EVALUATION REPORT

Geospatial Impact Evaluation of the Demarcation of Indian Territories Project (PPTAL) on Conflict and Deforestation

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AIDDATA
A Research Lab at William & Mary

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Front Cover

Map by Soren Patterson for AidData shows PPTAL-demarcated areas of indigenous lands (in light green) in the Brazilian Amazon. Intact forest (in dark green) by Greenpeace, University of Maryland, World Resources Institute and Transparent World. Forest loss (in pink) by Hansen/UMD/ Google/USGS/NASA. Basemap by Esri, HERE, Garmin, OpenStreetMap contributors and the GIS user community.

I. Motivation and Research Questions

In 2015, KfW and AidData collaborated to conduct an impact evaluation of the effects on deforestation of the Demarcation of Indian Territories project (PPTAL), which was implemented between 1995 and 2008. Using several decades of remotely-sensed satellite data as the outcome, the evaluation found no statistically significant effects on forest cover.

As part of the first round of research, we considered that the impact of demarcation might vary by the deforestation pressures faced by a given community. Nepstad et al. (2006) find that indigenous control of land is associated with much lower deforestation rates than control by other groups, especially near the "active frontier", and Pfaff et al. (2015) demonstrate that deforestation rates in indigenous lands in the Amazon may vary according to a community's distance to the "deforestation frontier." In Bolivia, Van Gils et al. (2006) identify distance from roads and settlements as main determinants of deforestation, also pointing to heterogeneous effects because of proximity to human threats. In the first round of research, we incorporated distance to human threats and the deforestation frontier into the analytical models. We also identified high-pressure lands using pre-PPTAL trends in NDVI and other covariates (e.g. nighttime lights, agricultural production), but did not find any distinguishable heterogeneity in the effect of PPTAL on deforestation.

In addition to proximity to human threats and pre-program trends, it would also have been useful to identify indigenous lands with land conflict events, such as land invasion, property destruction, unauthorized infrastructure, or resource exploitation. Godoy et al. (1998) demonstrate an increase in deforestation because of conflicts between cattle ranchers, loggers, and smallholders in the Bolivian rainforest. These conflicts include resource extraction on indigenous land without payment, destruction of indigenous crops by cattle, and using political leverage in courts to gain access to indigenous resources. In addition, land disputes where different groups attempt to gain legal control of land can lead to deforestation so that squatters can prove "productive use" of land (Alston et al. 1999). If land conflict increases deforestation, then perhaps a reduction in conflict events is one mechanism through which demarcation impacts deforestation. Property rights provide motivation to protect one's land, and when conflicts do arise, they also allow an appeal to the rule of law through the police or justice system to enforce these rights (Alston et al. 1996).

As a follow-up to the impact evaluation examining the effects of demarcation on deforestation, we conducted a second round of research to further explore both the potential effects of indigenous land conflict levels on deforestation, as well as whether demarcation reduced land conflict levels. In this new research, we sought to answer two primary research questions:

1) What is the effect of demarcation on levels of conflict in indigenous lands? We hypothesized that demarcation of indigenous lands would reduce levels of land conflict through increased land security.

2) Is the reduction of conflict a mechanism through which demarcation reduces deforestation? We hypothesized that demarcation increases land security, which reduces levels of land conflict, and in turn decreases deforestation.

II. Data Sources

To identify the effect of demarcation on conflict levels and deforestation in indigenous lands, AidData and KfW worked to extract conflict data in indigenous lands from reports compiled by the Indigenous Missionary Council between 2003 and 2014. KfW also obtained demarcation data from FUNAI for indigenous lands excluded from PPTAL, which enabled an expansion of communities included in the analysis. The conflict and demarcation datasets are discussed in greater detail below.

Demarcation Data

KfW identified two new FUNAI datasets with dates for five stages of the demarcation process (identification, delimitation, declaration, approval, and registration). One dataset was provided by researchers from Bonn University and was dated to 2011, while the other was provided directly from FUNAI and dated to 2016. Table 1 displays the total number of geographically located communities for which information was included for each of the 5 demarcation stages in both the 2011 and 2016 datasets. As shown in the final column, the 2011 and 2016 datasets do not match perfectly. Where the two datasets both include information for an indigenous community, they may agree (day, month, and year match perfectly), or disagree (day or month or year do not match), while "mutually exclusive" identifies the number of communities that included date information in one dataset and not the other. The disagreement between dates varies -- in some cases, it is only different days in the same month and year, while in others the year may differ considerably.

The additional demarcation information allowed us to expand the analysis to non-PPTAL lands. To maintain consistency in our analysis we had to select one demarcation dataset, and the FUNAI 2016 dataset demonstrated greater comprehensiveness. While we were able to use alternate data sources for robustness checks, the 2016 dataset was used as the primary dataset for all evaluation models.

Conflict Data

In December 2015 and January 2016, AidData conducted a search for data on conflict in indigenous lands. The most promising source was a series of yearly reports published by the Indigenous Missionary Council (CIMI) from 2003-2014 which recorded incidents of violence against indigenous peoples. The reports capture violence in several categories, including violence against the estate and violence against the individual - the categories of greatest interest for this research. Two consultants extracted the data from the Portuguese reports, recording the indigenous land on which the event took place, the type of conflict (e.g. land invasion, property destruction, resource exploitation), and any government involvement.

The final dataset includes nearly 1,200 incidents of land violence between 2003 and 2014. Some of these incidents take place on indigenous lands that do not exist in the lists compiled from FUNAI and PPTAL records, or if they do exist, cannot be geographically located. Indigenous lands for which we have also obtained demarcation process information further limits our sample. Table 2 identifies the total number of communities that are geographically located, have available demarcation date information (for both the 2011 and 2016 datasets), and on which acts of land violence occurred. The total number of land violence incidents that occurred in the communities are included in parentheses -- i.e. from the 2011 dataset, there are 102 communities for which we have identification stage data and on which an act of land violence occurred, and the total number of occurrences between 2003 and 2014 for those communities is 311.

The land violence data also demonstrates that there are some communities for which we had demarcation date information from only the 2011 or 2016 dataset. For consistency, we used the more comprehensive 2016 demarcation dataset as the primary demarcation dataset for the evaluation models.

From the land violence data, we extracted various outcomes measures. The models below used either counts of land violence in an indigenous community in a given year, or total counts in a community across all 12 years.

The data collection process also documented incidents of violence against individuals (e.g. murder, attempted murder, sexual assault, etc.). The final dataset includes approximately 2,000 incidents between 2003 and 2014. However, when limited by those that can be mapped and for which demarcation information exists, our sample includes only 1,427 incidents in 235 communities. We totaled the count of violent crimes for each community in each year to control for general crime levels in the models described below. Table 3 shows the sample construction for this measure.

III. Methodology

Research Question #1: Effects of Demarcation on Conflict Levels

For all models, the unit of analysis is the indigenous community, and we also included measures of personal violence gathered from the CIMI Reports as a control for general crime levels in each indigenous land, and a host of other relevant spatial covariates (e.g. population, urban travel time, topology, climate).

For most of our analysis, we adopt a panel data methodology in which the individual observation is at the community-year level (i.e., each community is represented by 12 rows in the dataset, one for each year between 2003 and 2014). Only communities ever demarcated are included. This framework allows us to account for potential confounds and unobserved factors that either remain constant for each community or similarly affect all communities in a given year (i.e., employing community and year-specific Fixed Effects). We also control for a variety of time-varying socioeconomic, governance, and demographic features.

The conflict outcome data we use begins in 2003, by which PPTAL had been active for 8 years and many PPTAL and non-PPTAL indigenous communities had been demarcated for some time. The late timing of the conflict outcome data relative to the demarcation timing informs our choice of evaluation models. We thus focus on two comparisons:

1. Comparing annual conflict among indigenous communities demarcated prior to 2004 based on the years elapsed since demarcation. We label this our *"early demarcation sample"*;

2. Comparing annual conflict among indigenous communities among communities demarcated in 2004 or later based on whether the demarcation had taken place in a given year. We label this our *"late demarcation sample."*

Early Demarcation Sample: In this sample, the treatment is measured as years prior to or after demarcation (i.e. a treatment variable equal to -3 denotes 3 years prior to demarcation, and equal to +3 denotes 3 years after demarcation). The earliest year of PPTAL demarcation is 1997, so using outcome data that begins in 2003, several communities were already demarcated for 6 years. The outcome is the count of land conflict events in any given year. By examining the marginal effect of each additional year of demarcation, this model shows the timing at which we begin to see a demarcation effect on conflict levels.

Late Demarcation Sample: In this sample, we focus on the 68 PPTAL communities demarcated after 2003, given that

this is the first year in which we have any land conflict data. The treatment indicator for each year reflects whether demarcation had already occurred in that year and is equal to 0 for all years prior to demarcation, and 1 for all years after demarcation. This captures the impact on land conflict only in the specific timespan after each community's treatment. The outcome is the count of land conflict events in any given year. This model uses a restricted sample, but it is also more rigorously identified given that demarcation only takes place in years for which we also have outcome data.

As noted above, PPTAL was not the only source of support for formalization. We thus conduct both comparisons among both the narrower PPTAL-only communities and the broader sample of communities demarcated through PPTAL or other means. A significant advantage of limiting the analysis to PPTAL communities is our understanding of the effects of any pre-program trends in conflict levels. During the first round of research on PPTAL, we examined the prioritization of communities for demarcation as part of the program. While the initial project documents stated that communities would be prioritized based on threats to the land and threats to the indigenous peoples, we did not find evidence that this prioritization mechanism was followed in the program's administrative data. Thus we are more confident that pre-program levels of conflict did not determine selection or prioritization among PPTAL communities.

As discussed, FUNAI provided a dataset of dates for each stage of the demarcation process for an expanded list of indigenous communities. This allowed us to apply the two panel models to the expanded set of PPTAL and non-PPTAL communities using the 2016 dataset. When working with non-PPTAL communities, we could not be certain if there was any prioritization of communities for demarcation, and more importantly, whether that prioritization was correlated in some way with land conflict. Given that the conflict data only begins in 2003, we were limited in establishing conflict pre-trends that would help us to understand any correlations.

Research Question #2: Effects of Conflict Reductions on Deforestation

We aim to assess whether these reductions in land conflict led to concomitant reductions in deforestation. One way to do so is to observe whether the impacts of demarcation on deforestation vary with and without controlling for conflict as a covariate. If demarcation leads to deforestation reductions *through* conflict reductions, its observed coefficient should become smaller once conflict is controlled for.

We conduct these tests using two specifications:

1. We compare the overall changes in forest greenness (proxied by the difference in the annual maximum of NDVI in 1995 and 2014) for demarcated and non-demarcated communities with and without controlling for land conflict.

2. We also return to our primary panel model framework from our previous study of the effects of demarcation on forest cover. We add land-related conflict as a covariate and test whether the null effects of demarcation on forest cover are overturned.

IV. Findings

Research Question #1: Effects on Conflict

We find evidence that demarcation reduced the incidence of land conflict among those communities supported early on in the PPTAL project (between 1995-2003). Table 4 shows the results of regressions among the sample of communities demarcated in this period. Column 1 controls only for the community's time invariant mean conflict (fixed effect), while column 2 adds controls for individual violence, nighttime lights, and population. Once we properly control for temporal changes in conflict by including year as a continuous measure (column 3) and annual dummies (column 4), we observe a reduction in land conflict associated with the number of years since demarcation. This relationship is statistically significant at the 99% confidence level in our most rigorous specification (column 4). The implied reductions in conflict are substantial but not dramatic: a community that has been demarcated for 10 years experiences roughly 15% fewer conflicts than one that has yet to be demarcated. These results are notable given that measurement of land conflicts is particularly challenging (as noted above), weakening detection of statistically significant effects.

The effect among later-supported communities was more variable and thus not statistically distinguishable. Table 5 shows the corollary results among the sample of communities demarcated through PPTAL between 2004 and 2008. Because we observe land conflicts for the full period during which demarcation occurs in this sample, we compare the incidence of this conflict before and after demarcation (rather than as a function of years-since-demarcation). In all of our specifications (columns 1-4), we estimate reductions in conflict due to demarcation that are too variable/noisy to differentiate from the null hypothesis of no reductions. One potential reason for the difference in our findings for early and more recently demarcated communities is that we have not yet observed the latter group for sufficiently long after demarcation. The early

demarcated group is observed for approximately 7.5 years after demarcation, on average (the median year of demarcation is 2001, while the mean of the observation period is mid-2008).

In addition to communities demarcated by PPTAL, additional efforts were made to demarcate other indigenous communities over this same period. We find quite consistent effects of demarcation when including these communities in our sample. In Table 6, we show results analogous to those in Table 4 but including additionally demarcated communities in our sample. Once again, once we appropriately control for annual variation in columns 3 and 4, we observe statistically significant reductions in land conflict associated with each additional year since demarcation. In fact, these effects appear even larger in this combined sample: a community that has been demarcated for 10 years experiences 42% fewer incidents than does one that has not yet been demarcated.

In Table 7, we examine the effects among the broader sample of demarcated communities whose rights were formalized between 2004 and 2014. As in the case of PPTAL-only communities (Table 5), we estimate substantial but noisy effects of demarcation. In fact, our coefficient estimates in our most rigorous specification (column 4) imply very large treatment effects, but there appears to be too much variation in the outcome measure to differentiate these effects from zero (this is true despite the relatively large sample size).

Research Question #2: Effects of Conflict Reductions on Deforestation

We do not find that these reductions in land conflict led to subsequent reductions in deforestation. Our results indicate that demarcation did not affect deforestation, either with or without controls for land conflict. We conduct these tests using two specifications: in Table 8, we compare the overall changes in forest greenness (proxied by the difference in the annual maximum of NDVI in 1995 and 2014) for demarcated and non-demarcated communities. In column 1, we estimate the overall differences without any controls, while column 2 adds the suite of controls for environmental and socioeconomic features; both show no differences between demarcated and non-demarcated communities. In column 3, we add our land conflict and individual violence measures as covariates. The estimated coefficient of demarcation remains nearly unchanged and not statistically significant. We repeat the exercise with a slightly expanded sample in columns 4-6, again finding no difference in coefficients with and without conflict controls.

a second test of the role of land conflict, we also return to our primary panel model framework from our previous study of the effects of demarcation on forest cover. This is a panel framework with the annual maximal NDVI as an outcome. We now add controls for conflict, with results shown in Table 9. Irrespective of which set of controls we employ in columns 1-4, we observe no statistically significant effects of demarcation on deforestation.

Taken together, these analyses demonstrate that land conflict reductions due to formalization of communal land rights were not associated with large changes in the standing forests in these communities.

It is also worth highlighting an important finding from our previous study: many of these communities were not experiencing dramatic deforestation over the period we observe, and were located relatively far from the "the Arc of Deforestation" (the frontier of agricultural expansion sweeping along the southern and eastern borders of the Amazon basin). It is thus not entirely surprising that we do not observe reductions in these already low rates of forest loss.

V. Policy Implications

Protecting the communal territories of indigenous peoples can lessen the incidence of land-related conflicts experienced by these communities. PPTAL provided effective support protecting the human rights of more than 100 indigenous communities. Our results suggest that these effects do not occur overnight but materialize over years and even decades after these rights are formalized.

Impacts on deforestation among these communities have yet to be felt, and thus one cannot associate improvements in conflict with changes in deforestation in this context.

Whether the PPTAL project was justified depends on whether one interprets its support as being one of human rights, in which case cost-effectiveness considerations may be moot. However, if policymakers seek to decide between alternative investments aimed at reducing conflict on indigenous lands, a future cost-effectiveness analysis is likely needed. Such an analysis would consider the full costs of formalization (including those borne by KfW, the World Bank, the Government of Brazil, and any other local actors). It would also need to account for the accumulation of benefits over time. Such an analysis is beyond the scope of the current study but would help inform programs intended to protect vulnerable human populations and forest ecosystems.

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Tables

Table 1: Number of Communities with Demarcation Information (Geographically Identifiable Communities Only)

Demarcation Stage	*Bonn 2011*	*FUNAI 2016*	*Overlap*
Identification	0	251	NA
Delimitation	132	202	Agree: 125 Disagree: 4 Mutually Exclusive: 76
Declaration	259	309	Agree: 236 Disagree: 21 Mutually Exclusive: 54
Approval	412	430	Agree: 401 Disagree: 6 Mutually Exclusive: 28
Registration	394	417	Agree: 349 Disagree: 41 Mutually Exclusive: 31

Table 2: Number of Communities with Land Violence Incident Data (Number of Incidents in Parentheses)

Demarcation Stage	*Bonn 2011*	*FUNAI 2016*	*2011 or 2016*
Declaration	102 (311)	123 (430)	130 (456)
Approval	158 (494)	164 (516)	166 (521)
Registration	156 (481)	157 (488)	168 (508)

Table 3: Number of Communities with Individual Violence Incident Data (Number of Incidents in Parentheses)

Demarcation Stage	*Bonn 2011*	*FUNAI 2016*	*2011 or 2016*
Declaration	99 (406)	120 (497)	126 (519)
Approval	177 (857)	183 (871)	185 (880)
Registration	168 (727)	178 (754)	182 (766)

Table 4: Conflict Outcome, Panel, PPTAL Demarcated before 2003

PPTAL Regression Results: Demarcation Pre-2003

	Dependent variable:			
	Land Conflict			
	(1)	**(2)**	**(3)**	**(4)**
Years Since Demarcation	0.003	0.003	-0.005*	-0.016***
	(0.003)	(0.003)	(0.002)	(0.003)
Individual Violence		-0.012	-0.012	-0.017
		(0.083)	(0.083)	(0.087)
Population		-0.001	-0.001	-0.003
		(0.001)	(0.001)	(0.002)
Nighttime Lights		0.002	0.002	0.008
		(0.020)	(0.020)	(0.024)
Year			0.008	
			(0.005)	
Constant	-0.032	-0.032	-15.031	0.140***
	(0.038)	(0.038)	(10.119)	(0.028)
Observations	792	792	792	792
Community Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	No	No	No	Yes
Note:		*$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$*		

Table 5: Conflict Outcome, Panel, PPTAL Demarcated 2004-2008
PPTAL Regression Results: Demarcated 2004-2008

	Dependent variable:			
	Land Conflict			
	(1)	**(2)**	**(3)**	**(4)**
Demarcation	-0.026	-0.026	-0.012	-0.015
	(0.057)	(0.057)	(0.083)	(0.119)
Individual Violence		0.001	0.002	0.029
		(0.006)	(0.010)	(0.032)
Population		-0.0002	0.0004	0.006*
		(0.002)	(0.004)	(0.003)
Nighttime Lights		0.001	0.002	0.003
		(0.005)	(0.005)	(0.007)
Year			-0.002	
			(0.008)	
Constant	0.015	0.016	4.423	-0.056
	(0.034)	(0.039)	(16.113)	(0.040)
Observations	276	276	276	276
Community Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	No	No	No	Yes
Note:		**p<0.1; **p<0.05; ***p<0.01*		

Table 6: Conflict Outcome, Panel, Demarcated by Any Project before 2003

Full Sample Regression Results: Demarcated 1995-2003

	Dependent variable:			
	Land Conflict			
	(1)	**(2)**	**(3)**	**(4)**
Years Since Demarcation	-0.006	-0.005	-0.042**	-0.042*
	(0.006)	(0.004)	(0.018)	(0.022)
Individual Violence		0.250*	0.250	0.248*
		(0.151)	(0.159)	(0.148)
Population		-0.001	-0.001	-0.0004
		(0.0004)	(0.0004)	(0.001)
Nighttime Lights		0.002	0.002	0.0003
		(0.004)	(0.004)	(0.004)
Year			0.037**	
			(0.017)	
Constant	0.136*	0.126**	-73.756**	0.191*
	(0.076)	(0.064)	(34.031)	(0.111)
Observations	1296	1296	1296	1296
Community Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	No	No	No	Yes
Note:		*$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$*		

Table 7: Conflict Outcome, Panel, Demarcated by Any Project 2004-2014

Full Sample Regression Results: Demarcated 2004-2014

	Dependent variable:			
	Land Conflict			
	(1)	**(2)**	**(3)**	**(4)**
Demarcation	0.038	0.042	-0.108	-0.054
	(0.080)	(0.076)	(0.079)	(0.075)
Individual Violence		0.151**	0.149**	0.147**
		(0.071)	(0.072)	(0.073)
Population		-0.014	-0.018*	-0.014
		(0.009)	(0.010)	(0.009)
Nighttime Lights		0.012	-0.003	-0.007
		(0.019)	(0.019)	(0.018)
Year			0.026***	
			(0.009)	
Constant	-0.016	1.776	-50.158***	2.037
	(0.035)	(1.431)	(18.667)	(1.473)
Observations	1020	1020	1020	1020
Community Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	No	No	No	Yes
Note:		**p <0.1; ** p<0.05; *** p<0.01*		

Table 8: Deforestation Outcome, Cross-section, All Communities

Regression Results

	Dependent variable:					
	Change in Max NDVI 1995-2014					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Demarcation	-0.004	-0.001	0.0001	-0.001	0.0001	0.001
	(0.006)	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)
Land Violence Count			-0.002			-0.002*
			(0.001)			(0.001)
Individual Violence Count			0.0002			-0.0001
			(0.0002)			(0.001)
Baseline NDVI		-0.498***	-0.514***		-0.273***	-0.281***
		(0.073)	(0.075)		(0.039)	(0.039)
Pre-Trend NDVI		-1.503***	-1.476**		-2.313***	-2.267***
		(0.557)	(0.575)		(0.395)	(0.395)
Area (hectares)		-0.00000***	-0.00000***		-0.00000***	-0.00000***
		(0.000)	(0.000)		(0.000)	(0.000)
Baseline Population Density		-0.0003***	-0.0003***		-0.0002***	-0.0002***
		(0.0001)	(0.0001)		(0.00004)	(0.00004)
Baseline Temperature		0.014***	0.014**		-0.002	-0.003
		(0.005)	(0.005)		(0.002)	(0.002)
Baseline Precipitation		0.0001	0.0001		0.0001	0.0001
		(0.0002)	(0.0002)		(0.0001)	(0.0001)
Temperature Trends		-0.286	-0.307		-0.048	-0.038
		(0.323)	(0.324)		(0.183)	(0.183)
Precipitation Trends		-0.006	-0.008		-0.003	-0.002
		(0.016)	(0.016)		(0.008)	(0.008)
Nighttime Lights Trends		-0.050	-0.055*		0.026	0.022
		(0.032)	(0.033)		(0.024)	(0.024)
Population Trends		-0.0004	-0.0003		-0.0001	0.0002
		(0.0004)	(0.0004)		(0.0003)	(0.0004)
Slope		0.004	0.004		0.002	0.002
		(0.003)	(0.003)		(0.002)	(0.002)
Elevation		0.00003	0.00003		0.00001	0.00001
		(0.00004)	(0.00004)		(0.00002)	(0.00002)
Distance to River		-0.00000	-0.00000		0.00000	0.00000
		(0.00001)	(0.00001)		(0.00000)	(0.00000)
Distance to Road		-0.00000	-0.00000		0.00000	0.00000
		(0.00000)	(0.00000)		(0.00000)	(0.00000)
Constant	0.078*	0.060	0.083	0.100***	0.327***	0.344***
	(0.041)	(0.139)	(0.140)	(0.005)	(0.050)	(0.051)
Observations	358	358	358	382	382	382
R^2	0.543	0.729	0.731	0.0001	0.300	0.307
Adjusted R^2	0.083	0.409	0.408	-0.003	0.271	0.274
Note:			**p<0.1; **p<0.05; ***p<0.01*			

Table 9: Deforestation Outcome, Panel, Ever Demarcated

Full Sample Regression Results: Ever Demarcated

	Dependent variable:			
	Max NDVI			
	(1)	**(2)**	**(3)**	**(4)**
Demarcation	0.002	0.002	-0.008	-0.010
	(0.002)	(0.002)	(0.020)	(0.012)
Land Violence		0.001	0.001	-0.001
		(0.002)	(0.002)	(0.002)
Individual Violence		0.002	0.002	0.002
		(0.004)	(0.004)	(0.004)
Population		0.00001	0.00001	-0.0002
		(0.0003)	(0.0003)	(0.0002)
Mean Temperature		0.013	0.013	0.012
		(0.014)	(0.014)	(0.013)
Max Temperature		-0.006	-0.006	-0.001
		(0.006)	(0.006)	(0.005)
Min Temperature		0.001	0.001	-0.004
		(0.007)	(0.007)	(0.005)
Mean Precipitation		0.00001	0.00001	0.0002
		(0.0002)	(0.0002)	(0.0002)
Max Precipitation		0.00002	0.00002	0.00001
		(0.0001)	(0.0001)	(0.0001)
Min Precipitation		0.00002	0.00002	-0.0001
		(0.0002)	(0.0002)	(0.0002)
Nighttime Lights		-0.002	-0.002	-0.002
		(0.001)	(0.001)	(0.001)
Year			0.010	
			(0.019)	
Constant	0.741***	0.516**	-19.983	0.524**
	(0.017)	(0.220)	(37.059)	(0.212)
Observations	3708	3708	3708	3708
Community Fixed Effects?	Yes	Yes	Yes	Yes
Year Fixed Effects?	No	No	No	Yes
Note:		*$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$*		