	(4) ACLED I(Non-State)
Transhumant Pastoral × Crop Agriculture Project	0.1062***	0.1136***	0.0938**	0.0907**
	(0.0309)	(0.0295)	(0.0383)	(0.0375)
Crop Agriculture Project	-0.0113**	-0.0126***	-0.0009	-0.0012
	(0.0054)	(0.0047)	(0.0080)	(0.0080)
L. UCDP I(Any)	0.1669***			
	(0.0123)			
L. UCDP I(State)		0.1522***		
		(0.0140)		
L. ACLED I(Any)			0.1055***	
			(0.0097)	
L. ACLED I(Non-State)				0.1065***
				(0.0098)
Additional Calculations				
Total Crop Ag. Effect in Median THP Area	0.0529	0.0562	0.0558	0.0537
p-value	[0.00]	[0.00]	[0.02]	[0.02]
Dep. Var. Mean	0.0312	0.0225	0.0660	0.0657
THP × Year FE	Yes	Yes	Yes	Yes
All Aid Controls	Yes	Yes	Yes	Yes
Country FE × Year FE	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes
Cells	8,813	8,813	8,813	8,813
Country-Years	980	980	833	833
Observations	176,260	176,260	149,821	149,821

Land Use Data

Variable	(1) 2010	(2) 1990	(3) Difference
Agriculture Land Cover	8.177	6.733	1.444***
	(14.420)	(12.635)	(0.037)
Barren Land Cover	26.477	26.579	-0.103***
	(41.424)	(41.459)	(0.008)
Forest Land Cover	9.304	9.909	-0.605***
	(23.066)	(23.433)	(0.018)
Grass Land Cover	6.296	4.948	1.348***
	(14.380)	(14.000)	(0.051)
Pasture Land Cover	29.217	29.577	-0.360***
	(27.947)	(27.466)	(0.059)
Savanna Land Cover	15.020	16.603	-1.584***
	(23.118)	(24.130)	(0.037)
Shrub Land Cover	4.347	4.539	-0.192***
	(12.252)	(12.415)	(0.013)
Urban Land Cover	0.135	0.084	0.051***
	(0.647)	(0.452)	(0.003)
Water Land Cover	1.027	1.027	-0.000
	(4.984)	(4.984)	(0.000)
Observations	8,813	8,813	317,268

Extremist Conflict

- UCDP conflicts are coded as being a **'jihadist conflict'** if any of the following is satisfied:
  1. The word "jihad–" is present in a participant's name.
  2. The word "jihad–" is present in the title of the source article.
  3. The word "islam–" is present in the title and the conflict involves a participant group that is explicitly jihadist:
     - E.g., Islamic State, Boko Haram, Al-Qaeda in the Islamic Maghreb (AQIM), Movement for Oneness and Jihad in West Africa (MUJAO), Benghazi Revolutionaries Shura Council, Ansar Dine, Ansaroul Islam, Mujahideen, Signed-in-Blood Battalion, Ansar al-Sharia in Libya (ASL), al-Murabitun, Macina Liberation Front (FLM), Jama'at Nasr al-Islam wal Muslimin (JNIM), Ansar al-Sunnah, Derna Protection Force (DPF), and Al-Shabaab.

Measuring Power Held by THP groups I

- Use the Ethnic Power Relations (EPR) Database, which reports the amount of power held by each ethnic group:
  0. Fully excluded from politics (self exclusion or discrimination)
  1. Powerless
  2. Junior partner in government
  3. Senior partner in government
  4. Dominant power
  5. Monopoly power

- Create a 0-5 integer variable that reflects the amount of political power held by group e in country c in year t, $Power_{ect}$

Measuring Power Held by THP groups II

- Total amount of political power in a country held by all ethnic groups: $\sum_e Power_{ect}$
- Power held by transhumant pastoral groups: $\sum_e TranshumantPastoral_e \times Power_{ect}$
- Calculate the share of total power held by transhumant pastoral groups:

$$Power_{ct}^{THP} = \frac{\sum_e TranshumantPastoral_e \times Power_{ect}}{\sum_e Power_{ect}}.$$