Development Mismatch?
Evidence from Agricultural Projects in Pastoral Africa

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ABSTRACT: We study the consequences of a clash between contemporary development initiatives and traditional economic practices in Africa. Crop agriculture has expanded considerably across the continent in recent years. Much of this expansion has occurred in traditionally pastoral areas, where land is typically managed according to customary arrangements. This is believed to be a major cause of conflict between pastoral and agricultural ethnic groups. We test this hypothesis using geocoded data on agricultural development projects across Africa from 1995-2014. We find that implementing agricultural projects in traditionally pastoral areas leads to a two-fold increase in the risk of conflict. We find no equivalent effect for agricultural projects implemented in traditionally agricultural areas, nor for non-agricultural projects implemented in either location. We also find that this mechanism contributes to the spread of extremist-religious conflict in the form of jihadist attacks. Finally, our estimated effects depend on the distribution of political power: when pastoral groups have more power, projects are less likely to incite violence. This is likely due to the effect of political power on project types and locations. Despite these effects on conflict, we find that crop agriculture projects increase nighttime luminosity in both pastoral and agricultural areas. Our results indicate that "development mismatch"–i.e., imposing projects that are misaligned with local populations–can be costly.

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1. Introduction

States and donors typically implement development aid projects in order to reduce poverty and boost economic growth. Many such projects are in the agricultural sector, where investments in crop production are undertaken to increase the supply of food and accelerate structural transformation into the higher-value-added manufacturing and services sectors. In Africa, these agricultural projects often involve preparing marginal lands for commercial crop production, since increases in productivity on the intensive margin are difficult to achieve.

We examine how the impact of these projects critically depends on the subsistence mode of populations residing in a location. If agricultural projects are situated in territories traditionally inhabited by agricultural ethnic groups, then there is consonance between the new investment and the existing way of life, potentially facilitating the adoption of new technologies. However, if agricultural projects are situated in areas that are traditionally used for grazing by transhumant pastoral ethnic groups, then there is dissonance between the new investment and the existing way of life, potentially fueling discord over land-use rights. This "mismatch" has been cited as a major driver of escalating violence in pastoral areas across the African continent in recent decades. In this paper, we empirically test the claim that agricultural development projects aggravate civil conflict in pastoral regions of Africa.

Transhumant pastoralism is a traditional economic practice that emerged 7,000 years ago as a response to rising aridity in northern Africa. In the wet season, herders traverse semi-arid pastoral areas in pursuit of plant biomass (*phytomass*) for grazing. In the dry season, herders migrate to neighboring agricultural areas, where they occupy more fertile farmlands that are left fallow after crops are harvested. The system is understood to be an efficient use of scarce resources in otherwise unproductive regions. It is facilitated by mobility, which permits pastoralists to withstand local weather shocks; flexibility, through customary land use arrangements that update from year to year; and cooperation with neighboring agricultural ethnic groups, who benefit from animals grazing on their farmland in return.

Despite this mutually beneficial arrangement, conflict between herders and farmers—and between herders and the state, which is typically aligned with farmers—is relatively common. According to some accounts, the 'core' actors (comprising the state and its donors) view pastoralism as "backward" (Catley, Scoones and Lind, 2013), "archaic" (Mattee and Shem, 2006) and "primitive" (Fratkin, Roth and Nathan, 2004). The imperative from this perspective is to sedentarize pastoral communities by expanding commercial crop agriculture into pastoral areas, modernizing production and fostering prosperity and peace.

The counterargument from the perspective of the 'periphery' (pastoralists) is that (i) transhumant pastoralism is an efficient use of dryland resources compared to alternatives (Campbell, Leslie, Little, Brainard and DeLuca, 1999, Fratkin et al., 2004, Behnke and Kerven, 2013); (ii) agricultural expansion projects often block access to critical dry-season water points and grazing areas; and (iii) there is a history of failed government-led irrigation projects in pastoral territories. These projects are thus enacted either because the government overestimates the benefits, underestimates the opportunity costs (i.e., forgone output from transhumant pastoralism), or nevertheless aims to replace pastoralism with crop agriculture because it is less costly to tax sedentary economic activities, even if they are less productive (Catley et al., 2013). From the perspective of pastoralists, the imperative is to resist the forced settlement—or even displacement—that accompanies such projects.

Whether or not agricultural development projects ultimately lead to violence in pastoral territories is an empirical question. On the one hand, these projects may create a surplus, the benefits of which could compensate affected pastoral groups and thus ensure peace. On the other hand, case study accounts indicate that, due to their informal land management system, pastoralists are easily expropriated "in the national interest" (Zambakari, 2017). Since they are usually on the margins of national political power, they may resort to violence against the state if they are evicted.

We take this question to the data. We assemble a panel dataset at the level of a 0.5 degree cell (around 55km $\times$ 55km at the equator) covering the African continent. We combine three main sources of data. First, we use geocoded conflict event data from UCDP (covering the period from 1989–2020) and ACLED (1997–2020) to create measures of conflict incidence that are equal to one if there is any conflict observed in a cell-year and 0 if there is none.[1] Second, we use geocoded World Bank development project data from Aid Data to create a cell-year level indictor for the presence of at least one development project. This data covers the period from 1995–2014. Third, we use ethnographic information on the traditional territories of transhumant pastoral ethnic groups to create an ethnic-territory-level measure of transhumant pastoralism (THP) (Murdock, 1959, 1967, McGuirk and Nunn, 2020). We take advantage of the sector labels in the World Bank data and ask if projects that are agricultural have a differential effect on the incidence of conflict in THP territories relative to non-THP territories. We estimate difference-in-differences (DD) style parameters in regressions that control for cell fixed effects and for country-by-year fixed effects.

We first find that, in non-THP territories, cells that receive an agricultural project experience a modest reduction in conflict (-1.7 p.p., $p<0.01$) compared to other cells. This result holds using the UCDP conflict data, which captures large-scale events, but not the ACLED data, which also includes smaller-scale events. However, we see a very large and significant difference (+9.7 p.p., $p<0.01$) when we allow the estimates to vary by the THP index. This estimate captures the difference between the DD estimates in THP and non-THP territories. It thus allows for cell-level sources of selection bias that vary over time but are common across both types of territories. The estimate is similar for both UCDP and ACLED outcomes.

We then allow the agricultural development projects to vary by subtype, distinguishing between crop agriculture projects, of which there are 4,186, and pastoral projects, which are rare in comparison (650). The hypothesis implies that the THP difference ought to be driven by crop agriculture projects, which are mismatched, and not pastoral projects, which are not. We see precisely this pattern. For crop agriculture projects, the THP difference is +13 p.p. ($p<0.01$), while for pastoral projects it varies between -13.4 p.p. ($p<0.01$) for UCDP and -0.05 p.p. ($p>0.10$) for ACLED. Since pastoral projects tend to be bundled with crop agriculture projects, this estimate

[1] See Sundberg and Melander (2013) and Raleigh, Linke, Hegre and Karlsen (2010)

effectively implies that the main mismatch effect in THP territories is either partially or entirely offset when the state also includes pastoral development projects.

Finally, we also allow non-agricultural projects to enter the estimating equation as a placebo treatment. These comprise around 74% of all projects, and include initiatives on infrastructure, energy, health, education, and many other sectors. We find that these projects have no differential effect on conflict in THP territories. Moreover, we show that the THP difference for crop agriculture is itself significantly different to the equivalent effect for non-agricultural projects. This amounts to a difference in triple difference comparison. It allows for cell-level selection bias that varies over time and is specific to THP areas, but common across crop agriculture and non-agriculture project types.

While the various differencing procedures account for most obvious concerns over selection bias that one would typically consider in this type of application, we proceed with three additional exercises in order to probe the robustness of our main findings. First, we plot event study estimates that show parallel trends prior to treatment and a sharp divergence thereafter. Second, we exploit a natural experiment based on a 'supply shock' of agricultural development projects funded by the World Bank: an unusual surfeit of projects that were launched around the time the Bank produced its 'World Development Report' on agriculture in 2008. Using this variation, we find results consistent with our main multi-way differencing estimates. Finally, we substitute data on World Bank agriculture projects for satellite data on land use. We find that, consistent with our main estimates, the expansion of agriculture in traditionally THP territories was followed by an increase in violent conflict relative to the same expansion in non-THP territories.

Having established the connection between agricultural development projects and civil conflict in pastoral areas, we then explore implications of these findings that are relevant for policy. First, we examine the growing presence of religious-extremist conflict—specifically jihadist conflict—in Africa. Since there are twice as many Muslims as Christians in THP groups, and again twice as many Christians as Muslims in agricultural groups, it is plausible that the effects we identify have a religious dimension. For example, jihadist groups may be able to exploit disaffected young pastoral men who are displaced as a result of agricultural expansion in pastoral areas. In this case, jihadist groups may provide resources (including weapons) in exchange for membership, resulting in conflict events that are categorized as jihadist.[2] We test for this using information reported in the UCDP conflict data that allows us to categorize conflict events into those involving well-known jihadist groups and those that do not. The (scaled) estimates are very similar for both types of conflict, which indicates that jihadist conflict responds to agricultural expansion in a similar way to non-jihadist conflict, implying that extremism is, in part, a response to government policy.

Next, we examine the role of political power in moderating our estimated effects. Using data from the Ethnic Power Relations dataset, we measure the share of political power that is held by pastoral groups in national government in each country and year. We then allow our main interaction of interest (i.e., THP $\times$ crop agricultural project) to vary by this measure. We find that

[2]For an account on how jihadists exploit farmer-herder tensions, see The Economist, "Fanatics and putschists are creating failed states in west Africa," August 1st, 2023.

political power plays a significant role: when pastoral groups are excluded from power, the THP difference is 17 percentage points; when pastoral groups are at the 90th percentile of political power, the difference is 10 percentage points. We find that the role of political power at the time a project is initiated is particularly important. While correlational only, these findings provide suggestive evidence that political power sharing is conducive to peace.

We then provide evidence for one mechanism explaining the role of political power. We find that, when pastoral groups have more political power, crop agriculture projects are more likely to paired with animal production projects in pastoral territories. This appears to come at the expense of non-agricultural projects. Since animal production projects offset the effects of crop agriculture projects on conflict, this finding uncovers one channel through which pastoral political power suppresses conflict in pastoral areas.

Finally, while crop agriculture projects lead to conflict in pastoral areas only, they contribute to an increase in nighttime light emissions in both agricultural and pastoral areas. This finding suggests that mismatched projects lead to contrasting development outcomes for different population subgroups.

This paper builds on a multidisciplinary case study literature on land-use tensions and pastoralism in Africa (e.g., see Catley et al., 2013), as well as an established ethnographic literature on the nature of transhumance in Africa (Lewis, 1961, Jacobs, 1965, Konczacki, 1978, Dyson-Hudson and Dyson-Hudson, 1980). In so doing, our paper contributes to a thin but growing economics literature on animal husbandry in Africa, which tends to focus on poverty and risk management within pastoralist groups (Little, Smith, Cellarius, Coppock and Barrett, 2001, McPeak and Barrett, 2001). We continue in the spirit of McGuirk and Nunn (2020), which focuses on relations between pastoral and other groups. In that paper, the symbiotic relationship between neighboring farmers and herders is undermined by drought in transhumant pastoral territories, which forces herders to migrate to nearby farmland before the harvest, generating conflict over resources. The present paper indicates that conflict between these groups is not only sparked by environmental shocks; government policies that constrain pastoral activities are additionally contributing to violence in pastoral neighborhoods of Africa.

Other papers focus on the behavioral consequences of ancestral pastoralism in contemporary populations. Nazarova (2020) and Le Rossignol and Lowes (2022) show respectively that individuals from pastoral backgrounds are today more risk tolerant and have a more likely to exhibit altruism towards in-group members than out-group members. Cao, Enke, Falk, Giuliano and Nunn (2021) further show that contemporary linguistic groups that descend from pastoral societies exhibit "culture of honor" traits, such as revenge-taking and violence. These characteristics are understood to complement the traditional pastoral way of life, which could absorb idiosyncratic shocks and which rewarded in-group cohesion and out-group aggression. Relatedly, Becker (2019) finds that women from pastoral backgrounds face restrictive gender norms, a trait that is linked to seasonal male absence in traditional pastoral societies.

Rather than focusing on the origins of these fixed characteristics, we instead shed light on political economy decisions that raise the risk of conflict between pastoral and non-pastoral groups, including the state. In this respect, we contribute to a rich literature that aims to understand when and where inter-group divisions become more salient (Posner, 2004, Eifert, Miguel and Posner, 2010, Hjort, 2014, Yanagizawa-Drott, 2014, Depetris-Chauvin, Durante and Campante, 2020, Mousa, 2020, Berge, Bjorvatn, Galle, Miguel, Posner, Tungodden and Zhang, 2020, Lowe, 2021), and eventually spark conflict (Montalvo and Reynal-Querol, 2005, Esteban, Mayoral and Ray, 2012, Rohner, Thoenig and Zilibotti, 2013, Michalopoulos and Papaioannou, 2016, Berman, Couttenier, Rohner and Thoenig, 2017, McGuirk and Burke, 2020, Moscona, Nunn and Robinson, 2020, Arbatli, Ashraf, Galor and Klemp, 2020, Eberle, Rohner and Thoenig, 2020).

2. Background

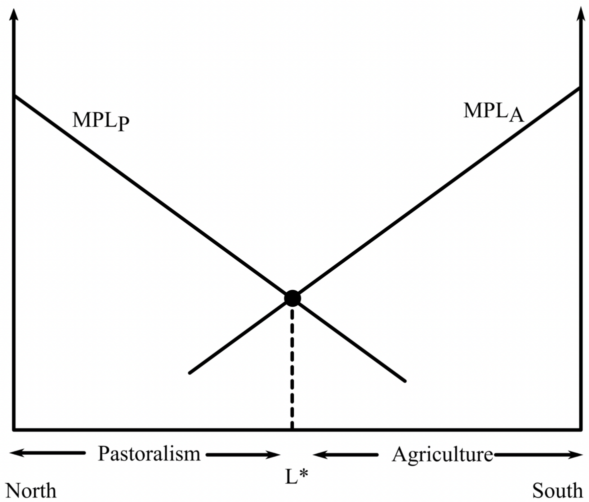
In this section, we first outline the rationale for converting land use from pastoralism to agriculture from the perspective of the 'core' actors, defined as the state and its donors. We discuss the conditions under which these conversions ought to avoid conflict with pastoral groups. We then contrast this framework with on-the-ground accounts of agricultural development projects in pastoral areas of Africa.

A. The Economic Logic of Land Use Conversions

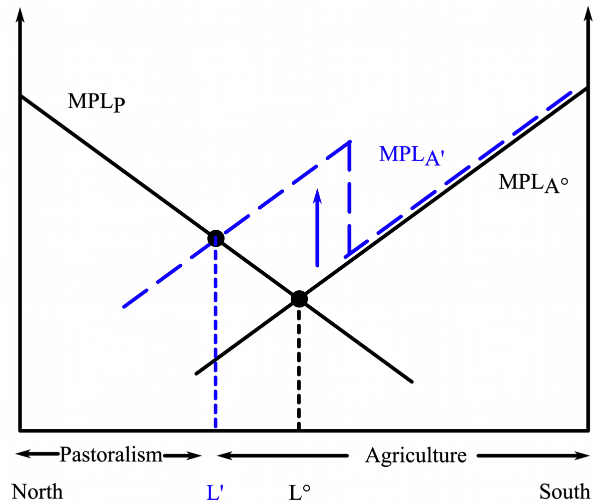
Consider a state containing a continuum of land from North to South (Figure 1a). In the North, pastoralism is more productive; in the South, agriculture is more productive. The marginal product of labor for each activity along the land continuum is denoted by MPL_P and MPL_A respectively. The point at which these curves intersect, L^*, defines the efficient border between each land use type. That is, the allocation of land that maximizes aggregate output.

Suppose the state wishes to increase crop output by investing in an agricultural capital project. Since raising yields on the intensive margin is notoriously difficult to achieve in Africa, we assume that the returns to agricultural investment are relatively low in areas closest to the South. Thus, the most profitable project is one that prepares marginal land for commercial crop production via, e.g., a large-scale irrigation project.

We illustrate the comparative statics in Figure 1b. The development project increases the productivity of agriculture in marginal areas, as represented by the shift from the old MPL_{A^o} to the new $\text{MPL}_{A'}$. As a result, the efficient border shifts from L^o to $L^{'}$, implying that the land segment $|L^o - L^{'}|$ is optimally converted from pastoralism to agriculture. This conversion ensures that aggregate output is maximized and is greater than initial output in part (a).



(a) Initial land use distribution



(b) Land use distribution after local investment in agricultural productivity

Figure 1: **Economics of Land Use Conversions.**

B. Transhumant Pastoralism, Land Use Conversions and Conflict

Since the new equilibrium at $L^{'}$ is more efficient, there is no obvious reason why conflict should emerge between pastoralists and the state and/or agriculturalists. The additional surplus could be allocated in such a way that all groups are better off. For example, pastoralists could exit the marginal area in exchange for transfers generated from the additional output. Alternatively, they could remain in the area with a view to adopting new technologies and converting their livelihoods to agriculture. Either of these arrangements could ensure a Pareto improvement, rather than a zero-sum redistribution.

Whether a Coasian solution occurs in reality is the subject of an extensive case study literature. While in theory there exist conditions under which conflict is avoided, in practice there are several examples of violent conflict emerging in the wake of agricultural development projects in pastoral areas. The typical path is summarized concisely by Zambakari (2017, pp. 200–203), for the case of Sudan. He argues that, first, transhumant pastoralists are vulnerable to expropriation, since they traditionally rely on communal land use without resorting to formal titling. In such customary regimes, common pasture land is "vulnerable to expropriation [. . .] in the 'national interest."' Second, the preparation of land for commercial crop agriculture is indeed followed by the eviction of transhumant pastoral communities. And, third, these evicted communities have resorted to violence in dealing with the state, since they are typically on the margins of political power: "[t]he displacement caused by mechanized farming remains a major source of grievance and conflict."

This experience is echoed in other parts of the continent, including the Awash Valley project in Ethiopia (Getachew, 2001, Behnke and Kerven, 2013), the Tana River Delta in Kenya (Umar, 1997, Nunow, 2013) and dryland areas of northern Ghana (Soeters, Weesie and Zoomers, 2017, FAO, 2018). Some episodes receive attention in international media outlets, such as in the Omo valley in

Ethiopia, where the 30,000 hectare Koka plantation precipitated violence between displaced Suri pastoralists and Dizi agriculturalists, who were perceived by the Suri to be collaborating with the government. The first episode of violence involved the murder of three Dizi police officers, who were marking land for expansions of the plantation. In retaliation, government forces reportedly killed 54 Suri civilians in a marketplace.[3]

Since conflict is extraordinarily costly, these accounts raise the question of why states and their donors persist with such projects. Catley et al. (2013) summarize three potential explanations. The first is that states overestimate the benefits. Agricultural projects require costly maintenance and new farmers require detailed knowledge of input and output markets. In practice, these conditions may not hold, especially in semi-arid areas.

The second is that states underestimate (or underweight) the opportunity costs, i.e., forgone production from displaced pastoral activities. Pastoralists are apparently viewed by the core actors to be "at once baffling, unruly, threatening and backward," and in need of civilizing. This stems from the belief that transhumant pastoralism is unproductive relative to other subsistence modes. For example, in his 2005 inaugural speech to parliament, Tanzanian President Jakaya Kikwete argued that mobile herders ought to modernize production and become sedentary (Mattee and Shem, 2006). In 2006, he maintained that, "we have to do away with archaic ways of livestock farming." Contrasting this perception is ample evidence that transhumant pastoralism is a comparatively efficient use of scarce resources in harsh environments, namely drylands, mountainous areas, and tundra (Schlee, 2013). Behnke and Kerven (2013) compare output from transhumant pastoralism and irrigated agriculture in the Awash valley in Ethiopia, finding that cotton and sugar cane production generally yield less per hectare than leaving the land to the Afar pastoralists who were displaced by the project. Relatedly, Campbell et al. (1999) find that pastoral Turkana are healthier than recently sedentarized Turkana, while Fratkin et al. (2004) observe similar differences amongst pastoral and sedentarized Rendille in northern Kenya. These patterns are consistent with pastoral resistance toward efforts to sedentarize through large-scale agricultural development projects.

The third explanation does not assume an information deficit on the part of the state. Since transhumant pastoralists are mobile, their economic activities are difficult to monitor, and hence they are rarely taxed. Thus, even if transhumant pastoralism is more productive than irrigated agriculture, its output is less accessible to the state. If we replace the assumption that states maximize aggregate output with the assumption that they instead maximize taxable output, à la Scott (1998, 2009), then converting land use from pastoralism to agriculture is potentially rational, even if it results in a loss of welfare for incumbent pastoral groups.

These explanations provide some insight into why states might persist with land use conversions in pastoral areas, even if they carry a risk of violent resistance. They do not, however, provide necessary conditions for conflict. In this sense, it is plausible that agricultural projects

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[3]See "'Nightmare' for Ethiopian pastoralists as foreign investors buy up land," published in The Guardian newspaper on Nov 10th, 2014 and available at the following URL: `https://www.theguardian.com/global-development/2014/nov/10/ethiopia-pastoralists-foreign-investors-land`; as well as "Ethiopia dam project is devastating the lives of remote indigenous groups," published in The Guardian on Feb 6th, 2013 and available at: `https://www.theguardian.com/global-development/2013/feb/07/ethiopian-dam-project-devastating-remote-tribes`.

do not cause conflict at all. It may be the case that the on-the-ground accounts are not broadly representative. It may also be the case that they reflect spurious correlation—mixed use areas might be prone to conflict independent of these projects; or, states may allocate projects to areas where the risk of conflict is increasing for other reasons. Thus, through omitted variable bias or through selection bias, we might observe an association between agricultural development projects and conflict that is not causal.

We proceed to the empirical analysis in this spirit. We aim to test the hypothesis that agricultural development projects lead to an increased risk of conflict when they are assigned to traditionally pastoral areas.

3. Data

Structure We assemble a panel dataset at the level of a 0.5 degree cell and year, covering the continent of Africa. There are 10,229 cells. We overlay the gridded dataset with a map of pre-colonial ethnic societies from Murdock (1959). Excluding uninhabited territories and lakes, we are left with 9,691 cells. We denote cells by i and ethnic territories by e. Cells are nested in ethnic territories according to the location of their centroids.

Conflict Our main outcome variable is an indicator for conflict incidence. It is equal to one if there is at least one violent conflict event in a cell-year and zero otherwise. An event can be a two-sided battle between armed groups or it can be a one-sided attack on civilians. We use two sources of geocoded conflict event data: the Uppsala Conflict Data Program (UCDP), which begins coverage in 1989, and the Armed Conflict Location and Event Data project (ACLED), which begins coverage in 1997.

To be included in the UCDP data, events must result in at least one fatality and they must involve a dyad that generated 25 fatalities in at least one year in the data series. There is no fatality minimum for inclusion in the ACLED data. In this respect, the UCDP data can be considered a measure of larger-scale violent events between major civil conflict actors.

Owing primarily to its longer coverage, we proceed using UCDP conflict incidence as the main outcome variable. We also show estimates using the ACLED outcome in each regression table. In addition to the main conflict incidence variables, we additionally use sub-categories for conflict involving the state, for which we prefer the UCDP data, and conflict not involving the state, for which we prefer ACLED data since it has fewer inclusion criteria and is thus better positioned to capture smaller-scale communal events.

World Bank Development Projects To measure development projects, we rely on richly detailed, geocoded data on projects funded by the World Bank from 1995–2014. The dataset is assembled and organized by the AidData research lab (AidData, 2020). Each observation in the data is for a specific project site. There are 16,591 project sites in Africa. We define agricultural projects as those for which "agriculture" is listed as one of the sector categories in the AidData dataset. These comprise 26% of project sites. We define non-agricultural projects as the rest (74%).

Within agricultural projects, we further distinguish between two sub-categories: crop agriculture projects, which comprise 25% of all project sites, and "animal production" (i.e., pastoral) projects, which comprise 4%. These sum to more than 26% because most animal production projects are bundled with crop agriculture projects.

To measure the appropriate treatment year for each project, we aim to identify the earliest date possible of the project life cycle. This is in order to capture incidents such as the one that began the Suri-Dizi conflict mentioned above, where Dizi police officers were killed for marking potential expansions of a plantation. In the World Bank data, this corresponds to the *initiation* date, which is when a project is assigned a unique ID number internally for record keeping. While the initiation date is not provided in the AidData dataset, we do observe the ID number, which is assigned chronologically, and the *transaction* date, which is later in the project life cycle (Kilby, 2013). To estimate the initiation date for each project, we first identify the projects with the shortest life cycle, i.e., the shortest gap between the initiation date and the transaction date. These are the projects with the highest ID numbers in a given period of transactions, e.g., per month. Using this sample, we estimate the transaction date as a linear function of the ID number. Using estimates from that regression, we predict the initiation date for all projects in the dataset using their ID number. The process yields an estimated initiation year that is 1.9 years earlier on average than the transaction year provided in the dataset. We proceed using this initiation year to measure our treatment timing. We also check our main results using the given transaction date instead.

Transhumant Pastoralism We measure transhumant pastoralism as in McGuirk and Nunn (2020). It is an index between 0 and 1 measuring an ethnic society's reliance on mobile animal husbandry, as documented in the *Ethnographic Atlas* (Murdock, 1967).

Other data We introduce other variables as they appear in the paper.

4. Estimation

Our main empirical strategy is to estimate the effect of agricultural development projects on conflict incidence using the following specification:

$$\begin{aligned} y_{it} \quad = \quad & \beta_1 THP_{e(i)} \times AgricultureProject_{it} + \beta_2 AgricultureProject_{it} \\ & + \lambda_t THP_{e(i)} + \alpha_i + \alpha_{c(i)t} + \eta_{it}, \end{aligned} \tag{1}$$

where y_{it} is the conflict incidence indicator for cell i and year t; $THP_{e(i)}$ is the index of transhumant pastoralism for the territory e in which cell i is nested; and $AgricultureProject_{it}$ is an indicator equal to one if an agricultural development project has been initiated in cell i by year t. Since this is an absorbing treatment—i.e., it switches from 0 to 1 but not from 1 to 0—we control for year fixed effects interacted with the transhumant pastoral index, $\lambda_t THP_{e(i)}$. This captures all shocks and trends that are common to THP areas. We additionally control for cell fixed effects α_i and country-by-year fixed effects $\alpha_{c(i)t}$. We cluster standard errors by cell, to allow for serial correlation within cells, and by country-year, to allow for spatial correlation across cells within countries.

The parameter β_2 captures the average difference-in-differences (DD) effect of agricultural projects in non-THP areas, as estimated by two-way fixed effects regression. Our parameter of interest, β_1, captures the additional effect of these projects in THP areas relative to non-THP areas. With the inclusion of cell fixed effects, both parameters allow for time invariant sources of omitted variable bias, such as a cell's proclivity to observe conflict due to geographical or historical factors. With the inclusion of country-by-year fixed effects, both also allow for time-varying sources of endogeneity at the level of a country, such as changes to national political institutions or other macroeconomic factors. Importantly, β_1 additionally allows for time-varying sources of selection bias at the level of a cell that are common to projects in both THP and non-THP territories. For example, if a state assigns agricultural projects to cells in which they perceive the risk of conflict to be changing. In this respect, it resembles a triple difference in spirit, which requires weaker assumptions than the standard DD estimator.

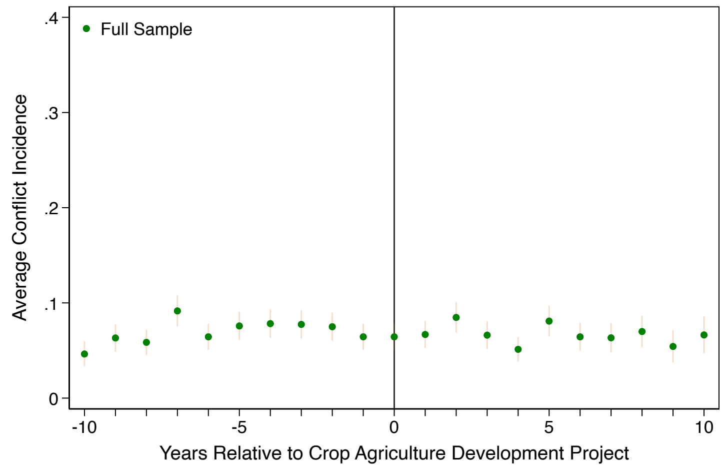
Our analysis proceeds in five steps. We begin by presenting event-study-style plots using raw data. Our objective is to compare mean conflict incidence by cell in years before and after the initiation of an agricultural project, in both THP and non-THP territories. Second, we present estimates based on our main fixed effects regression equation above. These are the main findings of the paper. Third, we present event study plots based on those regressions. This allows us to track the evolution of treatment effects over time. We also present estimates using the procedure in Callaway and Sant'Anna (2021), which corrects for bias due treatment effect heterogeneity. Fourth, we exploit variation generated from an unusual surfeit of World Bank agricultural projects that were supplied from 2006-2008 and coincided with the publication of the World Development Report on agriculture. This provides an alternate means of estimating our relationship of interest. Fifth, we dispense with the World Bank data altogether and instead use data on agricultural land use as measured from satellite imagery.

A. Raw Data Differencing

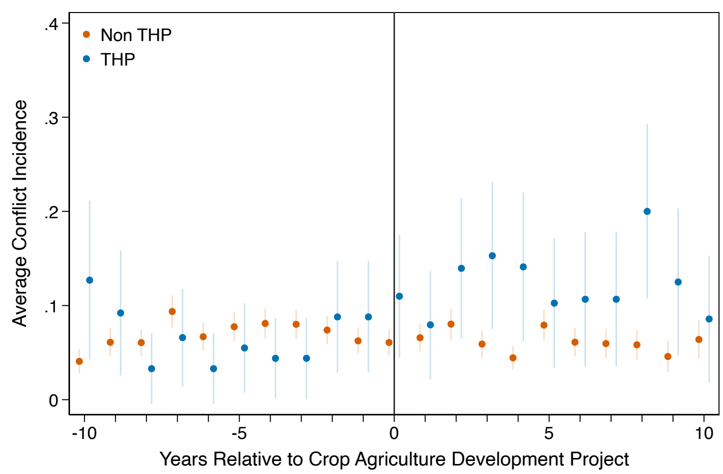
In Figure 2a, we present mean conflict incidence at the level of a cell relative to the year in which a crop agriculture project is initiated. This sample contains only cells that ever receive a project. We see no obvious change in conflict after a project is initiated, although there appears to be slightly more variance.

In Figure 2b, we split the sample between THP and non-THP cells. Here, a sharp divergence appears in THP cells once a project is initiated. Conflict after the project is markedly higher. By contrast, no such divergence appears for the non-THP cells.

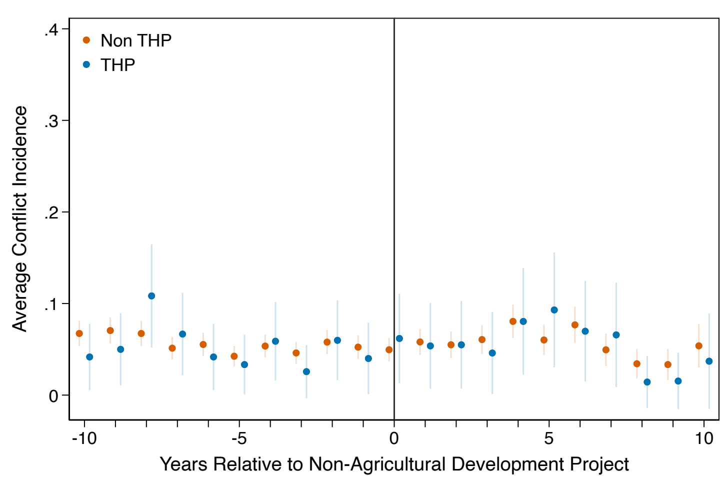
In Figure 2c, we replace the crop agriculture project variable with the non-agricultural project variable. This measures projects on, for example, education, health, energy, infrastructure and governance. We consider this as a placebo treatment variable, since it includes many characteristics of the treatment variable—including contact with the state and other providers of public services—without changes in land use toward agriculture. Here, we see no divergence after a project is initiated.



(a) Mean UCDP Conflict Incidence and Temporal Proximity to Crop Agriculture Project: Full Sample



(b) Mean UCDP Conflict Incidence and Temporal Proximity to Crop Agriculture Project: THP and Non-THP Territories



(c) Mean UCDP Conflict Incidence and Temporal Proximity to Non-Agricultural Project: THP and Non-THP Territories

Figure 2: **Raw Data Differences**

Table 1: Differential Effect of Agricultural Aid on Conflict in THP vs. Other 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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

B. Multi-Way Differencing with Fixed Effects

In Table 1 we present estimates from our main specification. Focusing on column (1), where the outcome variable is UCDP conflict incidence, we estimate a coefficient of -0.0165 ($p<0.01$) for β_2. This estimate implies that, in non-THP areas, conflict incidence falls by around 53% of the sample mean in cells where an agricultural project is initiated relative to other non-THP cells. This is consistent with a large literature documenting how productivity shocks in labor-intensive sectors tend to lower the risk of conflict (Dal Bo and Dal Bo, 2011, Dube and Vargas, 2013, McGuirk and Burke, 2020).

By contrast, the estimate for β_1 is 0.097 ($p<0.01$), more than three times the sample mean. This indicates the differential effect in THP areas relative to non-THP areas. It allows for time-varying sources of selection bias that are common between THP and non-THP areas. In the middle panel of the table, we calculate the total effect of an agricultural project in the typical THP area, which we define as the median THP index value conditional on being greater than zero. In these cells, a project is predicted to increase the risk of conflict by 4.2 p.p, or 135% of the sample mean.[4]

We see similar patterns for UCDP conflict involving the state (column 2) and for all ACLED measures, including conflict not involving the state (column 6). We do not estimate a significant effect for UCDP non-state conflict. We proceed presenting only the main UCDP and ACLED conflict outcomes, together with state-involved conflict as measured by UCDP and non-state conflict as measured by ACLED.

[4]The calculation is: $(0.0968 \times 0.605) - 0.0165 = 0.042$.

Table 2: 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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 3: 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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

In Table 2, we separate the $AgricultureProject_{it}$ variable into the crop agriculture component and the animal production (i.e., pastoral) component. The theoretical expectation is straightforward: if conflict is due to land use conversions from pastoralism to agriculture, then the estimate for β_2 ought to be driven entirely by crop agriculture projects and not animal production projects. This is precisely what we see. Focusing again on column (1), the THP difference for crop agriculture is + 12.9 p.p. ($p<0.01$). Interestingly, the THP difference for animal production is -13.4 p.p ($p<0.01$). The difference is significant for UCDP outcomes, but not for ACLED outcomes.

Since animal production projects are bundled with crop agriculture in pastoral areas, we compute the combined THP difference in the first row of the middle panel. It is not significantly different to zero in any of the four columns. This implies that, when crop agriculture projects in pastoral territories are paired with animal production projects, there is no additional effect on conflict relative to non-THP areas. In effect, pastoral development projects entirely offset the deleterious effect of agricultural projects in pastoral territories.

Finally, we present our most complete specification in Table 3. This includes an indicator for non-agricultural projects and the corresponding THP interaction. This serves three important purposes. First, these are important control variables, since World Bank projects of different types may be correlated across space and time. Second, the THP interaction allows us to check whether THP cells respond differently to aid of any type relative to non-THP cells. It may be the case that contact with the state due to other development project types may also spark conflict in THP areas. Third, the THP interaction serves as a placebo treatment. By comparing the THP interactions for crop agriculture versus non-agriculture projects, we can determine statistically whether or not the specific nature of the project—i.e., crop agriculture—significantly affects conflict holding constant other characteristics common to aid projects in general. This comparison allows for time-varying selection bias at the level of a cell that is specific to THP areas but common across aid types. Thus, it is a very different identifying assumption to the one we make in estimating β_2 in equation 1 (Tables 1 and 2).

The results reinforce our findings. First, our main estimates of interest remain large and significant. The total effect of a crop agriculture project in the median THP territory ranges from 6.3 p.p. to 6.4 p.p. across the two main specifications (columns 1 and 3). The effect is more than twice the sample average for UCDP all conflict incidence (205%), almost three times the sample average for UCDP state conflict (295%), and around equal to the mean for ACLED all conflict and non-state conflict (96% and 94% respectively). Second, we note that none of the THP interactions for non-agricultural projects are statistically significant. This implies that conflict in pastoral communities is not affected by aid in general; it is a function of crop agriculture specifically. Third, we show that the difference between the THP interactions for crop agriculture and non-agriculture projects is itself significant for the UCDP outcomes ($p<0.01$) but not for ACLED outcomes. We also confirm that the THP interactions for crop agriculture and animal production are significantly different across all specifications.[5]

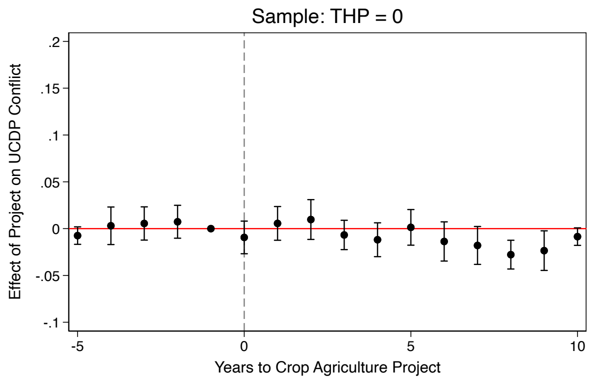
Taken together, this exercise indicates that crop agriculture projects significantly increase the risk of conflict in traditionally pastoral territories of Africa. The effect is robust to allowing for selection bias that is specific to crop agriculture projects but common across THP and non-THP areas, as well as selection bias that is specific to THP areas but common across projects types. It is not due to a more general effect of development projects in THP areas, and it is largely offset by the additional inclusion of animal production (i.e., pastoral) development projects.

C. Event Study Design

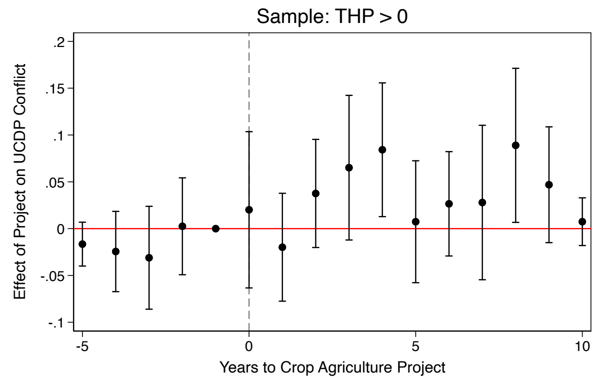
In Figure 3, we present event study plots that derive from specification 1, i.e., including leads and lags in order to observe pre- and post-treatment dynamics. We focus on the main UCDP conflict incidence outcome.

In Figure 3a, we limit the sample to non-THP cells. We see that the negative effect of projects on violence in non-THP areas becomes apparent at around year t+3. In Figure 3b, we limit the sample

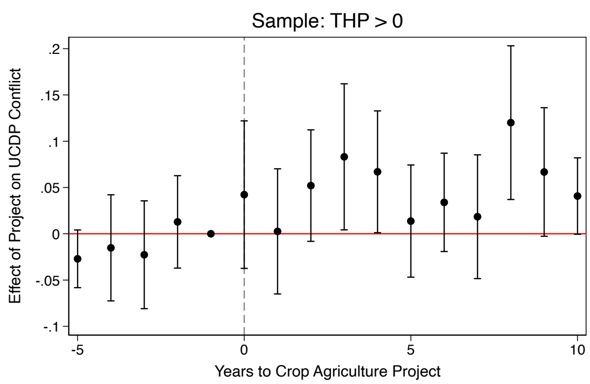
[5]We include three additional robustness tests in the Appendix. In Table A1, we allow the Crop Agriculture Project treatment to vary by other ethnicity-level characteristics: pre-colonial jurisdictional hierarchy, religion (both from the *Ethnographic Atlas*), and segmentary lineage (from Moscona et al. (2020)). The main interaction effect is unchanged by the inclusion of these covariates. In Table A2, we control for a triple interaction between ethnicity fixed effects, country fixed effects, and year fixed effects. This is a highly demanding specification, since it shuts down much of our available variation. Nevertheless, the UCDP estimates remain unchanged. The ACLED estimates, while no longer significant, are positive and sizable. In Table A3, we control for lagged dependent variables, since conflict may beget more conflict over time within cells. Again, all four main estimates are largely unaffected by the inclusion of these controls.



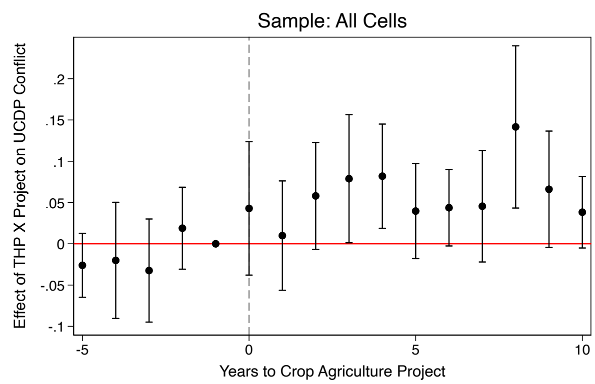
(a) Sample THP = 0



(b) Sample THP > 0



(c) Sample THP > 0, with Aid Controls



(d) Pooled Sample Interaction Effects, with Aid Controls

Figure 3: **Event Study Figures.**

to THP cells. Here, we see no obvious difference in conflict trends during the pre-treatment period, and yet a large and significant increase in conflict soon after the project is initiated. The effects are still large 9 years later. In Figure 3c, we include controls for the other aid types, finding similar results. In Figure 3d, we pool all cells and estimate the dynamic interaction effects corresponding to our main estimating equation, again finding similar results.

Finally, in Figure 4, we again limit the sample to THP cells but we use the procedure in Callaway and Sant'Anna (2021) to estimate the event study estimates. These estimates are markedly similar to those presented above, indicating that bias due to treatment effect heterogeneity is not a first-order concern.

D. Examining a 2006-2008 Supply Shock

While the evidence presented in the previous sections is consistent and robust to obvious sources of selection bias, we nonetheless avail of an alternative identification approach that is permitted by a "supply shock" of World Bank agricultural projects for which planning was initiated in 2006 and completed in 2008.

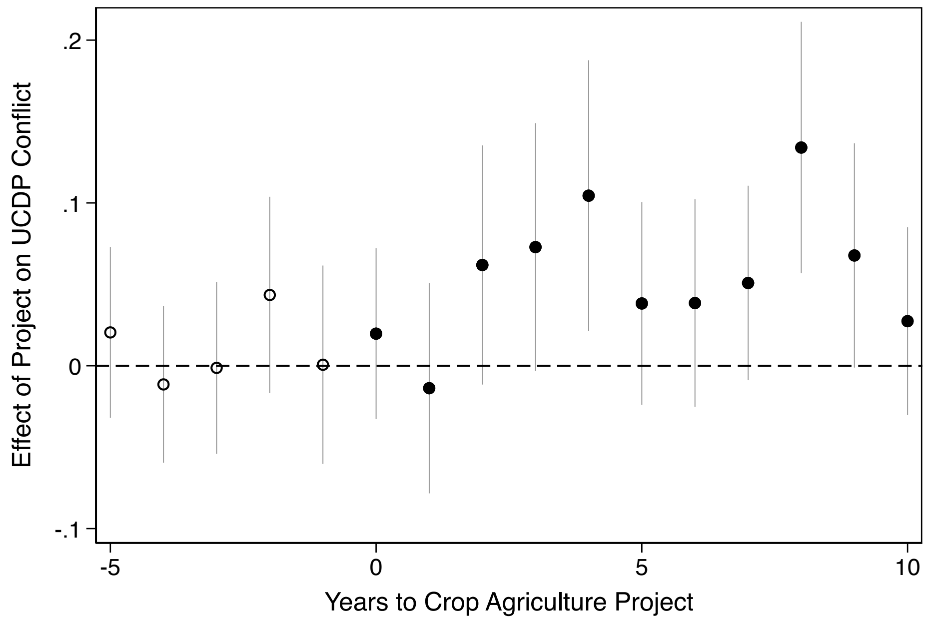
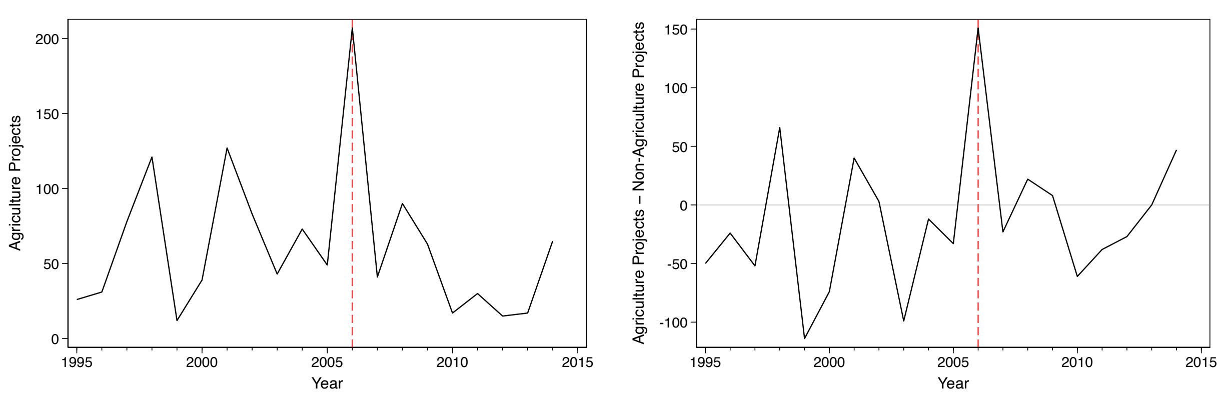


Figure 4: **Event Study Plot: Callaway & Sant'Anna (2021) Estimator**

In Figure 5a, we plot the number of new agricultural aid projects initiated each year. In most years, there are considerably fewer than 100 new projects. In 2006, there are more than 200 new projects. One reason for this spike may be a general supply shift across all project types. We check for this in Figure 5b by presenting instead the net number of new agricultural projects, that is, agriculture projects minus non-agriculture projects. Here, the 2006 spike is even more stark. In most years, there are more non-agricultural projects initiated than there are agricultural projects. However, in 2006 there are 150 more agricultural projects.

One potential explanation for this unusual surfeit of projects relates to the annual publication of the World Bank's flagship *World Development Report* (WDR), which provides in-depth analysis



(a) New WB Agriculture Projects

(b) WB Agriculture Projects − Non-Agriculture Projects

Figure 5: **New World Bank Agriculture Projects over Time**

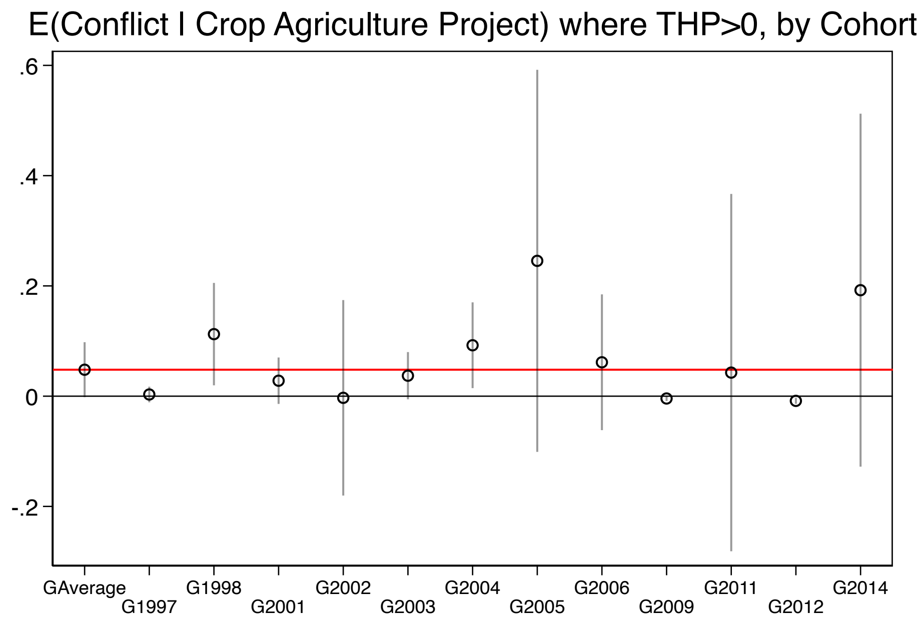


Figure 6: **Effect of 2006 Cohort Relative to Mean Effects**

and commentary on one area of economic development policy each year. The 2008 report on agriculture calls for sharply increased investment in Africa (pp. xiii). It is plausible that the topic of a given WDR provides a window into the organization's priorities, and that, importantly, the discrete change in topics from year to year generates some arbitrary variation in the World Bank's development investment portfolio that is independent of demand-side factors.[6]

We harness this variation under the assumption that, whatever decision rule states typically adopt for assigning crop agriculture projects to cells, it is unlikely to resemble the assignment mechanism generated by this supply shock. Thus, we proceed by comparing the average effect of the relevant 2006 cohort to the overall average effect. If these effects are similar, it suggests that the main findings are not driven by a demand-side selection mechanism whereby the state assigns agricultural projects to pastoral areas in order to suppress conflict.

We present this comparison in Figure 6. We plot average treatment effects for each cohort of agricultural projects initiated in THP cells. To estimate these effects, we again use the Callaway and Sant'Anna (2021) estimator to allow for cohort-by-cohort heterogeneity. The overall average treatment effect is represented by the red line. The treatment effect for the 2006 cohort (labeled "G2006") is almost identical.

This finding implies that the estimates are similar whether we rely on the 2006 supply shock or not, suggesting that our main result is unlikely to be driven by a demand-side selection mechanism.

[6]There is a similar coincidence with respect to environmental development projects for which planning was initiated in 2008 and completed in 2010, the year of the "Development and Climate Change" WDR. As in the case for agriculture, more projects were supplied in this period than in any other period in the dataset.

E. Land Use Data

For the final part of the main empirical analysis, we replace data on agricultural development projects with satellite-based data on land use from Meiyappan and Jain (2012). This data estimates the share of a cell used for various purposes (including crop agriculture production) in 1990, 2000 and 2010. We linearly interpolate values for the intervening years. We estimate a specification of the following form:

$$\begin{aligned} y_{iet} &= \gamma_1 THP_e \times AgricultureLandCover_{it} \\ &+ \gamma_2 AgricultureLandCover_{it} + \alpha_i + \alpha_{c(i)t} + \eta_{iet} \end{aligned} \quad (2)$$

where $AgricultureLandCover_{it}$ measures the (estimated) percentage of a cell's area used for agricultural activities in a given year. It varies from 0-100.

We also include controls for forest, urban, barren and shrub land, in addition to the corresponding THP interactions. We omit all land uses related to pastoralism: pasture, savanna and grassland. The parameter γ_2 is the DD effect of an expansion of agriculture in non-THP areas relative to the omitted categories. Our parameter of interest, γ_1, captures the additional effect of an expansion of agriculture in THP areas.

We present the estimates in Table 4. For the main UCDP outcome, the findings are qualitatively similar to those in Table 1: a 1 p.p. expansion of agriculture in non-THP areas is followed by a moderate decline in violent conflict of -0.35 p.p. ($p<0.05$), while the THP interaction is positive and large, but not significant (+ 0.55 p.p. ($p>0.10$). For the main ACLED outcome, the THP interaction is positive, large and significant (+ 1.38 p.p. ($p<0.05$)).

5. Heterogeneity by Political Power

Next, as in McGuirk and Nunn (2020), we allow our main interaction of interest to vary by the share of national political power that is held by transhumant pastoral ethnic groups.[7] The variable is equal to zero when pastoral groups are not in parliament and equal to one when they have a monopoly on national politics. In Table 5, we measure this variable with one lag to mitigate against potential reverse causality, since conflict can lead to regime changes. In Table 6, we measure the variable at the time a project is initiated, as this is the period when a project life cycle is planned.

The rationale for this exercise is that conflict ought to be avoided when groups can more easily negotiate. Consequently, minority groups in opposition have greater incentives to fight in the absence of power-sharing (e.g., see Mueller and Rohner, 2018).

The pattern in Table 5 is consistent with this view for UCDP outcomes. The first column indicates that our main estimate of interest is closer to zero when THP groups share more power. This is driven by conflict involving the state (column 2). The middle panel shows that, when THP

[7]This variable is constructed by combining data from the Ethnic Power Relations dataset with data from Murdock (1959). For details on this process, see McGuirk and Nunn (2020).

Table 4: Land Use Measures (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)
Transhumant Pastoral × Shrub Land Cover	0.0372***	0.0405***	0.0406*	0.0397*
	(0.0131)	(0.0130)	(0.0209)	(0.0209)
Shrub Land Cover	-0.0076	-0.0061	-0.0125**	-0.0122**
	(0.0048)	(0.0046)	(0.0052)	(0.0051)
Transhumant Pastoral × Forest Land Cover	0.0010	-0.0016	-0.0482	-0.0492
	(0.0249)	(0.0226)	(0.0527)	(0.0527)
Forest Land Cover	0.0007	-0.0001	0.0090***	0.0090***
	(0.0020)	(0.0013)	(0.0033)	(0.0033)
Transhumant Pastoral × Urban Land Cover	0.0390*	0.0338*	-0.0463	-0.0476
	(0.0231)	(0.0200)	(0.0576)	(0.0577)
Urban Land Cover	-0.0232	-0.0193	0.0358	0.0364
	(0.0161)	(0.0141)	(0.0245)	(0.0245)
Transhumant Pastoral × Barren Land Cover	0.0008	-0.0003	-0.0550	-0.0561
	(0.0095)	(0.0095)	(0.0360)	(0.0359)
Barren Land Cover	-0.0039	-0.0041	0.0164	0.0168
	(0.0029)	(0.0026)	(0.0140)	(0.0140)
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
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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 5: Heterogeneity by THP Share of Political Power

	(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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: 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

Note: All outcome variables measure conflict incidence at the level of a cell-year. “I(Any)” is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. “I(State)” is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; “I(Non-State)” is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

power moves from the 10th percentile to the 90th percentile, the THP interaction effect decreases by 6 percentage points.[8]

The estimates in Table 6 imply a more pronounced difference (7-8 p.p.) when power is measured at the time a project is initiated, suggesting this this is a critical period when the balance of political power has a persistent influence on the life-cycle of a project.

Finally, in Table 7, we provide one potential explanation for this pattern. We restrict the sample to observations for which the crop agriculture treatment is equal to one. We then ask whether THP political power increases the share of these projects that is coupled with Animal Production (i.e., pastoral) projects. We see evidence that is clearly consistent with this hypothesis (columns 2 and 3), but only in THP areas. We see no similar pattern for non-agricultural projects (columns 4-6); if anything, the effect is reversed, suggesting substitution between project types. This exercise indicates that pastoral political power may shape the type of development aid projects that are assigned to pastoral regions.

Table 7: THP Political Power And New Development Project Types

	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

Note: This sample is restricted to cell-years for which the Crop Agriculture Project variable is equal to one. The outcome variables are equal to one when there is a new Animal Production Project (columns 1-3) or new Non-Agricultural Project (columns 4-6) initiated in a cell. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

6. Additional Outcomes

In this section, we examine the effects of agricultural projects on religious-extremist conflict and on economic development measures.

A. Religious Extremist Conflict

The first exercise examines the effect of agricultural development on the incidence of jihadist conflict in Africa. Among THP groups, there are around twice as many Muslims as there are

[8] Interestingly, in the third column we note that the general effect of THP power on conflict in THP areas is negative, large and highly significant. There is less violence in pastoral regions when pastoral people are better represented in national politics.

Table 8: 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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Jihadist)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year that involves at least one self-styled jihadist group. "I(Non Jihadist)" is an indicator variable that equals one if at least one conflict event not involving a self-styled jihadist group occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Christians (McGuirk and Nunn, 2020). Similarly, among non-THP groups, there are around twice as many Christians as there are Muslims. It is possible that, in generating conflict between pastoral and non-pastoral groups, the mechanism that we study also generates conflict (mechanically) between Muslims and Christians. Since jihadist groups have proliferated across the continent in recent years, it is plausible that disaffected young pastoral men are vulnerable to recruitment into these groups in the wake of being dispossessed or displaced by an agricultural land use conversion (Benjaminsen and Ba, 2019).

In this scenario, we may expect to observe conflict involving jihadist groups as a response to agricultural development projects. The counterpoint is that jihadist conflict has a more complex combination of determinants and is thus unaffected by government policies over local land use.

We examine this question empirically. We generate two conflict incidence variables using the UCDP data: one based on events that include well known jihadist groups and one based on events that do not.[9] We then estimate a version of equation (1) using each type of outcome. The estimates, presented in columns (1) and (3) of Table 8, indicate that both jihadist and non-jihadist conflict are affected in a similar manner when crop agriculture projects are initiated in THP areas.

To ensure that we are not capturing the effect of assigning a project to areas with different

[9] We identify jihadist conflict events as those for which (i) the word "jihad" is present in either actor's name or in the source headline or (ii) the word "Islam-" appears in the source headline and one of the actors is explicitly jihadist. The groups identified are the following: 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.

religious compositions, we also include control interactions whereby the THP component is replaced by the share of a territory's population that is Muslim and Christian, respectively (columns 2 and 4).[10] The estimates are robust to the inclusion of these interactions, indicating that the effects are not due to mismatched projects in areas where people believe in Islam *per se*; rather they are due to mismatched projects in areas where people practice pastoralism.

B. Development Outcomes

While we have demonstrated that agricultural projects in pastoral territories lead to sharp increases in violent conflict, it is unclear whether they positively or adversely affect economic development outcomes in the long run. On the one hand, these mismatched projects may undermine development for the reasons stated above: projects may be unsuited to semi-arid conditions and/or they may be resisted by local pastoral groups. It is also plausible that the conflict sparked by these projects itself undermines development. On the other hand, these projects may contribute to agricultural productivity by facilitating a reallocation of labor from subsistence to commercial crop production. While this may only benefit a subset of the population, it may still influence economic indicators.

To test this, we examine the effects of agricultural projects on nighttime luminosity at the level of a cell and year. We estimate our main specification only replacing the conflict outcome with outcomes measuring (i) any and (ii) mean nighttime lights emission from the DMSP-OLS Nighttime Lights Time Series Version 4, which is available from 1992 to 2013.[11]

The estimates, presented in Table 9, indicate that crop agricultural projects increase nighttime luminosity in both THP and non-THP areas. We present event study estimates for the mean luminosity measure in Figure 7a (for THP cells) and 7b (for non-THP) cells. This pattern suggests that, even though these projects lead to violence in THP areas, they nonetheless contribute to economic development as measured by nightlights.

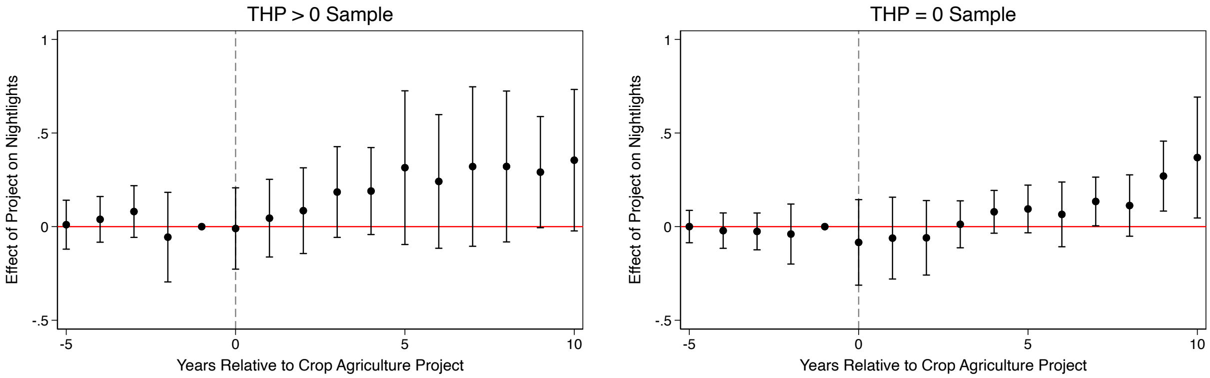
[10]The data are constructed using information from the World Religion Database, which reports information on the populations of 18 religions for each language group in the world. The data are reported with Ethnologue identifiers which we match to our Ethnographic Atlas. Since multiple Ethnologue groups often match to one Ethnographic Atlas group, we create Ethnographic Atlas level measures by taking population-weighted averages across all Ethnologue groups that match to an Ethnographic Atlas group. See McGuirk and Nunn (2020).

[11]Image and data processing by NOAA's National Geophysical Data Center. DMSP data collected by US Air Force Weather Agency. Data source: PRIO GRID 2 Tollefsen, Strand and Buhaug (2012).

Table 9: Effect of Development Projects on Nightlight Luminosity

	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

Note: Standard errors (reported in parentheses) are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.



(a) THP Cells

(b) Non-THP Cells

Figure 7: **Effect of Crop Agriculture Project on Nightlights**

7. Discussion and Conclusion

Civil conflict reverses economic development by undermining physical, human, and social capital. This paper documents how land use policies can exacerbate conflict in traditionally pastoral areas of Africa. We estimate that World Bank crop agriculture projects increase the risk of conflict in a transhumant pastoral cell by about 6.4 p.p., more twice the sample mean. We estimate consistent findings using raw data plots, fixed effects regressions that allow for different sources of selection bias, event study plots, a natural experiment, and satellite-based data on land use instead of World Bank project data. These projects also contribute to the spread of jihadist conflict. Despite this heterogeneity, we find that crop agriculture projects increase nighttime luminosity in both pastoral and agricultural areas.

Our main estimated effects on conflict are closer to zero when pastoral groups share more political power during the initiation stage of a project. We also find that, when agricultural projects are paired with animal production projects in pastoral areas, the risk of conflict is muted. We conclude that more inclusive political representation and more consonance between development aid projects and the populations they purportedly serve are likely conducive to peace in pastoral Africa.

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Online Appendix (Not for Publication)

Appendix A. Additional Data Details

Conflict Data

For ACLED and UCDP, we use as consistent a coding procedure as possible so that, in the end, the primary difference between the two measures is the lower barrier to entry in ACLED.

For the ACLED measures, to match the UCDP measure as closely as possible we do not include some "types" of conflicts. We do not include "non-violent actions" (e.g., weapons distribution, non-violent transfer of territory, etc) and "demonstrations" (e.g., protests and riots).

We measure conflict events using "violent events" but omit "explosions/remote violence," which includes chemical weapons, air strikes, bombs, and shelling. The remaining subcategories within "violent events" category are "battles" and "violence against civilians", which are analogous to the two-sided and one-sided events in the UCDP data. Our results are almost identical when we allow for broader definitions of conflict events.

We then separate events by the actors involved in a way that mimics the UCDP definitions:

- Any: Any violent event
- State: Events involving the state. These are interaction codes that either begin or end with a 1.
- Non-State: Events not involving the state, which means all interaction codes that neither begin nor end with 1

For UCDP, the categories are off-the-shelf but for one adjustment. We combine one-way and two-way events involving the state for our measure of state conflict and we combine those not-involving the state for our measure of non-state conflict.

Appendix Tables

Table A1: Controlling for Other Ethnic Characteristics

	(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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: 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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A3: Controlling for Lagged Outcomes

	(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

Note: All outcome variables measure conflict incidence at the level of a cell-year. "I(Any)" is an indicator variable that equals one if at least one violent conflict occurs in a cell and year. "I(State)" is an indicator variable that equals one if at least one conflict event involving the state occurs in a cell and year; "I(Non-State)" is an indicator variable that equals one if at least one conflict event not involving the state occurs in a cell and year. Standard errors, which are reported in parentheses, are adjusted for clustering at the level of a cell and a country-year. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A4: Summary Statistics: Cell-Year Variables

	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

Table A5: Summary Statistics: Ethnicity-Level Variables

	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

Table A6: Difference in Means: Cell-Year Variables (I)

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

Table A7: Difference in Means: Cell-Year Variables (II)

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

Table A8: Difference in Means: Ethnicity-Level Variables

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