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Evidence from Western Panama**

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Does the Recognition of Indigenous Territories Impact Household Economic Situations? Evidence from Western Panama

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Abstract

The Government of Panama created a semi-autonomous indigenous area in 1997. The establishment of this region institutionalizes indigenous authorities and prohibits land privatization. This study investigates the effect of the recognition of common property land to indigenous groups without centralized political culture on economic performance. By using difference-in-differences approach at household-level data, I find that non-migrant indigenous households living in the semi-autonomous territory declined their consumption relative to their counterparts living outside. Further, indigenous households inside the treatment area are less likely to participate in agricultural market activities and they earn less monetary benefits from the market.

JEL J15, O12, O17

Keywords: Institutions, indigenous people, difference-in-differences, market participation.

1 Introduction

In 2007, 144 countries voted in favor of the United Nations Declaration on the Rights of Indigenous People (UNDRIP) to recognize the importance of indigenous peoples' rights. UNDRIP indicates that indigenous peoples' rights to land and resources will enable them to strengthen their institutions and to promote their development. Land is the main asset that indigenous people possess and, in many countries, they experience high levels of land tenure insecurity. Economic literature considers land property rights as a precondition for development and previous empirical papers find a positive impact of land

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property rights on agricultural productivity and investments (Besley 1995; Fenske 2013; Goldstein and Udry 2008). The rights of indigenous people to land is a topic that has gotten wide attention in multiple social sciences.

Indigenous land rights tend to be in the form of common property resources and cooperative behavior is necessary in order to manage common property areas. A large number of indigenous groups have no history of shared or centralized governance over their territories. Recent research has attributed poor economic performance to the integration of people who had no history of political centralization into jurisdictions (Dippel 2014; Gennaioli and Rainer 2007).

This paper intends to examine whether the recognition of common property land to indigenous groups without centralized political culture have any impact on their economic condition. I exploit the creation of an indigenous semi-autonomous territory in western Panama in 1997 to understand this topic. The Government of Panama with Law 10 of 1997 and the publication of the Organic Charter (*Carta Organica*) in the Official Gazette in 1999 creates *Comarca*¹ *Ngobe-Bugle* in western Panama. The vast majority of the inhabitants of the indigenous territory are members of the Ngobe and Bugle groups.² These ethnic groups do not share history of centralized political organization and decision were made at the family-level.

The Government of Panama only granted half of the land requested by the Ngobe-Bugle authorities. This left a portion of the indigenous people living outside the territory (Wickstrom 2003). I use a difference-in-differences approach to examine whether the economic conditions of Ngobe-Bugle people living inside and outside the indigenous semi-autonomous area differ across groups after the recognition of Ngobe-Bugle authorities and land tenure systems.

Using a difference-in-differences methodology, I find evidence that Ngobe-Bugle households living inside the indigenous region have lower consumption relative to their counterparts (i.e. other Ngobe-Bugle households) outside the indigenous area after the recognition of *Comarca Ngobe-Bugle*. My results are robust to the inclusion of control variables and district fixed effects. These results can be explained by coordination failures and lack of cooperation in the indigenous territory. Lack of cooperation coupled with communal land, decreases market attractiveness to invest in public goods and other productive investments (e.g. roads), increasing transaction costs for house-

¹Semi-autonomous indigenous regions are called *Comarcas* in Panama.

²Ngobe and Bugle are culturally similar groups with common traditions but with different native languages. Ngobe tribe is the largest indigenous group in Panama and Ngobe people are considered the most ancient settlers on the Isthmus of Panama. In this paper I refer to these groups as Ngobe-Bugle people since they are the main focus of my research.

holds inside the indigenous area. Difference-in-differences results confirm that agricultural market participation is lower within Comarca Ngobe-Bugle than outside after the recognition of indigenous authorities over their land. Further, farmers in the indigenous area are more likely to be self-sufficient, earning less from agricultural market activities.

The recognition of indigenous authorities and land tenancy systems may impact economic outcomes since Ngobe and Bugle groups lacked centralized political organization. One line of research investigates the impact of the creation of artificial boundaries and lack of political centralization on economic outcomes. For example, Dippel (2014) shows that the integration of ethnic groups with no history of centralized or shared governance reduces per capita income in reservations in the US. The author suggests that an increase in political conflict creates an uncertain business environment. As mentioned above, the Ngobe and Bugle peoples lived in small family units without centralized political culture. This resulted in a segmentary and acephalous political organization (Wickstrom 2003). Recently, the Ngobe-Bugle people have displayed unity in order to obtain their land rights and to protest against hydroelectric dam projects near their lands, however, high levels of corruption in their organization exists.

This paper contributes to the literature that explains the causes of under-performance of indigenous people by examining the economic impact of the creation of an indigenous semi-autonomous region. Indigenous people are the poorest and more vulnerable citizens of Latin America since they tend to live in difficult-access areas, have lower education attainment, and lower access to basic sanitation. This area of research emphasizes the significance of institutions, political integration, and property rights mostly using empirical evidence from North American aboriginals (Aragon 2015; Dippel 2014). This paper presents new empirical evidence from an understudied group and shows that granting rights over land is not enough to improve the socioeconomic conditions of indigenous people.

This research relates to the effects of institutions and artificial jurisdictional boundaries on current economic performance. A large number of research use institutions to explain the differences in development throughout the world. Acemoglu and Robinson (2001) show that the institutional choice by a country is the main driver of cross-country income disparities today. Similarly, Easterly and Levine (2003) conclude that institutions predominantly affect income. However, the impact of institutions as the main factor for development is not a consensus in economic literature. Sachs (2003) argues that geography is a stronger explanatory variable to understand cross-country income differences. Further, Michalopoulos and Papaioannou (2014) found that cross-border differences in institutions do not translate into dif-

ferences in economic performance within partitioned ethnicities in Africa.

The rest of this paper is organized as follows. Section 2 provides a background Comarca and Ngobe Bugle people. Section 3 introduces the data and econometric frameworks. Section 4 provides the results. Section 5 discusses about the economic mechanisms. Finally, Section 6 concludes this research.

2 Comarca and Ngobe-Bugle people

Panama has five semi-autonomous regions where the government recognizes the rights of indigenous people over their lands, their traditional land organizations, and their management systems (Solis et al. 2005). These regions are considered indispensable to improve socioeconomic conditions for indigenous peoples. However poverty, and lack of access to public goods and sanitation is pervasive in indigenous areas, especially in western Panama. In this section I briefly discuss about the economic situation and traditions of the Ngobe and Bugle peoples. Then, I introduce the concept of Comarca and how it came into existence in Panama.

2.1 Ngobe and Bugle groups

Ngobe and Bugle are the two largest indigenous groups in western Panama. According to the 2010 population census of Panama, there are 260,058 Ngobe people and 24,912 Bugle people.³ These ethnic groups are considered the most ancient settlers of the Isthmus of Panama. Ngobe and Bugle people are the poorest citizens of Panama, 92% of them live below the national poverty line and 82% live in extreme poverty (Vakis and Lindert 2000). In the past, Ngobe and Bugle people lived in small family units without a centralized political culture. This resulted in a segmentary and political organization without clear leadership (Wickstrom 2003). Ngobe-Bugle authorities and organization mobilized to obtain legal recognition of their homeland at the end of the 1990's, however disagreements inside their organizations about who represents their government are common, and high levels of corruption exist.

Ngobe and Bugle settlements are in mostly mountainous areas. Their principal economic activities include slash-and-burn agriculture, craft production, and, to a lesser extent, unskilled labor outside the indigenous area. Their main crops are rice, yam, corn, beans, and banana. Fruits and other

³The total indigenous population of Panama was 438,559 in 2010. There are eight different indigenous groups in the Central American country. Each group has its own language, traditions, and political organizations.

permanent crops are also produced and sometimes commercialized. For example, cacao and coffee beans are their main cash crops. Some households tend to migrate temporarily to work on banana, coffee, and other plantations.

Ngobe-Bugle traditions highly value non-economic intangibles as kinship, friendship, availability and need in order to exchange or trade (Young and Bort, 1979). Their land tenancy system is not open access, instead land is collectively owned by kin-group. Their main ways to have access to land are through inheritance, exploitation of land, and living inside the community.

2.2 Comarca

The Government of Panama is considered to have positive relationships with its indigenous minorities since the 1970's as it recognizes their basic human rights (Herlihy 1995). However, poverty and extreme poverty among indigenous groups is immense. For example, in 1997, 83% percent of indigenous people were living under the poverty line (Vakis and Lindert 2000).⁴

The concept of Comarca emerges after the *Kuna* indigenous group rebelled against the Government of Panama in 1925.⁵ Comarca *Kuna-Yala* becomes the first semi-autonomous territory that recognizes indigenous political structure and land tenancy system in Panama.⁶ Thenceforth, the idea of recognizing semi-autonomous territories for other indigenous groups becomes apparent, especially during the end of the 1960's when Panama was ruled by a military government.⁷

The project of a semi-autonomous for the Ngobe and Bugle groups starts in the 1960's. Herrera (2012) suggests that it is not accomplished during that time because of the following reasons: 1-Disagreements between the Ngobe authorities and the Government of Panama about the borders of the indigenous region. 2- Large land owners and non-indigenous peasants opposed to the Comarca project. 3- Cerro Colorado mine was near to the limits of the indigenous territory.

A considerable achievement for indigenous citizens of Panama occurred

⁴Poverty is far higher among the indigenous people living within geographic "indigenous" areas as compared with their indigenous counterparts living in urban places.

⁵The Kuna people's rebellion against the Government of Panama is known as the Dule Revolution. After long political struggles, the Government acknowledged land rights and political structure of the Kuna people in eastern Panama through Law 2 of 1938.

⁶Comarca Kuna Yala was considered a model to follow for other indigenous groups in Latin America.

⁷Omar Torrijos, the de facto dictator of Panama from 1968 to 1981, started a series of social reforms including efforts to recognize the indigenous peoples position in the Panamanian society and to improve their living standards. Torrijos recommended indigenous groups to organize and fight for their land rights.

at the beginning of the 1970's when the Panamanian Constitution of 1972 granted indigenous peoples the rights to participate in the political system and it introduced the notion of indigenous land rights. After this, the recognition of new indigenous semi-autonomous regions starts. Comarca Ngobe-Bugle is created by Law 10 of 1997 and its administrative organization is recognized by the publication of the "*Carta Organica de la Comarca Ngobe-Bugle*" in the Official Gazette of Panama in 1999.

Law 10 was approved and ratified on March 7th 1997. It has 11 chapters and clarifies the borders of the Comarca area.⁸ On September 9th 1999, the "*Carta Organica de la Comarca Ngobe-Bugle*" is published in the Official Gazette, addressing issues as land property system, governance, justice, budget, and other crucial topics inside the Comarca area.

Collective land holding is the main land tenancy system inside the Comarca territory. "*Carta Organica*" and Law 10 empower Ngobe-Bugle authorities and recognize the indigenous groups' land tenancy system. Further, they define the borders and prohibits private land appropriation of non-indigenous peasants in Ngobe-Bugle territories.⁹

3 Data and Methodology

This section explains the data source, the identification strategy, and summary statistics.

3.1 Data

I use data from Living Standards Measurement Study (LSMS) by World Bank and Panama's Ministry of Economics and Finance at household level. Three independent rounds have been held in 1997, 2003 and 2008, i.e. pool cross-sectional data. I use data from each round, making use of Ngobe-Bugle farm households living in indigenous and rural areas in western Panama. LSMS does not ask for ethnicity. Thus, I define a household as Ngobe-Bugle if the native language of the household head is either Ngobere or Buglere.

⁸Law 10 of 1997 ends a long struggle between the Ngobe-Bugle people and the Panamanian government, yet it is ambiguous about the role of tribal administration inside the Comarca. After Law 10 approval, Ngobe authorities and members of the Panamanian Government agreed to elaborate a document to explain in details different aspects about the Comarca.

⁹*Carta Organica* explains some especial cases where private property might be acceptable in Chapter 2 of Title 2. However, the private appropriation should be done by a group of Ngobe-Bugle people in a collective way.

The first LSMS survey was collected between June and October in 1997. This is three months after Law 10 is approved. However the effect of the creation of Comarca should not come into effect until the publication of “*Carta Organica de la Comarca Ngobe-Bugle*” in the Panamanian official gazette in 1999. Therefore I use 1997 as a pretreatment period, and 2003 and 2008 as treatment periods.

3.2 Methodology

The aim of this research is to estimate the treatment effect of the creation of Comarca on economic outcomes of the Ngobe-Bugle people. In order to do so, I estimate a difference-in-differences approach to understand how the Comarca impacts household consumption.

I examine differential trends for households living in Comarca and non-Comarca regions over time. Note that both treatment and control households are members of Ngobe-Bugle groups with similar living conditions and culture before 1997. If non-Comarca households present information on the expected economic outcome trends for Comarca households had Law 10 not happened, the difference-in-differences outcomes across treatment and control households should remove the impact of confounding factors and isolate the effect of the creation of Comarca on economic outcomes.

The regression model can be written as:

$$y_{idt} = \beta X_{it} + \gamma \text{ComarcaRegion}_i + \delta \text{ComarcaRegion} \times \text{Post1997}_{idt} + D_d + D_t + \varepsilon_{idt} \quad (1)$$

Where, y_{idt} is an outcome variable. X_{it} controls for household observable characteristics. ComarcaRegion_i is a dummy that takes the value of one if the household is inside the Comarca and zero otherwise. $\text{Comarca} \times \text{Post1997}_{idt}$ is the interaction between treatment dummy and a time dummy variable that takes the value of one for the years 2003 and 2008, and zero for 1997. D_d is district dummy variable and D_t is year dummy. ε_{idt} is an error term.

The key difference-in-differences assumption is that non-Comarca households would experience the same trends in economic outcomes as Comarca households without the treatment conditional on observable characteristics. Table 1 indicates that socioeconomic characteristics are similar among Comarca and non-Comarca households in 1997. Log of household consumption is not statistically significant across treatment and control households before the institutionalization of Comarca land tenure systems and indigenous authorities. Access to piped water and electricity services is generally similar across groups. Further, agricultural market participation, earning from trade and income obtained from remittance is not different across groups before

Table 1: Summary Statistics 1997

	Comarca (1)	Non-Comarca (2)	Diff. (3)	t-value (4)
Log household consumption	7.198 (0.617)	7.331 (0.808)	-0.133 (0.122)	-1.09
Water service	0.268 (0.444)	0.222 (0.422)	0.046 (0.081)	0.56
Electricity access	0.033 (0.178)	0.028 (0.167)	0.005 (0.033)	-0.15
Household sells products in market	0.255 (0.437)	0.222 (0.422)	0.033 (0.080)	0.41
Amount household trades in market in US dollars	12.464 (51.24)	4.444 (17.54)	8.020 (10.28)	0.92
Remittance household	0.131 (0.338)	0.111 (0.319)	0.020 (0.062)	0.32
Persons per household	7.451 (3.456)	6.167 (3.028)	1.284 (0.626)	2.05**
Illiteracy	0.575 (0.500)	0.444 (0.504)	0.131 (0.092)	1.42
Gender (1= male)	0.830 (0.377)	0.889 (0.319)	-0.059 (0.068)	-0.87
Age of Head of Household	44.98 (13.24)	45.81 (14.37)	-0.825 (0.071)	-0.33
No. of persons with wage	0.176 (0.474)	0.389 (0.688)	-0.212 (0.097)	-2.20**
No. of households 1997	152	36		
No. of households 2003	167	69		
No. of households 2008	217	84		

Notes: Agricultural non-migrant households. In columns 1 and 2 standard deviations are in parentheses whereas in column 3 standard errors are in parentheses. ***, ** and * stands for significance at the 1%, 5% and 10% respectively.

Table 2: Comarca propensity: Probit regression

Aggregated corregimiento data 1997		
Average household size	0.612	(1.62)
Water service%	0.706	(0.59)
Electricity%	-2.571	(-0.46)
Agriculture%	0.945	(0.47)
Average Consumption	0.029	(1.07)
Av. Consumption squared	-0.000	(-1.10)
Av. Consumption cube	0.000	(1.06)
No. of corregimientos	28	
Pseudo R.2	0.517	

Notes: Z-values are in parentheses.

1997.

Comarca and non-Comarca households have similar demographic characteristics.¹⁰ Table 1 shows that illiteracy incidence is higher in Comarca households however the difference across groups is not statistically significant. Number of persons per household and number of persons with wage per household is statistically different across Comarca and non-Comarca households.

Some households may have preferences to live either in Comarca area or non-Comarca area given the differences in authorities and land tenancy systems in each particular region. If this is the case, self-selection bias is present and it will lead to bias results. I deal with this issue restricting the data to non-migrant Ngobe-Bugle households to avoid self-selection bias.

I use a propensity score matching (PSM) difference in differences approach as robustness check to the baseline results from equation (1). In this particular case, a difference-in-difference estimator will be biased if outcome changes are correlated to initial differences in the number of people per households across Comarca and non-Comarca households. The justification of balancing on propensity scores comes from Rosenbaum and Rubin (1983). The authors argue that if outcomes changes are independent on participation because of X , then they are also independent given the propensity score: $P(X_i) = Pr(T_i = 1 | X), (0 < P(X) < 1)$. And this removes selection bias based on observable characteristics.

This study uses repeated cross-section data. I cannot calculate a propen-

¹⁰Ngobe-Bugle households living in rural and indigenous areas of western Panama share the same culture.

sity score for each household based on initial conditions since I do not observe the same households at different periods. I address this issue applying a propensity score methodology at corregimiento-level, then using households from matched corregimientos in difference-in-differences regressions. Panama is divided into provinces, districts and corregimientos. Similarly, Comarcas are divided into districts and corregimientos.

PSM creates a statistical comparison group based on observable covariates that might affect Comarca placement. Corregimientos that were assigned as part of Comarca are largely inhabited by Ngobe-Bugle people, present low provision of public services, and have lower average consumption than other corregimientos in western Panama.

I balance treatment and control corregimientos in terms of initial conditions that might influence Comarca placement. First, I calculate the average of the following variables for Ngobe-Bugle households at corregimiento-level: number of persons per household; access to piped water; access to electricity; percentage of households engaged in agricultural activities; average consumption; and polynomial terms of initial consumption. Secondly, I estimate a probit regression on observed covariates to obtain a propensity score at corregimiento-level. Finally, I match corregimientos based on the propensity score using Nearest Neighbor Matching technique.

The data is restricted to a small number of corregimientos: 19 in treatment group and 9 in control group. After matching, I drop matched corregimientos that do not satisfy common support. Following Caliendo and Kopeining (2008) the region of common support is defined as the overlap of the minimum and maximum values of the propensity score in both groups.

Table 2 shows the results from the probit model for Comarca placement. None of the variables are statistically significant. This is not surprising given that the data is restricted to rural and indigenous corregimientos inhabited by Ngobe-Bugle people in western Panama. I use non-migrant Ngobe-Bugle households from matched corregimientos to estimate the following difference-in-difference regression:

$$y_{idt} = \beta X_{it} + \gamma \text{ComarcaRegion}_i + \delta \text{ComarcaRegion} \times \text{Post1997}_{idt} + D_d + D_t + \varepsilon_{idt} \quad (2)$$

Where, y_{idt} is an outcome variable. X_{it} controls for household observable characteristics. Comarca region_i is a dummy that takes the value of one if the household is inside the Comarca and zero otherwise. $\text{Comarca} \times \text{Post1997}_{idt}$ is the interaction between treatment dummy and a time dummy variable that takes the value of one for the years 2003 and 2008, and zero for 1997. D_d is district dummy variable and D_t is a time dummy. ε_{it} is an error term.

Appendix 1 looks at the summary statistics at household level from matched *corregimientos*. This time none of the outcome variables and covariates used in this analysis are statistically different across groups. The only exception is number of persons with wage per household which is statistically larger at the 10% in treatment households. The initial difference in that variable is the main caveat of the above estimation however I do not expect it to be a large source of bias in the results. That aside, the PSM approach constructs similar treatment and control groups.

4 Results

This section shows the results of the main estimations of this paper. I.e. the effect of the recognition of indigenous authorities and land rights on household consumption.

4.1 Baseline results

I focus my analyses at household-level to explore the effect of the recognition of indigenous authorities and land rights on Ngobe-Bugle peoples living standards. I restrict the data to non-migrant Ngobe-Bugle households engaged in agricultural activities in western Panama. The main economic activity for Ngobe-Bugle people dwelling in indigenous and rural areas of western Panama is semi-subsistence agriculture. Thus, I use household real consumption as a proxy variable to measure the economic situation and living standards of these people given that various households are not participating in a monetary economy.

Table 3 looks at the effect of the creation of Comarca on household consumption. Column 1 shows a specification without control variables and district fixed effects. $\text{Comarca} \times \text{Post1997}$ is the variable of interest and it shows that the recognition of the semi-autonomous indigenous region have a negative statistically significant effect on household consumption. In column 2, I control for household, head of household observable characteristics, and fixed effects. Again the effect of $\text{Comarca} \times \text{Post1997}$ on household consumption is negative and statistically significant. Column 1 and 2 suggest that the impact of the recognition of indigenous authorities and land tenancy system on consumption is strongly negative. Column 2 suggests that $\text{Comarca} \times \text{Post1997}$ decreases real consumption to households inside the indigenous area around 30% relative to households outside the indigenous region.

Column 2 of Table 3 shows that persons per household is strongly positive and statistically significant. Number of persons with wage controls for

Table 3: Effects of the creation of the Comarca on consumption

	Log household consumption			
	Whole dataset (1)	(2)	Matched (3)	Corregimientos (4)
Comarca×Post1997	-0.557*	-0.343*	-0.855**	-0.793*
	(0.270)	(0.182)	(0.293)	(0.388)
Comarca region	-0.133	-0.255	0.135	0.348
	(0.280)	(0.263)	(0.257)	(0.329)
Persons per household		0.051***		0.064***
		(0.010)		(0.018)
No. of persons with wage in household		0.183***		0.083**
		(0.026)		(0.027)
Illiterate dummy		-0.277***		-0.235**
		(0.046)		(0.084)
Gender of household head dummy (male=1)		-0.131**		0.031
		(0.055)		(0.133)
Age of household head		0.019**		0.018
		(0.008)		(0.013)
Age of household head squared		-0.000**		-0.000
		(0.000)		(0.000)
District fixed effects	No	Yes	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	712	712	211	211
R-squared	0.186	0.385	0.344	0.553

Notes: Non-migrant households that are engaged in agricultural activities. Columns 3 and 4 use households from matched corregimientos. Standard errors clustered at district level in parentheses. ***, ** and * stands for significance at the 1%, 5% and 10% respectively.

off-farm income. Even though all households are engaged in agricultural activities, some household members sell their labor in the informal and formal job market. As expected the coefficient of number of persons with wage is positive and statistically significant on log consumption. Illiterate is a dummy variable that takes the value of one if household head does not know how to write and read, zero otherwise. It controls for human capital and it has a negative effect on household consumption. Gender of household head is also a dummy variable (male=1, female=0) and it shows that gender is a strong determinant for household consumption. Ngobe-Bugle households with male head have lower consumption than households with female head. Lastly, I control for age of household head. Age of household head increases consumption and it is non-linear given that the squared term is negative.

Columns 3 and 4 of table 3 replicate the estimations of column 1 and 2, respectively, using households from matched corregimientos with a propensity score on common support as a robustness check. The results are consistent given that the coefficient of interest is negative and statistically significant at 10%.

Law 10 of 1997 and its ratification on the Official Gazette in 1999 clarify where private appropriation of land is legally permissible and where it is not in western Panama. Ngobe-Bugle households living outside the new semi-autonomous region have the possibility to acquire land property rights given that the Government of Panama together with international agencies executed land formalization projects at the beginning of the 2000s in rural areas. However, the impact of land regularization is more likely to benefit non-indigenous peasants and large scale landowners because they are better informed about the benefits of land privatization. Ngobe-Bugle traditions do not recognize private land, impeding Ngobe-Bugle households living outside Comarca to benefit from formalization of land (Thampy, 2013).

The results in Table 3 may be explained by the following mechanisms. First, Ngobe-Bugle households living in Comarca territory face a worse off market environment compared to households living outside the indigenous area since the prohibition of land privatization may disincentivize productive investments. Secondly, indigenous authorities need to accept projects that the Government of Panama executes in the area, making difficult to construct public goods and infrastructure since Ngobe-Bugle authorities have a great number of disagreements in their organization.¹¹

¹¹The Government of Panama may not execute some projects based on discrimination against their ethnic minorities.

Table 4: Road situation at community-level (%)

	1997		2003		2008	
	Comarca	Non-Comarca	Comarca	Non-Comarca	Comarca	Non-Comarca
Main road is paved	0.0	25.0	3.1	46.7	3.1	54.5
Main road is dirt road	5.3	37.5	28.1	13.3	53.1	22.7
Have the roads improved? Yes	31.6	37.5	12.5	26.7	34.4	50.0
No. of communities	19	9	32	15	32	22

Notes: Percentages.

5 Economic mechanisms

This section explores possible economic mechanisms and confounding factors to understand why Ngobe and Bugle people inside the indigenous area are having lower levels of consumption relative to their counterparts outside Comarca Ngobe-Bugle.

5.1 Market participation

Ngobe-Bugle communities either outside or inside Comarca region suffer from alienation and ethnic discrimination from other members of the Panamanian society. Indigenous populations are under-served of all types of public goods regardless of their geographical location in Panama.

Qualitative data suggests the existence of under-provision of roads and lack of maintenance of the existing road networks in indigenous areas. LSMS community data asks leaders of each community about the state of road infrastructure. Table 4 shows qualitative information about the road situation at community-level by Comarca and non-Comarca areas. LSMS asks the following question to leaders of each community: Have the road infrastructure in this community improved in the last 5 years? In 1997, 32% of the leaders from communities in Comarca Ngobe-Bugle and 37% of leaders from communities outside the indigenous region used in this paper answered yes to the question. In 2008, 34% of the community leaders from the indigenous territory agreed that the roads and access points have improved. In contrast, 50% of the community leaders outside the indigenous territory confirmed that the roads improved in 2008. Leaders perception differences about roads infrastructure improvements increases across treatment and control communities throughout time, suggesting a larger under-provision of roads and lack of maintenance of the existing road networks in Comarca Ngobe-Bugle relative to the communities outside the indigenous semi-autonomous territory. Further, a considerable number of communities do not have roads at all in the Comarca area.

Deficient infrastructure affects agricultural market participation. Accord-

ing to the Population Census of Panama of 2000, 91% of the Ngobe-Bugle population is engaged in agricultural activities. Households used in this paper are engaged in agricultural activities regardless of their interactions with the market. The relationship of farm households with the market depends on how the markets work. Lack of infrastructure investments increase transaction costs creating price bands that result in selective market failures. It may leave a number of households to remain self-sufficient (de Janvry et al. 1991). If Ngobe-Bugle authorities are not able to organize to obtain better road networks after the recognition of the Comarca area, the Government of Panama is likely to under-invests since it is not an attractive area to locate productive investments.¹²

Since the recognition of the Comarca land, indigenous authorities present disagreements about who the head of the Comarca Ngobe-Bugle government is, and there has been intense political conflicts (Wickstrom 2003). Market attractiveness is affected by an increase of conflicts coupled with low capacity of indigenous leaders to negotiate with the Government of Panama to obtain infrastructure investments.

Table 5 explores whether the recognition of indigenous authorities over their traditional lands affect the decision to participate in agricultural markets and the amount traded. The outcome variable in Column 1 is a dummy that takes the value of one if the household sells products in the market and zero otherwise. This regression is calculated using a linear probability model. Column 1 shows that the coefficient of interest have negative sign and it is statistically significant on the decision to participate in the market after including control variables and fixed effects. An agricultural household decides whether to participate in the market or not based on fixed transaction costs. These costs include: search for a market; negotiation and bargaining; and screening, enforcement and supervision (Key et al. 2000).

The results in Column 1 of Table 5 suggest that the creation of the Comarca land affects agriculture market participation decisions for households living in the indigenous area relative to control households. The number of markets where farmers can sell their products are low in both sides of the indigenous area, however intermediary costs may be higher in the Comarca region. This translates into higher search and negotiation costs related with agricultural transactions. It is well known that infrastructure investments decrease transaction costs of trading in the market since farm households can obtain benefits from higher availability of inputs, and integration of product and factor markets (Renkow et al. 2004).

¹²Discrimination against ethnic minorities coupled with indigenous authorities disputes and prohibition of private appropriation of land might discourage investments.

Table 5: Effects of Comarca on market participation

	(1)	(2)	(3)
	Sells product in market	Amount traded in US. dollars	log of amount traded
Comarca×Post1997	-0.416** (0.193)	-67.79*** (22.07)	-1.116** (0.448)
Comarca region	-0.003 (0.146)	26.47 (26.56)	1.434*** (0.371)
Persons per household	0.007 (0.006)	2.379 (2.347)	0.010 (0.021)
No. of persons with wage in household	-0.022 (0.021)	9.017 (15.14)	0.155 (0.119)
Illiterate dummy	-0.030 (0.036)	-7.115 (9.413)	-0.175 (0.204)
Gender of household head dummy (Gender=1 if male)	0.032 (0.054)	11.84* (5.645)	0.176 (0.256)
Age of household head	0.002 (0.007)	1.799 (2.021)	-0.047 (0.032)
Age of household head squared	0.000 (0.000)	-0.012 (0.017)	0.000 (0.000)
District fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	712	712	259
R-squared	0.122	0.078	0.568

Notes: Standard errors clustered at district level in parentheses. ***, ** and * stands for significance at the 1%, 5% and 10% respectively.

Column 2 of Table 5 looks at the amount traded in current dollars¹³ after the creation of Comarca. The results indicate that households inside the indigenous territory are earning less from agricultural trade relative to their counterparts outside the indigenous semi-autonomous region. Column 3 explores the decision of how much to sell in the market conditional on participation. Column 3 shows that households in the Comarca area earn 67% less from trading relative to control households.

Construction of new roads and improvement of existing ones is a responsibility of the Ministry of Public Works in both inside and outside the indigenous area. The Government of Panama through the Ministry of Public Works may under-invest in roads inside the indigenous region since infrastructure projects have to be consulted with Ngobe-Bugle authorities and, as explained before, disagreements between indigenous authorities exist.

Construction of new roads and improvement of existing ones is a responsibility of the Ministry of Public Works in both inside and outside the indigenous area. The Government of Panama through the Ministry of Public Works may under-invest in roads inside the indigenous region for the following reasons. First, in Comarca Ngobe-Bugle projects have to be consulted to Ngobe-Bugle authorities in order to be held and, as explained before, disagreements between indigenous authorities exist. Second, marginalization against indigenous people translates into less levels of investment in Comarca Ngobe-Bugle.

5.2 Investments and access to credit

I turn my attention to two other possible mechanisms that could explain the differences in consumption across Comarca and non-Comarca households: low cost investments and access to credit.

Individual property rights are known to affect productivity through a more efficient resource allocation. Two broad channels through which property rights impact resource allocation are: limiting expropriation and facilitating market transactions (Besley and Ghatak 2010). Land property rights are better defined outside the indigenous area however the majority of Ngobe-Bugle households outside the indigenous territory do not have land rights certificates after 1997, experiencing high levels of land informality. Among Ngobe-Bugle people, either living inside or outside the indigenous territory, land rights depend largely on input of labor. Ngobe-Bugle land tenancy sys-

¹³Panama has a dollarized monetary system. US. dollar and Panamanian balboa are the official currencies of Panama since 1903. Balboa is tied to US dollar to an exchange rate of 1:1.

Table 6: Comarca and investments (%)

	1997	2003	2008
Seeds			
Treatment	0	2	34
Control	3	0	0
Natural Fertilizers			
Treatment	0	2	0
Control	0	0	0
Other Fertilizers			
Treatment	0	2	0
Control	0	0	0
Pesticides			
Treatment	5	12	0
Control	6	0	0

Notes: Households that undertook low cost investments by group.

tem is not based on open access common property rights. Instead, use rights are based in terms of who uses or invests labor and time.

Poorly defined land property rights raise land insecurity. High levels of land insecurity increase constraints on investments and on access to credit. I do not expect investments, credits, and land transfers to be potential channels to explain the differences on consumption across groups. Households outside Comarca Ngobe-Bugle are exposed to higher expropriation risks because of the threat that non-indigenous peasants and large landowners represent. Table 6 shows the percentage of Ngobe-Bugle farmers that invest on seeds, natural fertilizers, other fertilizers, and pesticides by treatment and control group. Households living in the indigenous territory are investing more on low cost inputs than households outside. Investment is not a possible mechanism to understand difference in consumption after the delimitation of Comarca borders due to the low percentage of farmers that actually invest. In fact, higher levels of low costs investment inside the indigenous territory can be understood as an increase in land security for Comarca households.

Ngobe-Bugle land tenure system is based on collective land holdings by kin group. After passing Law 10 land markets became nonexistent throughout the territory of Comarca Ngobe-Bugle. Further, as land is not owned privately, it cannot be used as a collateral to obtain credit. Given the lack of formal land rights for households outside Comarca Ngobe-Bugle, they are not likely to obtain loans. As Ngobe-Bugle farmers lack productive assets, agricultural credit markets do not work for indigenous peoples.

Table 7: Comarca, wage and transfer income

	Received wage (1)	Transfers (2)	Remittances (3)	Off-farm income in USD (4)
Comarca× Post1997	0.011 (0.186)	-0.004 (0.039)	-0.015 (0.051)	31.86 (28.16)
Comarca region	-0.113 (0.158)	-0.083 (0.078)	0.099* (0.054)	-14.43 (41.73)
Persons per household	0.021*** (0.004)	-0.003** (0.001)	-0.006* (0.003)	5.644 (4.039)
Illiterate dummy	-0.098** (0.040)	-0.027 (0.030)	-0.016 (0.019)	-41.90** (13.88)
Gender of household head dummy (male=1)	-0.120* (0.055)	-0.179*** (0.040)	-0.106*** (0.027)	-155.67*** (23.18)
Age of household head	0.004 (0.007)	-0.005* (0.000)	0.003 (0.008)	2.198 (1.761)
Age of household head squared	-0.000 (0.001)	0.000** (0.001)	0.000 (0.000)	-0.008 0.017
District fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	712	712	712	712
R-squared	0.153	0.219	0.104	0.196

Notes: Linear probability regressions in Columns 1, 2 and 3. Standard errors clustered at district level in parentheses. ***, ** and * stands for significance at the 1%, 5% and 10% respectively.

5.3 Other possible mechanisms

In this subsection, I explore two alternative mechanisms that could explain the results. First, a worse off business environment in the Comarca region may decrease off-farm work opportunities for treatment households relative to control households. If this is the case, wage would be the main reason why Ngobe-Bugle households outside and inside the indigenous territory have different levels of consumption. Second, NPO's, philanthropic foundations and the Government of Panama provide financial help and transfer payments to Ngobe-Bugle households. I do not expect this to be a relevant explanation because households in both control and treatment areas are poor and with similar economic situation before 1997.

Table 7 explores possible confounding factors. Column 1 shows that whether someone in a household earns money from selling his or her labor is completely unrelated to their location across groups. The outcome variable is a dummy that takes the value of one if someone in the household works outside the farm and receives salary from it, zero otherwise. The results in Column 1 of Table 7 confirm that labor market participation decision is not a mechanism to explain consumption differences.

Column 2 looks at transfer payments, monetary assistance or any other type of financial compensation from the government, foundations or friends. The results of Column 2 show that transfers do not change across treatment and control group after the creation of Comarca Ngobe-Bugle. Similarly, Column 3 indicates that urban-rural remittances are not a confounding factors since the coefficient is not statistically significant.

Column 4 looks at a household's earnings outside the farm in current US dollars. I construct this variable adding household's reported off-farm income (e.g wages, transfer payments, remittances, donations, etc.). The result indicates that other earnings cannot explain the difference in consumption after the recognition of Comarca Ngobe-Bugle.

6 Conclusion

Indigenous peoples are the poorest and most vulnerable citizens of Panama, especially those living in indigenous and rural areas in western Panama. The recognition of indigenous people land rights is an enormous step towards improving the socioeconomic conditions of these groups, however this should be done together with pro-poor policies to reduce poverty, infrastructure projects to facilitate agricultural market transactions, and investments on other public goods to reduce the inequity gap.

Using data from Living Standard Measurement Survey, I demonstrate that the creation of Comarca Ngobe-Bugle is not translating into a better economic development for indigenous populations in western Panama. On the contrary, Ngobe-Bugle households inside the indigenous region are having lower consumption relative to their counterparts living in rural areas of western Panama. The results are robust to specification checks and the main economic mechanism through which the creation of the Comarca area affects consumption is agricultural market participation. Conflicts within indigenous political authorities, coupled with discrimination from the Government of Panama, decrease attractiveness to invest in public goods. Deficient infrastructure increases transaction costs affecting market participation.

Future research should disentangle the impact of the increase of political conflicts from marginalization of Ngobe-Bugle people to understand what is the main political cause that disincentivizes investment of public goods in Comarca Ngobe-Bugle. The results of this study should be interpreted with caution given that the data this paper uses is repeated cross-section. An analysis where I could observe the same households throughout time would be preferable however, to the best of my knowledge, such data do not exist for Ngobe-Bugle people.

Appendix 1: Summary Statistics 1997 from Match results

	Comarca (1)	Non-Comarca (2)	Diff. (3)	t-value (4)
Log household consumption	6.981 (0.662)	6.846 (0.535)	0.135 (0.159)	0.85
Water service	0.356 (0.484)	0.348 (0.487)	0.008 (0.124)	0.06
Electricity access	0.022 (0.178)	0.043 (0.167)	-0.021 (0.044)	-0.48
Household sells products in market	0.067 (0.252)	0.130 (0.344)	-0.064 (0.073)	-0.87
Household trades in market in US dollars	14.5 (83.85)	3.739 (12.99)	10.76 (17.65)	0.61
Remittance household	0.044 (0.208)	0.130 (0.344)	-0.086 (0.067)	-1.28
Persons per household	5.556 (2.350)	5.696 (3.052)	-0.140 (0.668)	-0.21
Illiteracy	0.667 (0.477)	0.478 (0.511)	0.188 (0.125)	1.51
Gender (1= male)	0.889 (0.318)	0.913 (0.288)	-0.024 (0.079)	-0.31
Age of head of household	41.04 (12.38)	45.69 (15.52)	-4.651 (3.463)	-1.34
No. of persons with wage	0.267 (0.618)	0.043 (0.209)	0.223 (0.133)	1.68*
No. of households 1997	45	23		

Notes: Agricultural non-migrant households. In columns 1 and 2 standard deviations are in parentheses whereas in column 3 standard errors are in parentheses.

References

- Acemoglu, Daron, & Robinson, James A. 2001. A Theory of Political Transitions. *American Economic Review*, **91**(4), 938–963.
- Alesina, Alberto, Devleeschauwer, Arnaud, Easterly, William, Kurlat, Sergio, & Wacziarg, Romain. 2003. Fractionalization. *Journal of Economic Growth*, **8**(2), 155–194.
- Aragón, Fernando M. 2015. Do Better Property Rights Improve Local Income?: Evidence from First Nations’ Treaties. *Journal of Development Economics*, **116**, 43–56.

- Baland, Jean-Marie, & Platteau, Jean-Philippe. 1998. Division of the Commons: A Partial Assessment of the New Institutional Economics of Land Rights. *American Journal of Agricultural Economics*, **80**(3), 644–650.
- Besley, T, & Ghatak, M. 2010. Property Rights and Economic Development. *Handbook of Development Economics*, **5**.
- Besley, Timothy. 1995. Property Rights and Investment Incentives: Theory and Evidence from Ghana". *Journal of Political Economy*, **103**(5), 903–937.
- Caliendo, Marco, & Kopeinig, Sabine. 2008. Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, **22**(1), 31–72.
- Dasgupta, Partha. 2010. Place of Nature in Economic Development. *Handbook of Development Economics*, **5**.
- De Janvry, Alain, & Sadoulet, Elisabeth. 2015. *Development Economics: Theory and Practice*. Routledge.
- De Janvry, Alain, Fafchamps, Marcel, & Sadoulet, Elisabeth. 1991. Peasant Household Behaviour with Missing Markets: Some Paradoxes Explained. *The Economic Journal*, **101**(409), 1400–1417.
- Dippel, Christian. 2014. Forced Coexistence and Economic Development: Evidence from Native American Reservations. *Econometrica*, **82**(6), 2131–2165.
- Easterly, William, & Levine, Ross. 2003. Tropics, Germs, and Crops: How Endowments Influence Economic Development. *Journal of Monetary Economics*, **50**(1), 3–39.
- Fenske, James. 2011. Land Tenure and Investment Incentives: Evidence from West Africa. *Journal of Development Economics*, **95**(2), 137–156.
- Gennaioli, Nicola, & Rainer, Ilija. 2007. The Modern Impact of Precolonial Centralization in Africa. *Journal of Economic Growth*, **12**(3), 185.
- Goldstein, Markus, & Udry, Christopher. 2008. The Profits of Power: Land Rights and Agricultural Investment in Ghana. *Journal of Political Economy*, **116**(6), 981–1022.
- Herrera, Francisco. 2012. The Development of Indigenous Territorial Claims and the Response of the State in Panama. *Quaderns-e*, **17**(1), 44–59.

- Key, Nigel, Sadoulet, Elisabeth, & Janvry, Alain de. 2000. Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics*, **82**(2), 245–259.
- Khandker, Shahidur R, Koolwal, Gayatri B, & Samad, Hussain A. 2009. *Handbook on impact evaluation: Quantitative methods and practices*. World Bank Publications.
- Michalopoulos, Stelios, & Papaioannou, Elias. 2013. National Institutions and Subnational Development in Africa. *The Quarterly Journal of Economics*, **129**(1), 151–213.
- Ostrom, Elinor. 2015. *Governing the commons*. Cambridge University Press.
- Renkow, Mitch, Hallstrom, Daniel G, & Karanja, Daniel D. 2004. Rural Infrastructure, Transactions Costs and Market Participation in Kenya. *Journal of Development Economics*, **73**(1), 349–367.
- Rosenbaum, Paul R, & Rubin, Donald B. 1983. The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika*, **70**(1), 41–55.
- Sachs, Jeffrey D. 2003. *Institutions Don't Rule: Direct Effects of Geography on per Capita Income*. Tech. rept. National Bureau of Economic Research.
- Solis Rivera V.; Madrigal Cordero P.; Fonseca Borrás M.; Govan H., Varela V. 2006. Community Conservation Areas in Central America: Recognising them for Equity and Good Governance. *Parks*, **16**(1), 21–27.
- Thampy, Gayatri. 2013. *Indigenous Contestations of Shifting Property Regimes: Land Conflicts and the Ngobe in Bocas del Toro, Panama*. Ph.D. thesis, The Ohio State University.
- Vakis, Renos, & Lindert, Kathy. 2000. Poverty in Indigenous Populations in Panama: A Study Using LSMS Data". *Banco Mundial, LCSHD Paper Series*.
- Wickstrom, Stefanie. 2003. The Politics of Development in Indigenous Panama. *Latin American Perspectives*, **30**(4), 43–68.
- Young, Phillip, & Bort, John. 1979. The Politicization of the Guaymi. *Journal of the Steward Anthropological Society*, **11**(1), 101–119.