Multinationals, Monopsony and Local Development:
Evidence from the United Fruit Company*

Esteban Méndez-Chacón
Central Bank of Costa Rica

Diana Van Patten
UCLA

November 4th, 2019
Click here for most recent version.

Abstract

This paper studies the short- and long-run effects of large firms on economic development. We use evidence from one of the largest multinationals of the 20th Century: The United Fruit Company (UFC). The firm was given a large land concession in Costa Rica — one of the so-called "Banana Republics"— from 1889 to 1984. Using administrative census data with census-block geo-references from 1973 to 2011, we implement a geographic regression discontinuity (RD) design that exploits a quasi-random assignment of land. We find that the firm had a positive and persistent effect on living standards. Regions within the UFC were 26% less likely to be poor in 1973 than nearby counterfactual locations, with only 63% of the gap closing over the following 3 decades. Company documents explain that a key concern at the time was to attract and maintain a sizable workforce, which induced the firm to invest heavily in local amenities that likely account for our result. We then build a dynamic spatial model in which a firm's labor market power *within* a region depends on how mobile workers are *across* locations and run couterfactual exercises. The model is consistent with observable spatial frictions and the RD estimates, and shows that the firm increases aggregate welfare by 2.9%. This effect is increasing in worker mobility: If workers were half as mobile, the firm would have *decreased* aggregate welfare by 6%. The model also shows that a local monopsonist compensates workers mostly through local amenities keeping wages low, and leads to higher welfare levels than a counterfactual with perfectly competitive labor markets in all regions, if we assume amenities have productivity spillovers.

Keywords: Multinationals, Economic Development, Monopsony, Labor Mobility.
JEL Codes: F23, J42, O43, R13.

---

*Contact emails: dvpr@ucla.edu, mendezce@bccr.fi.cr. We are especially grateful to Ariel Burstein, Lee Ohanian, Pablo Fajgelbaum, Michela Giorcelli for their guidance and support. We thank Treb Allen, Andy Atkeson, Andy Bernard, Dora Costa, Ellora Derenoncourt, Eric Edmonds, Sebastian Edwards, Simon Fuchs, Walker Hanlon, Douglas Irwin, Keith Jenkins, Jorge León, Adriana Lleras-Muney, Sara Lowes, Erzo F.P. Luttmer, Douglas L. Miller, Paul Novosad, Nina Pavcnik, Adolfo Quesada-Román, James Schmitz, Todd Schoellman, Armand Sim, Vladimir Smirnyagin, Vitaly Titov, Ronny Viales, Jonathan Vogel, and Romain Wacziarg for helpful comments and discussion.

1 Introduction

The top 1% of the largest firms in emerging economies account for more than one-half of local exports and are primarily foreign-owned (Freund and Pierola, 2015). Despite their central role in developing countries, the extent to which host economies benefit from these enterprises is widely debated. On the one hand, monopsony power and the extractive activities of these foreign companies may explain why some places remain persistently poorer than others (Borensztein et al., 1995; Aitken and Harrison, 1999; Xu, 2000; Alfaro et al., 2003; Alfaro and Charlton, 2007). The other side believes that the new technologies and capital injections associated with these firms can positively affect long-run growth (Blomstrom, 1986; Blomstrom and Wolff, 1989; Lipsey, 2002; Smarzynska Javorcik, 2004; Harrison and Rodríguez-Clare, 2009). The empirical evidence, however, remains scarce. In fact, it is challenging to estimate the causal effects of these firms on local development and follow their evolution over time.

This paper studies the short- and long-run effects of large foreign investment projects on local economic development. We also explore the role of local monopsony power and of the spatial structure of the labor market in determining the direction and persistence of these effects. We use evidence from one of the largest multinationals of the 20th Century: the United Fruit Company (UFC), the infamous firm hosted by the so-called "Banana Republics". This American firm was given a large land concession in Costa Rica,[1] in and was the only employer in this region — where it required workers to live — from 1889 to 1984. In this sense, the firm appeared to function as a *local* monopsonist.

The concession had a well-defined boundary. We identify a segment of this boundary that was redrawn quasi-randomly.[2] This quasi-random variation, along with detailed census micro-data geo-referenced at the census-block level, allows us to use a geographic regression discontinuity design to identify the effect of being under the company's *direct* influence. Specifically, we compare units located within a close distance from, but on different sides of, the UFC boundary. Our data spans over a decade before the company stops operating, and almost three decades after its closure (1973-2011), which allows us to document how the UFC effect evolves over time.

[1]This concession was equivalent to 4% of the national territory and around 1800 hectares. For reference, since 2006, more than 400 land acquisitions in Africa, Central and Southeast Asia, Eastern Europe and Latin America have been larger than the UFC's concession in Costa Rica (Cotula and Vermeulen, 2009).

[2]This segment of the boundary was redrawn in 1904 and jointly shaped by a river and how this river intersected preexisting land plots, leading to a border with balanced geographic attributes and uncorrelated with ex-ante determinants of growth.

We find that households living within the former UFC regions have had better economic outcomes (housing, sanitation, education, and consumption capacity), and were 26% less likely to be poor than households living outside. This effect is persistent over time: Since the UFC closed, the treated and untreated regions have converged slowly, with only 63% of the income gap closing over the following 3 decades.[3]

Historical data collected from primary sources suggests that investments in local amenities carried out by the UFC — hospitals, schools, roads — are the main drivers of our results. For instance, we document that investments per student and per patient in UFC-operated schools and hospitals were significantly larger than in local schools and hospitals run by the government, and sometimes even twice as large. Access to these investments was restricted, for the most part, to UFC workers who were required to live within the plantation. This might explain the sharp discontinuity in outcomes right at the boundary.[4] We do not find evidence of other channels, such as selective migration or negative spillovers on the control group, being the main mechanisms behind our results.

Why were these investments in local amenities higher than in the rest of the country? While the company might have invested in hospitals to have healthier workers, it is less clear why it would benefit from more schooling. Evidence form archival company annual reports suggests that these investments were induced by the need to attract and maintain a sizable workforce, given the initially high levels of worker turnover.[5] For instance, after describing annual turnovers of up to 100% per year, the 1922 report states "These migratory habits do not permit them to remain in the plantation from one year to the next, and *as soon as they become physically efficient in our methods and acquire money they either return to their homes or migrate elsewhere and must be replaced*." Later, the 1925 report states "We recommend a greater investment in corporate welfare beyond medical measures. An endeavor should be made to stabilize the population...we must provide measures for taking care of families of married men, by furnishing them with *garden facilities, schools, and some forms of entertainment. In other words, we must take an interest in our people if we might hope to retain their services indefinitely*."

The quantitative evidence on workers' outside option is consistent with the qualitative evidence from the company reports. In fact, empirically, the intensity of UFC's investments

[3]Robustness checks include a falsification test, in which we draw placebo borders and rerun our analysis; using different bandwidths and considering different subsamples of the population, such as only non-migrants.

[4]For instance, only workers and their families could live within the plantation, and there was restricted access to hospitals and schools for families of non-workers.

[5]High turnover was a result of the workers' outside option: coffee. Unlike bananas, coffee is a seasonal crop, and workers could earn relatively high wages during the coffee harvesting season.

in a location is positively correlated with the degree of competition for labor faced by the company. Using suitability to grow coffee (the main outside option for agricultural workers at the time) to instrument for wages, we find that locations where workers had a 10% higher outside option in 1973 also had a 0.01% lower probability of being poor in 2011, on average.

Our mechanisms suggest that the relationship between labor mobility, monopsony, and investments was crucial in determining the firm's effect. Motivated by this evidence and the growing literature on the effects of market power, and in order to account for spillover and run a counterfactual analysis, we build a dynamic model of economic geography. This framework allows us to have a better understanding of the company's aggregate effect after accounting for spillovers, and to run counterfactuals to shed light on how the firm's impact changes in scenarios with less worker mobility or with a more competitive labor market.

In our model, the company is a local monopsony in one location, while workers are mobile across locations. Thus, *the less mobile workers are, the more inelastic the labor supply that the firm faces is.* In other words, the degree of monopsony power of the firm *within* its region depends on how mobile workers are *across* locations. To incorporate the investment dynamics that we documented empirically, we assume that the local monopsonist can choose workers' compensation bundle: a combination of wages *and* local amenities. These local amenities are costly for the firm and depreciate over time, but increase workers' utility and have productivity spillovers that make them more productive. Understanding the conditions that determine the composition of this compensation is one of our goals.

The model is consistent with local estimates from our empirical analysis and moments of the historical data, and captures observable spatial frictions. We also use the migration gravity equation along with an instrumental variables strategy that follows Allen and Donaldson (2018) to obtain an estimate of the migration elasticity.

We find that after accounting for spillovers, the company increased the country welfare by 2.9%. A counterfactual exercise with perfect competition in the labor market in all regions, as opposed to monopsony within the company's region, shows a difference in the composition of the compensation bundles chosen by the firm. A monopsonist compensates workers mostly through local amenities while keeping wages low. Assuming the firm has no monopsony power, however, leads to a compensation consisting mostly of wages, with lower levels of investment. If we assume amenities (schools, hospitals) have productivity spillovers, aggregate welfare is higher in the monopsonist's case compared with a case that features perfect competition in every region's labor market.

The company's welfare effect also depends crucially on worker mobility. For instance,

the firm would have *decreased* aggregate welfare by 6% if workers were half as mobile. The intuition behind this result is that if workers are less mobile their outside option decreases, and the company can reduce their compensation. In the extreme case of immobile workers, the company could potentially not pay for the labor input, thereby negatively affecting worker's welfare.

The results of this counterfactual analysis – that the firm could have had a large negative impact on welfare if workers were relatively immobile – allows us to reconcile our results with findings from a growing body of literature that analyzes the long-run impact of colonial and historical institutions on economic development. Most prior literature has considered settings in which labor was coerced and relatively immobile, such as the slave trade (Nunn, 2008), the *mita* system in Peru (Dell, 2010), forced coffee cultivation in Puerto Rico (Bobonis and Morrow, 2013), forced rubber cultivation in Africa (Lowes and Montero, 2016), or the Dutch Cultivation System (Dell and Olken, 2017). This literature consistently finds that companies tend to underprovide public goods within their concessions and that exposure to these regimes can lead to negative and persistent effects on development.[6] We thereby complement these studied by shedding light on the importance of workers' outside options in determining the direction of this effect.

Our works also contributes to three strands of the literature on the consequences of firms exercising market power. Our contribution to this literature is threefold. First, we explore theoretically and quantitatively how the degree of labor market power of a firm *within* a location depends on the mobility of workers *across* locations. This idea was explored by early literature describing the market for college professors, in which some employers are geographically isolated and pay low wages to professors with high moving costs (Black and Loewenstein, 1991; Ransom, 1993), and more recently by recent literature on labor economics that studies the effects of local labor market power and how this affects the spatial distribution of employment (Neumark et al., 2008; Holmes, 2011; Pope and Pope, 2015).[7] Second, we explore how this local monopsony power affects a firm's incentive to invest in local amenities, and consider a compensation that does not focus only on wages as in Gutiérrez and Philippon (2017) and Autor et al. (2017), who document an increase in market power associated with declines in the labor share across many industries. More recently, Berger et al. (2018) build a model to study labor market power and the declining

[6] An exception being Dell and Olken (2017), who find that villages forced to grow sugar cane have better long-run outcomes as a result of sugar factories and industrial structures promoting economic activity, with locations close to former factories in the mid-19th century being more industrialized today.

[7] Recent work by (Kahn and Tracy, 2019), which was developed in parallel with ours, also explores how local monopsony power affects the spatial distribution of wages and rents across cities.

labor share in the US. Third, we study long-run outcomes and how persistent these effects can be.

Finally, the paper is related to the literature on the effects and spillovers of foreign direct investment (FDI). Our paper contributes to this literature by providing novel micro-evidence of the benefits of large-scale FDI through a natural experiment. Empirical studies of the effects of FDI have produced mixed evidence. While some studies find evidence of FDI being beneficial using macro- and micro-data (e.g., Blomstrom 1986; Blomstrom and Wolff 1989; Smarzynska Javorcik 2004; Lipsey 2006; Harrison and Rodríguez-Clare 2009), others are not so optimistic about these benefits, especially for developing countries (e.g., Aitken and Harrison 1999; Borensztein et al. 1995; Xu 2000; Alfaro et al. 2003; Alfaro and Charlton 2007). We show how in a context with high labor mobility FDI had positive local and aggregate effects due to the need to compete for labor, while in cases with low labor mobility, both local and aggregate effects can be negative.

The rest of the paper is organized as follows. Section 2 provides an overview of the historical background. Section 3 includes details of the data used in our analysis. We describe our estimation framework in Section 4. Section 5 presents our results. We discuss evidence on the potential the mechanisms behind our findings in Section 6. Section 7 develops the model and presents the counterfactual exercises, and Section 8 concludes.

2 Historical Background

2.1 Historical Overview

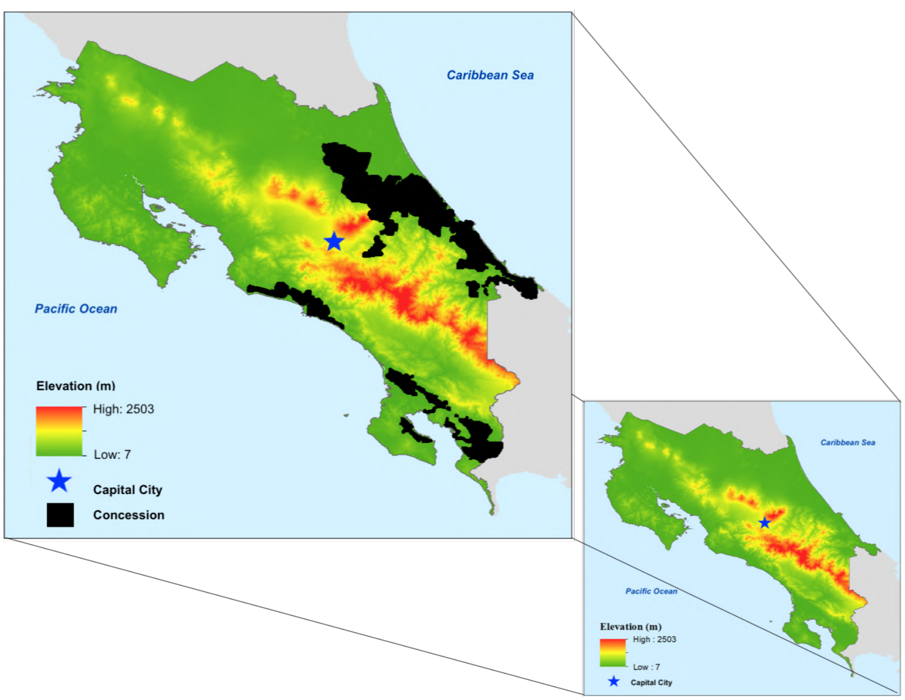
The history of banana plantations in Costa Rica dates back to the construction of from the capital to the Caribbean Coast in 1880. In exchange of building this railroad, the government gave Minor C. Keith –an American contractor– a concession of 3,333 km^2 of undeveloped land equivalent to 4% of the country's territory (Casey, 1979). The area corresponding with this concession is shown in Figure 1. After completing the railroad's construction, Keith experimented with exporting the bananas he had planted along the railroad tracks to feed workers (Bucheli, 2005). The experiment was successful, and the UFC was founded in 1899.

With its headquarters in Boston, the company eventually had operations in Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Honduras, Jamaica, Nicaragua, and Panama (May and Lasso, 1958). According to the UFC's Annual Reports to the Shareholders, by 1930, the company landholdings in Latin America reached 13,339.12 km^2.

The UFC transformed the acquired lowlands into plantations and towns, where it provided healthcare, housing, schooling and sanitation to its workers and their families. The UFC also invested in infrastructure, such as wireless communication systems to coordinate the whole process, and railroads to carry the bananas from the plantations to the ports where the bananas were shipped to the United States and Europe in company vessels. However, the firm was also infamous for its extractive practices in many of the "Banana Republics" where it operated. In Costa Rica, the UFC significantly transformed the local economy. By 1950, it was responsible for 58% of the country's total exports. It employed approximately 7% of of the country's total labor force and 12% of its agricultural labor force.

In 1984 the UFC went bankrupt and stopped production in the area of our study. The reasons for this closure include expropriations in other countries (like Cuba and Nicaragua), a sequence of hurricanes that destroyed some of the remaining plantations in the Caribbean (not in Costa Rica), and scandals of corruption that significantly affected the firm's stock price. After the firm's closure, land in the area of our study was auctioned and sold to the highest bidder. More historical details are discussed in Appendix A.

Figure 1: The UFC's Boundary



Notes: The area of the UFC's concession is shown in black. These contours surrounds the areas of land concession that was given to the UFC. Elevation is shown in the background

2.2 Land Assignment

Understanding why some land was assigned to the company is key in identifying its long-run impact. It is documented that the firm took into consideration geographic characteristics when negotiating which areas were going to be part of their land concession (Casey, 1979; Cerdas Albertazzi, 1993). Thus, it is not surprising that geographical features change discretely along many segments of the UFC boundary, as shown in Figure 1.

However, in the Caribbean Coast, we identified an area where land was assigned quasi-randomly. Initially, due to ambiguities in the concession's contract, the UFC and the government had some discrepancies regarding the limits of the concession. In 1904, a legislative decree resolved these differences in criterion. The modification declared some land—that the UFC considered as part of the original concessions—as state property. Officially, this area was called Astúa-Pirie Soley (1940), and the decree specified that the property rights over these lands could not be sold back to the company (Viales, 2012).

Because the Caribbean Coast was very scarcely populated, the boundaries of the Astúa-Pirie region were chosen using features of the landscape as reference so that they would be easy to enforce for the local authorities. The legislative decree declared that the southern boundary of the Astúa-Pirie region would "follow the Reventazón River, from La Junta to the Caribbean Sea."[8]; its eastern boundary adjoins the Atlantic Ocean; its northern boundary would "follow an imaginary line drawn from the intersection between Toro Amarillo River with the old railroad up to a point in the coast located five miles northeast from the mouth of Tortuguero River."[9]; finally, the western boundary would "follow the main railroad, from La Junta to the point where the railroad crosses Toro Amarillo River"(ANCR, 1904, p. 44).

In practice, the southern boundary—that defines the limit between the Astúa-Pirie region and the UFC—follows the Reventazón River *closely but not exactly.* The reason is that preexisting plots of land that overlapped with the river were not broken apart, leading to a border with straight lines.

2.3 Commuting Between Regions

People who lived in regions near UFC plantations, in general, did not commute and work for the company or used its services. Unlike other types of agricultural activities with a seasonal demand for labor, the UFC needed a permanent labor supply of around 150 workers per 800-

[8]La Junta was the point where the railroad from the capital intersected the railroad from Limón.

[9]The "old railroad" was the name given to the railroad to Guápiles because it was the remains of an unsuccessful previous attempt to build a railroad to the central valley.

acre farm, and there were several incentives to keep people from commuting in and out of the plantation.

First, due to the extension of the plantations and to reduce transportation costs, the UFC created camps within their farms for its workers (Cerdas Albertazzi, 1993). The typical farm consisted of 800 acres of land, with about 20 acres devoted to campsite and buildings, and 150 acres to pasture land (Jones and Morrison, 1952). Besides houses and administrative buildings, special facilities were also present, such as commissaries, schools, electric plants, sewage systems, and recreational facilities (Wiley, 2008). The wide range of services and facilities provided by the company converted plantations into communities that allowed people to live and work full time within them.[10] Second, given concerns about malaria spreading from outside the plantation, only workers were allowed to live within the UFC and flows of people were discouraged. Finally, people living in areas around the UFC had restricted access to services provided by the company. For example, as we describe in Section 5, data on patients at UFC hospitals suggests that most of them were workers or part of a workers' family. For the few non-workers in the hospitals' records, we observe average spending per patient was lower relative to workers and their families, suggesting that commuters could not enjoy the amenities the company provided in the same way as locals. More details are discussed in Section 6.1.1.

2.4 Other Historical Examples

Historically, it has been relatively common for one or a few large companies—often foreign ones—to dominate a local economy in a developing region. In colonial and quasi-colonial arrangements, labor was sometimes coerced into working for a major producer; examples like the mita mining system in Peru (Dell, 2010), coffee farms in Puerto Rico (Bobonis and Morrow, 2013), or rubber cultivation in South Africa (Lowes and Montero, 2016) have been studied in detail. Another example is the Dutch East India Company, which used both coerced and paid labor while being a monopsony in many of the regions where it operated (Lucassen, 2004). Other case which involved coerced labor is the 1891 charters from the Portuguese to the Mozambique Company and the British Nyassa Company to administer the southern part of Mozambique for 50 years and the northern part of the country for 35

[10]For people within the plantations, the company was omnipresent in their lives. (Harpelle, 2001) mention that typical residents "were likely born in the company hospital, educated in the company school, lived in company housing, obtained household supplies and clothing from the company commissaries, and, if they could afford it, looked forward to being carried to their final resting places in the Northern Railway's [a subsidiary of the UFC] funeral car."

years, respectively (Vail, 1976). A more current example is the entrance of Firestone into Liberia in 1928, when rubber became crucial to the local economy. For instance, in 1972, Firestone produced 57% of the Liberian agricultural output and 6% of its GDP (McCoskey, 2011).

Finally, it is worth mentioning that these large investment projects are not only in the past. A recent wave of large-scale land acquisitions in developing countries—the so called "land grabs"—has been a subject of great debate. Driven mostly by a concern over food security and the biofuels boom, these projects consist of large leases (of up to 99 years) or purchases of farmland for agricultural investment in Africa, Central and Southeast Asia, Eastern Europe and Latin America; some of them involving hundreds of thousands of hectares (Cotula et al., 2009; Cotula and Vermeulen, 2009). For instance, since 2006, over 400 land concessions in developing countries were assigned to foreigners to develop agricultural activities, and were larger than the UFC's land concession in Costa Rica.[11]

3 Data

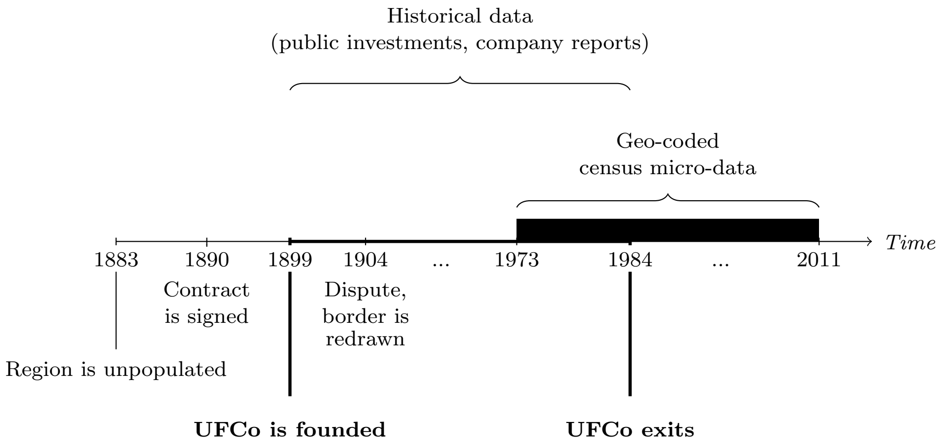
3.1 Outcome Data

We examine the UFC's long-run impact on economic development by testing whether it affects living standards today. To measure living standards, we obtained restricted-access microdata from Costa Rican Censuses collected by the National Institute of Statistics and Census (Instituto Nacional de Estadística y Censos) for years 1973, 1984, 2000, and 2011. As the UFC stopped operations in 1984, the range covered by these censuses allows us to analyze the outcomes during and after the company's tenure. For ease of exposition, Figure 2 shows how the available data fits into a time line of main events.

The data is recorded at the census-block level, the smallest territorial division of the country. Both the size and borders of a census-block change across censuses. For the 1973, 1984, and 2000 censuses, each census-block contains approximately 60 dwellings in urban areas and 40 dwellings in rural areas. They also tend to coincide with one or two city blocks in urban areas (Bonilla and Rosero, 2008). For the 2011 census, in most cases, the census-block coincides with a city-block (Fallas-Paniagua, 2013). For all years, the data include each census-block centroid's coordinates. The level of spatial disaggregation provided by the

[11] For instance, in Ethiopia, Ghana, Madagascar and Mali leases add up to 2 million hectares, with allocations to foreign investors accounting for over 1.4 million hectares (which is roughly the size of Swaziland or Kuwait).

Figure 2: Main Events and Data Availability



census-block data allows us to compare observations within close proximity of each other.

Except for the 1973 census, which includes information on wages, later censuses do not contain direct measures of income or consumption. Therefore, we follow the "Unsatisfied Basic Needs" (UBN) method to generate variables that measure economic outcomes. The UBN method was introduced by the Economic Commission for Latin America and the Caribbean (ECLAC), to identify households in poverty without relying on income data (Feres and Mancero, 2001). The method requires specifying a set of basic needs and a threshold to consider those needs as "satisfied" (Armendáriz and Larraín B., 2017).[12]

We construct variables that capture four dimensions: housing, sanitation, education, and consumption. While Appendix B details the specific variables from the censuses that constitute each dimension, a general description of each is the following: (i) housing: refers to the quality of the household dwelling's material and household overcrowding; (ii) sanitation: refers to the method for disposal of human excreta that the household uses; (iii) education: refers to school attendance and academic achievement for household members from 7 to 17 years old; and (iv) consumption: refers to the relationship between the number of income recipients (employed, pensioned, or renter), their years of schooling, and the total number of household members. A household is considered poor if it has at least one unsatisfied need. We then estimate the severity of poverty through the total number of UBN: an index that ranges from 0 to 4, where each unsatisfied basic need adds one point to the index.

[12]As a robustness check, we also use a different unsatisfied basic needs for Costa Rica constructed by Méndez and Trejos (2004) using questions from the 2000 census. It is straightforward to apply their method to the 2011 census (Méndez and Bravo, 2014), while to extend it to the 1973 and 1984 censuses, we restrict the set of unsatisfied basic needs to those whose information is available in all the four censuses considered in our paper.

3.2 Historical Data

To understand which census-blocks were directly affected by the UFC, we collected and digitized maps of the company's properties, which were published by the UFC Engineering Department and are available in the Costa Rican National Archive.[13]

For a better understanding of living standards and investments during UFC's tenure, we collected and digitized UFC reports with data on wages, number of employees, production, and investments in areas such as education, housing, and health from collections held by Cornell University, University of Kansas, and the Center for Central American Historical Studies. We also use annual reports from the Medical Department of the UFC describing the sanitation and health programs and spending per patient in company-run hospitals from 1912 to 1931. We also collected data from Costa Rican Statistic Yearbooks, which from 1907 to 1917 contain details on the number of patients and health expenses carried out by hospitals in Costa Rica, including the ones ran by the UFC. Export data was also collected from these yearbooks, and from Export Bulletins. 19 agricultural censuses taken between 1900 and 1984 provide information on land use, and we use data from Costa Rican censuses between 1864-1963 to analyze aggregated population patterns, such as migration before and during the UFC apogee, or the size and occupation of the country's labor force.

4 Impact of the Company

4.1 Empirical Strategy

To estimate the causal effect of the UFC, we use well-defined boundaries based on historical records and compare observations located just inside former UFC plantations to observations located just outside them. Our estimation of the *average* UFC effect uses the following RD specification:

$$y_{igt} = \gamma UFC_g + f(\text{geographic location}_g) + \mathbf{X}_{igt}\beta + \mathbf{X}_g\Gamma + \alpha_t + \varepsilon_{igt}, , \quad (1)$$

where y_{igt} is an outcome of individual or household i in census-block g and year t; and UFC_g is an indicator variable equal to one if the census-block g's centroid was inside a UFC plantation,

[13] Although the Virtual Map Library of the National University of Costa Rica (Mapoteca Virtual de la Universidad Nacional de Costa Rica) has digitized part of the collection, collecting all available maps required in-person visits to the archives, taking high-quality pictures of the original maps, and digitizing them. Figure 14 in Appendix C provides an example of a map showing the UFC landholdings in the Costa Rican Pacific Coast.

and equal to zero otherwise. $f(\text{geographic location}_g)$ is a RD polynomial, which is a smooth function on latitude and longitude that controls for the geographic location of census-block g. This multidimensional discontinuity in a longitude–latitude space allows us to compare units, not only on different sides of the boundary, but on a comparable position. Following Gelman and Imbens (2017), and in line with recent work whose estimation framework relies on a geographical regression discontinuity design (Dell et al., 2015; Lowes and Montero, 2016; Dell and Olken, 2017), we use a linear RD polynomial in longitude–latitude and test for robustness to a variety of specifications. $\mathbf{X}_{igt}$ is a vector of covariates (number of adults, children, infants per household) for individual or household i. $\mathbf{X}_g$ is a vector of geographic characteristics (slope, elevation, temperature) for census-block g, and α_t is a year fixed effect.

In order to study a *time-varying* UFC effect, we allow for a different UFC coefficient in every census, by estimating the following RD specification:

$$\begin{aligned} y_{igt} = &\gamma_{1973} UFC_{g,1973} + \gamma_{1984} UFC_{g,1984} + \gamma_{2000} UFC_{g,2000} + \gamma_{2011} UFC_{g,2011} + \\ &f(\text{location}_g) + \mathbf{X}_{igt}\beta + \mathbf{X}_g\Gamma + \alpha_t + \varepsilon_{igt}, \end{aligned} \tag{2}$$

where the indicator variable $UFC_{g,t}$ is equal to one if at time t individual or household unit i is in census-block g, whose centroid was inside a UFC plantation; and equal to zero otherwise.

4.2 Pre-Characteristic Balance

We begin by examining whether geographic characteristics are similar along the re-drawn boundary that was described in Section 2.2. Namely, we test a null hypothesis of no geographical differences on both sides of this segment of the UFC boundary. We fail to reject this null in the segment shown in Figure 3. In this area, the border was redrawn arbitrarily and geographic characteristics are balanced. Table 1 shows that elevation, slope, and temperature do not change discretely across this segment of the UFC boundary, thus fail to reject our null. [14] Following (Conley, 1999), we allow for spatial dependence of an unknown form (reported in brackets). For comparison, we also report robust standard errors

[14]The unit of analysis to examine the geographic characteristics is a 1x1 km grid cell. Results are statistically equal if we use 1x1 km grid cells or census-blocks as the unit of analysis. Elevation and temperature data were obtained from the Global Climate Database created by Hijmans et al. (2005). The spatial resolution is 30 arc-seconds. Elevation above sea level is in meters and was constructed using NASA's Shuttle Radar Topography Mission data. From the elevation information, we calculate the slope (in degrees). Hijmans et al. also compiled monthly averages of temperature measured by weather stations from 1960 to 1990. We measure temperature in Celsius and take an annual average.

(in parentheses). [15] This table also shows that as we move far away from this segment of the boundary the differences in elevation, slope, and temperature become significant.

Therefore, exploiting the level of disaggregation of our data – which includes close to 9000 households even within this subregion – and not to contaminate the analysis that might be very sensitive to changes in the landscape (most economic activity was related to agriculture)– our main results will include only observations whose census-block's centroid is located within 5 km from this segment of the UFC boundary; where we know the border was arbitrary and observable geographic features are balanced.

Figure 3: Study boundary. Elevation is shown in the background.

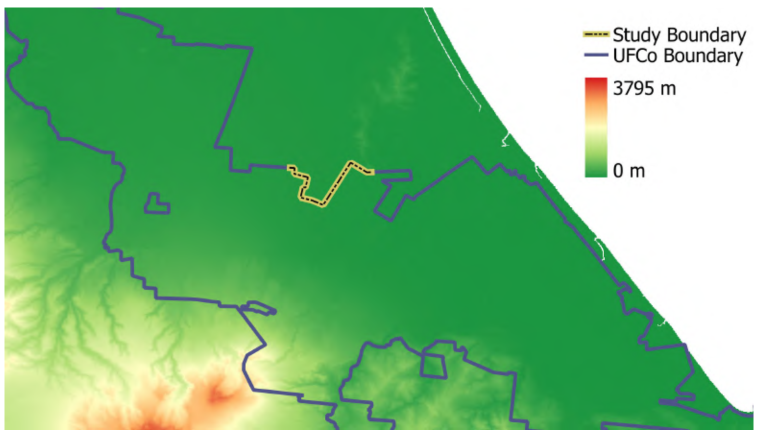


Table 1: Balance on Geographic Characteristics

	Sample falls within					
	<5 km of UFC boundary			<10 km of UFC boundary		
	Inside	Outside	s.e	Inside	Outside	s.e
Elevation	38.552	38.235	(1.330)	50.893	37.759	(2.273)***
			[3.530]			[6.514]**
Slope	0.256	0.312	(0.072)	0.493	0.328	(0.063)***
			[0.140]			[0.154]
Temperature	26.087	26.097	(0.006)	26.028	26.097	(0.011)***
			[0.014]			[0.031]**

Notes: The unit of observation is 1x1 km grid cells (with 181 and 309 cells in our sample when considering 5 and 10 km, respectively). Robust standard errors for the difference in means between UFC and non-UFC observations are in parentheses. Conley standard errors for the difference in means are in brackets. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In terms of pre-existing social and economic characteristics, the study area was close to being uninhabited before the UFC's arrival, thus having no pre-trends on either side of the

[15] We compute Conley Standard errors at the cutoff distance of 2 km. However, the results are robust to alternative cutoffs.

boundary. According to the 1864 Costa Rican Census, only 545 people lived in the entire Caribbean Coast, a 0.45% of the Costa Rican population at that time (Oficina Central de Estadística, 1868). Company officials wrote that when they first arrived "with the exception of the little village of Matina, which contained fifty or sixty inhabitants, not one individual was settled anywhere on the line. In fact, the route had not even been explored, and the rivers were first named when the engineers crossed them"(Keith, 1886).

5 Results

5.1 Average Effect Pooling Across Years

Table 2 explores whether households living in areas that were directly exposed to the UFC are on average better-off than those living just across the border. The table includes the results of estimating Equation 1 using the probability of having an unsatisfied basic need (UBN) in each dimension (housing, sanitation, education, and consumption), the probability of being poor, and the total number of UBNs as dependent variables. All regressions include geographic controls, demographic controls for the number of household members aged 0-4 (infants), 5-14 (children), and 15 and older (adults), census fixed effects, and a linear polynomial in latitude and longitude. We report standard errors clustered at the census-block level and Conley standard errors.

Table 2: Average UFC Effect

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.095	-0.016	-0.057	-0.059	-0.124	-0.228
	(0.026)***	(0.017)	(0.022)**	(0.025)**	(0.031)***	(0.057)***
	[0.029]***	[0.015]	[0.019]***	[0.025]**	[0.026]***	[0.051]***
Adjusted R^2	0.102	0.173	0.241	0.015	0.115	0.200
N	8,786	8,786	8,786	8,786	8,786	8,786
Clusters	200	200	200	200	200	200
Mean	0.176	0.060	0.235	0.200	0.481	0.670
% Variation w.r.t. Mean	**-54.0**	**-26.7**	**-24.3**	**-30.0**	**-25.8**	**-34.0**

Notes: UBN=Unsatisfied Basic Need. The last row shows the percentage variation in each coefficient with respect to the sample's mean. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic (slope, elevation, temperature) and demographic (number of adults, children, infants per household) controls; census FE, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The estimates suggest that the households located in the former UFC region are in general better off. Column (1) to (4) of Table 2 shows that the households have higher living standards in every dimension considered. Note that, although some coefficients might seem somewhat small, the percentage variation of these probabilities with respect to the sample mean (last row) is sizable, and they are all statistically significant at the 1% or 5% level, except for sanitation. For instance, consider the coefficient -0,095 in Column (1): Households in former UFC areas have 9.5 percentage points (pp) lower probability of having an unsatisfied housing need; a 54 percent decrease with respect to the sample's mean. These households also have 1.6pp and 5.7pp lower probability of having an unsatisfied need in sanitation and education, respectively.

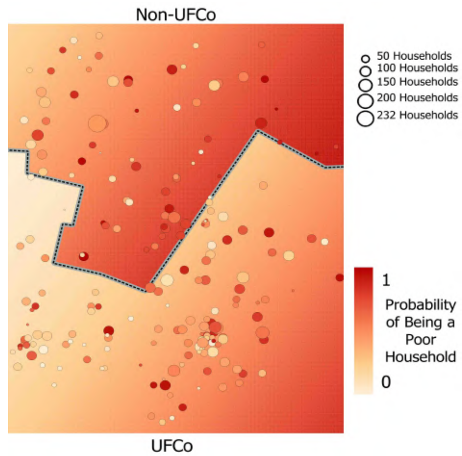
Households in former UFC areas also have a 12.4pp lower probability of being poor (Column 5); a 26 percent variation with respect to the sample's mean. Figure 4 summarizes the results for the probability of being poor, and shows the spatial distribution of households across space .In this figure, each dot corresponds to the centroid of a census-block; a monochromatic color scale represents the average outcome value for the households within the census-block, where lighter colors stand for better outcomes; and each dot's size represents the number of observations in the census-block. The background in each sub-figure shows predicted values, for a finely spaced grid of longitude-latitude coordinates, from a regression of the outcome variable under consideration on the UFC dummy and a linear polynomial in latitude and longitude. The predicted jump across the UFC boundary is clear in both sub-figures. The plots corresponding with other outcome variables, along with a standard RD plot in 2—instead of 3—dimensions, are reported in Appendix D.

Column 6 (the number of UBN) is read differently than the rest of columns, as it takes values that range from 1 to 4. The severity of poverty is lower in the former UFC areas, where the households have on average 0.228 fewer unsatisfied needs than the households in the non-UFC region. For completeness, we also present results using the entire boundary—which are contaminated by unbalanced ex-ante geographic characteristics—in Appendix D. Results in the entire boundary are consistent with our results in the balanced subsample: in general, the former shows larger percentage variations with respect to the sample mean, but magnitudes in both estimations are overall close to each other.

5.2 Time-Varying Effect

The company stopped operations in 1984, and we examine census data from 1973-2011. Therefore, we can disentangle the differentiated effects of the company's presence during its

Figure 4: UFC Effect on the Probability of Being Poor



Notes: This figure shows the study boundary, with UFC territories being South. Each dot represents a census-block's centroid. Dot-color indicates the average outcome value for households, and dot-size represents the number of households in each census-block. As shown, lighter colors stand for better economic outcomes. It also shows the spatial distribution of households across space.

tenure, and also at different points in time after it stopped operating. Figure 5 shows how the UFC effect changed over time. The table corresponding with these results is reported in Appendix D (Table D.5). The probability of being poor and the total number of UBN are quite persistent over time, being significant during every year of our study. The probability of bad quality housing is also very persistent across years, for instance, in 2011, approximately 30 years after the UFC left, households within UFC former lands are 9.3 percentage points less likely of having a UBN in housing relative to households outside. The magnitude of the UFC effect in this dimension is high given the mean probability for the entire region (0.124). The effect on sanitation rapidly vanishes and is insignificant after 1973. Finally, education and consumption are always worse outside the UFC, but the significance of the coefficients disappears after 2000.

Figure 5 also shows how, since the UFC closed, the treated and untreated regions have converged slowly, with only 63% of the poverty gap closing over the following 3 decades. More generally, the *severity* of poverty –measured by the number of UBN – has decreased over time. While a household in 1973 had 0.668 less UBN than a household outside, in 2011 the difference was reduced to 0.126, and the difference is statistically different from zero at 1% level.

5.3 Robustness

Falsification Test: As a falsification test, we re-run the analysis using placebo borders. In particular, we draw fake borders at a distance of 2 km both inwards and outwards of the actual UFC border. Table G.10 in Appendix G presents the results, showing that our placebo tests deliver insignificant results in every case, both economically and statistically.Although in Tables 2 and D.5 we use a linear polynomial in latitude and longitude, our main message is robust to alternative specifications of the RD polynomial. Appendix H.1.1 documents that a quadratic polynomial leads to similar conclusions. Appendix H.1.2 shows that estimates are almost identical when we use a linear polynomial in latitude, longitude, and distance to the boundary.

Different Bandwidth As an additional robustness check, we eliminate observations close to the boundary in case there might have been some negative spillover from the company to the outside (note that when exploring the river's effect we did the opposite: limit the analysis to observations close to the boundary). Table H.23 in Appendix H.4 shows the results. Overall, the coefficients are very similar to the ones of our main regression, both qualitatively and quantitatively.

Different Control Variables Besides the specification of the RD polynomial, we also analyze how the results change to varying the control variables. Appendix H.2.1 shows that results are robust to excluding demographic controls, Appendix H.2.2 to excluding geographic controls, and Appendix H.2.3 to excluding both demographic and geographic controls.

Effect of the River A possible concern is that the river, which is close to our boundary, is driving our result. To address this issue, we run our main specification restricting the sample to units "on the wrong side" of the river (1937 total units), that is, units that are above the river and belong to the UFC, and units that are below the river and did not belong to the company. Appendix H.3 presents the results. In this limited sample, we are comparing only households located very close to each other (1km from the boundary, at most), and we still find results that are consistent with our main findings.

Income and Nighttime Lights Data We use nighttime lights data as a proxy of income to confirm our findings through an alternative measure of economic development. Figure 18 in Appendix J shows a satellite image in which areas inside the former UFC landholdings

display higher luminosity. Results in Table J.32 confirm this difference in luminosity is significant, both statistically and economically.[16]

Alternative Index of UBN Our Unsatisfied Basic Needs (UBN) are a modified version of the ones proposed by Méndez and Trejos (2004). Because Méndez and Trejos constructed the index using information from the 2000 and 2011 census, our modification consists of selecting the variables whose information is available in each of the 1973, 1984, 2000, and 2011 censuses. Therefore, as a robustness test, we re-run the estimation restricting the analysis to the 2000 and 2011 census and using the Unsatisfied Basic Needs (UBN) as proposed by Méndez and Trejos. Table I.30 shows that our main message is robust to this alternative definition of UBN.

6 Suggestive Evidence on the Mechanism

To understand the channels that led to the difference between regions that we found with our empirical strategy, we collected and digitized data on different outcomes from 1907-1984. Using this data, Section 6.1 discusses evidence on investments in local amenities (such as schools, hospitals) being much larger within the UFC than in nearby regions. Studying company reports, we show in Section 6.1.4 how it seems like these investments were at least partially motivated by the need to attract and maintain a sizable workforce. Finally, Section 6.2 considers other plausible mechanisms (selective migration, negative spillovers from the company to neighboring regions), finding no evidence in support of these being the main drivers behind our results given the available data.

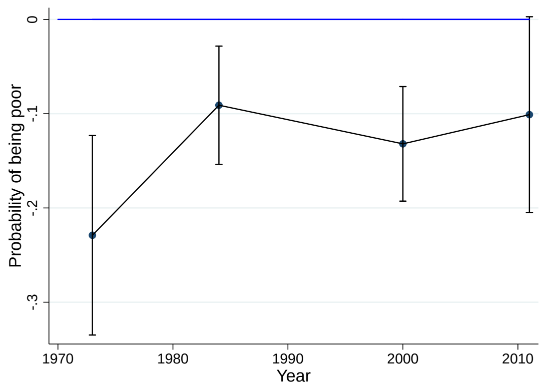
6.1 Investments in Local Amenities

6.1.1 Investment in Healthcare and Sanitation

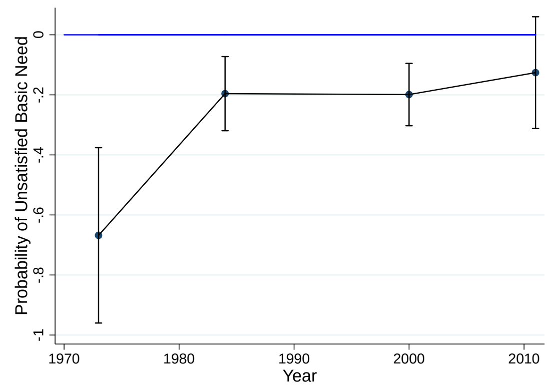
While constructing the railroad to the Caribbean Coast in Costa Rica, the company experienced the loss of around five thousand workers due to the unhealthy and dangerous conditions of the tropical forest (Bucheli, 2005). The experience, along with lessons from the Panama Canal's construction, taught managers about the importance of sanitation and health care to sustain a large workforce. As a consequence, the UFC invested in sanitation

[16] Assuming an elasticity between nighttime light intensity and GDP of 0.3 (consistent with the findings in Henderson et al. (2012) and Hodler and Raschky (2014)), the 21% difference in nighttime light intensity implies that the output in the former UFC plantations is about 6.37% higher.

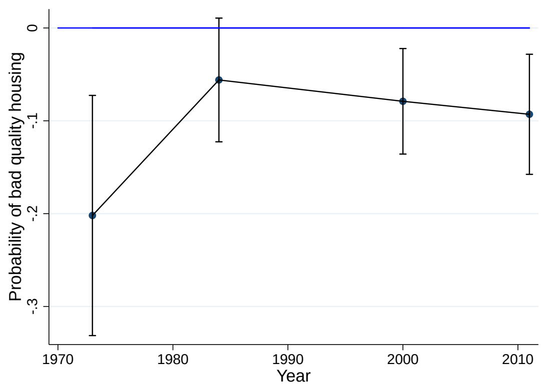
Figure 5: Time-Varying UFC Effect (1973-2011)



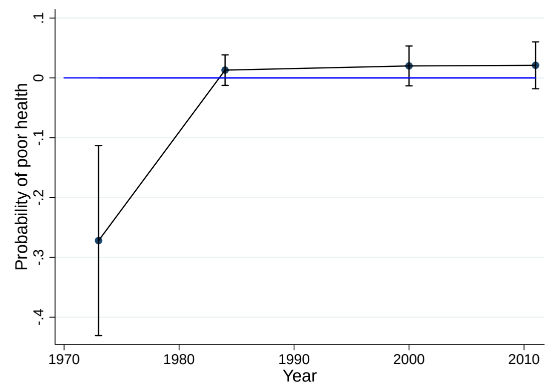
(a) Probability of Being Poor



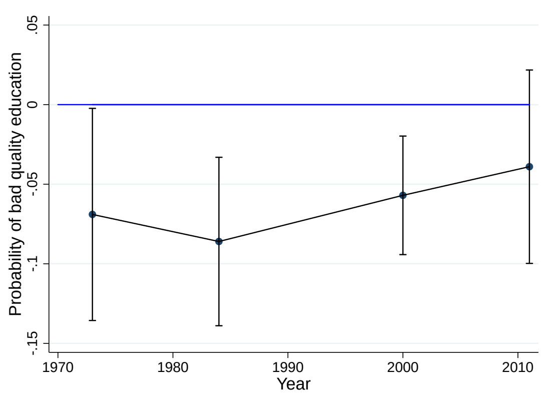
(b) Total Number of UBN



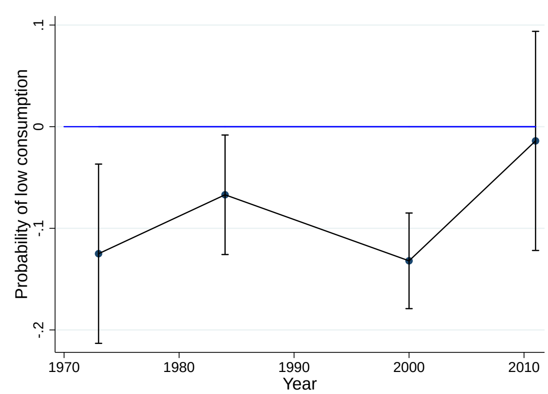
(c) Housing Dimension



(d) Sanitation Dimension



(e) Education Dimension



(f) Consumption Dimension

Notes: The figure shows the evolution of the UFC effect across years for several outcome variables.The absolute effect is decreasing over time in all cases. Confidence intervals show Conley standard errors. Table D.5 shows further details regarding these regressions' output.

infrastructure, launched health programs, and provided medical attention to its employees. Infrastructure investments included pipes, drinking water systems, sewage system, street lighting, macadamized roads, a dike (Sanou and Quesada, 1998), and by 1942 the company operated three hospitals in the country[17]

Employees and their dependents had access to medical and surgical treatment, including medicines in the case of employees, without any additional cost to the worker (UFCo, 1916).[18] Moreover, neighbors from non-UFC regions could not commute and get access to the same quality of healthcare. As Figure 6b shows, between 1907 and 1917 workers or their families who attended a UFC hospital (red line) received more than twice the spending per patient than people who attended UFC hospitals but were *not* in the payroll or related to a worker (green line), and although a higher level of spending does not necessarily imply a higher quality of health care, UFC's medical services were known of being among the best in the country (Casey, 1979). For reference, we also show expenditure per patient in the most modern *public* hospital at the time (San Juan de Dios); which suggests a non-worker would have been on average better-off attending this government-run hospital than commuting to the UFC's hospital[19].

6.1.2 Investments on Housing Infrastructure

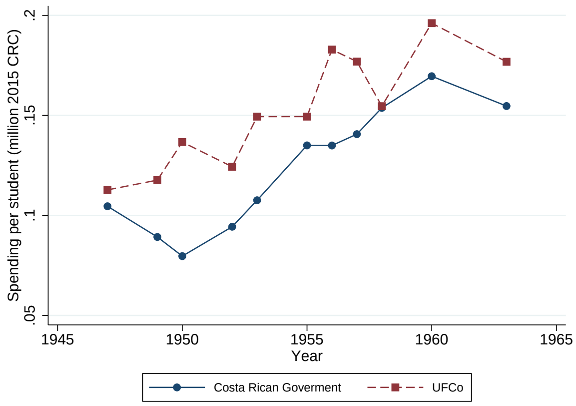
Given the remoteness the plantations and to reduce transportation costs, the UFC provided the majority of its workers with free housing *within* the company's land. This was partially motivated by concerns with diseases like malaria and yellow fever, which spread easily if the population is constantly commuting from outside the plantation. Each of the UFC's divisions consisted of farms, and each farm had a camp where workers lived.

Usually, the houses for plantation laborers were laid out around a soccer field. By 1958 the majority of laborers lived in barracks-type structures. Single families occupied the majority of barracks, and there were buildings for unmarried workers (May and Lasso, 1958). The barrack structures exceeded the standards of many surrounding communities (Wiley, 2008).

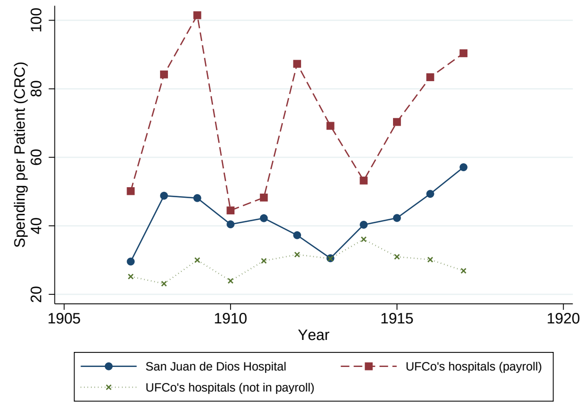
[17]The staff included doctors, sanitary inspectors, and nurses from the United States and other Central American countries (Morgan, 1993), and equipment was modern (Deeks, 1924).

[18]To cover healthcare for employees and their dependents, the UFC deducted 2% from their salary, but there was no marginal cost for any treatment and it was mandatory to pay this fee.

[19]Despite the positive impact of the UFC programs, its benefits were restricted to employees and their immediate families. The general manager of the Medical Department explained that given the size of the UFC landholdings, it was impossible from a commercial standpoint to sanitate completely all areas and therefore their efforts were "mainly directed to protecting the larger communities and camps were our employees are located" UFCo (1921). In fact, to increase sanitary benefits, company doctors suggested preventing workers from traveling between plantations and surrounding villages, which were unscreened. Although non-employees could receive medical attention in the UFC healthcare network, they had to pay higher fees.



(a) Spending per Student



(b) Spending per Patient

Notes: Panel (a) shows data on spending per student (in 2015 Costa Rican Colones) in UFC schools vs local schools run by the government, between 1947-1963. Data results from authors' calculations based on company reports and Molina (2017). Panel (b) shows data on spending per patient (in Costa Rican Colones), between 1907-1917 in UFC hospitals, and compares it with spending per patient in the San Juan de Dios Hospital; the largest Costa Rican hospital at the time, located in the capital. Data was calculated based on 1907- 1917 Costa Rican Statistic Yearbooks.

Related to the sanitary programs impulsed by the UFC, a squad cleaned the grounds, collected trash, systematically sprayed with DDT to control for mosquitos and insects, and scrubbed out public toilets and bathing facilities. Moreover, the water supplied to the taps was safe for drinking. Besides housing, the UFC provided basic services *for its employees* within each camp, such as schools, commissaries, dispensaries, and recreational facilities. (May and Lasso, 1958) claim that "the places of worship, recreational facilities, and athletic fields and equipment provided for United's workers are upon a scale matched by few, if any, locally owned agricultural enterprises."

6.1.3 Investments in Human Capital

One of the services that the company provided within its camps was primary education to the children of its employees. The curriculum in the schools included vocational training and before the 1940s, was taught mostly in English. The emphasis on primary education was significant, and child labor became uncommon in the banana regions (Viales, 1998). By 1955, the company had constructed 62 primary schools within its landholdings in Costa Rica (May and Lasso, 1958). As shown in Figure 6a,[20] spending per student in schools

[20]In Figure 6a the amounts were converted to constant 2015 Costa Rican Colones (CRC) by splicing four price indexes: (i) Cost of Living Index Base 1936 = 100 (*Índice de costo de la vida Base 1936 =100*); (ii) Consumer Price Index for Middle Income and Low-Income Citizens in the Metropolitan Area Base 1964 = 100 (*Índice de precios al consumidor de ingresos medios y bajos del Área Metropolitana Base 1964=100*); (iii) Consumer Price Index Base January 1995 = 100 (*Índice de precios al consumidor Base Enero 1995 =*

operated by the UFC was consistently higher than public spending in primary education between 1947 and 1963.[21] On average, the company's yearly spending was 23% higher than the government's spending during this period.

By the time children completed primary education, they were old enough to work. The UFC did not provide directly secondary education although offered some incentives. If the parents could afford the first two years of secondary education of their children in the United States, the UFC paid for the last two years and provided free transportation to and from the United States. Moreover, if the parents organized secondary schools by themselves and paid a private tuition fee for the teachers, the UFC provided a building and furniture (May and Lasso, 1958). Despite the incentives, secondary and tertiary education was costly and out of reach for most children. This is consistent with the company's effect on years of schooling being significant only for primary schooling, and not for secondary schooling, as documented in Table A.3. Appendix A.1.1 includes more details regarding this effect.

6.1.4 Why So Much Investment? Outside Options and Worker Turnover

While it is easier to imagine the motifs of the company to invest in hospitals and have healthy workers, it is less clear why would it benefit from more educated children. Annual Reports of the company, which were intended to inform shareholders of the situation in the plantations, suggest these investments were motivated by the need to attract and maintain a sizable workforce. High turnover was common, given the workers' outside option: coffee, which unlike bananas is a seasonal crop, and offered high wages during the coffee harvesting season.

Annual Reports to Shareholders up to 1924 consistently mention worker turnover as being an important problem to address. For instance, the report from 1922 (UFCo, 1929) mentions how there are problems with worker's "discipline", and refusal to comply with company medical policies as consequences of high turnover. In one division, there was 100% labor turnover within a year. An extract documenting this dynamic appears below.

> "...stable communities tend to be more disciplined, and can be educated to take better care of themselves...this is impossible with fluctuating populations on our plantations...there is constant overturn of labor and we are periodically importing new laborers...these migratory habits do not permit them to remain in the

100); and (iv) Consumer Price Index Base June 2015 = 100 (*Índice de precios al consumidor Base Junio 2015 = 100*).

[21] Data is only available for this subset of years.

plantation from one year to the next, and *as soon as they become physically efficient in our methods and acquire money they either return to their homes or migrate elsewhere and must be replaced.*"

In 1925, the company's president changed, and the new directives started mentioning new strategies in the company reports (UFCo, 1925). Namely, the report states:

> "We recommend a greater investment in corporate welfare beyond medical measures. An endeavor should be made to stabilize the population...we must not only build and maintain attractive and comfortable camps, but we must also provide measures for taking care of families of married men, by furnishing them with *garden facilities, schools, and some forms of entertainment. In other words, we must take an interest in our people if we might hope to retain their services indefinitely.*"

Reports from 1927-1940 mention how strong investments started in 1927-1930, stopped during the depression, and continued in the late 1930s-early 1940s. ("we have *poured* resources into following the recommendations [to decrease turnover]"; 1928). Later reports (1937, 1940) document how "family housing served as an incentive for long service" and "schools formed the cornerstone of childrearing".

This sheds new light on a potential mechanism behind our positive results: given the workers' outside options and initially high levels of turnover, there was a need to retain workers which led to an increase in investments in "welfare" (local amenities), which seems to be the main driver of the positive effect on development we previously documented.

We explore the mechanism described in these reports empirically. Namely, we test the existence of a positive correlation between better outcomes today due to UFC's investments, and workers' outside options during UFC times. To do so, and given that data on UFC investments is too agreggated to exploit spatial variation,we would like to consider $ln(Prob(poor)j2011) = \beta ln\left(\frac{wage_{i1973}}{price_{i1973}}\right) + \varepsilon_{j2011}$, where for each region j within the UFC, we choose closest district i outside which is suitable to grow coffee (the main outside option for wages at the time), and use the real wage in this district i as a proxy of the "outside option" of workers in region j. Through our mechanism, regions within the UFC with a higher outside option in 1973 should have received higher UFC investments, and should exhibit better outcomes (lower probability of being poor) in 2011.

However, using wages as a regressor creates a potential endogeneity concern: UFC investments might have increased wages in relatively close regions, for instance. Thus, we proceed

in 2 stages. First, we regress squared meters cultivated with coffee in region i during UFC times on geographic characteristics (slope, temperature, precipitation) in the same region, to obtain a proxy of each region's suitability to grow coffee based on geographic characteristics. Second, we regress wages in 1973 in region i on this measure of suitability to grow coffee in region i in the same year. The idea being that regions more suitable to grow coffee –which grows in a different climate and altitude than banana– should offer higher wages for agricultural workers. That is, we consider

$$ln(Prob(poor)j2011) = \hat{\beta} \ln{(X_i)} + \hat{\varepsilon}_{jt},$$

where X_i is the suitability to grow coffee of region i based on its geographic characteristics, and $\hat{\beta}$ captures how they affect the current probability of being poor. The exclusion restriction to use this instrument is that land suitability for coffee during UFC times in other regions affects current outcomes only through its effect on wages during UFC times .

Data on wages outside the UFC comes from the 1973 population census. While the Minister of Finance reported price indexes for this year, the procedure to construct them is unclear, thus we will assume the price index is the same and normalized to 1 in all regions. Our first stage shows that suitability to grow coffee can predict wages relatively well, with a coefficient equal to 0.21 and significant at 5%. Then, in our second stage we find that $\hat{\beta} = 0.01$, significant at 10%, suggesting that a 1% higher outside option is correlated with .001% higher UFC stock of investment during its tenure. We consider this heroic calculation as suggestive evidence in support of our mechanism. Later on, we will asses the potential of this mechanism relating labor mobility to market power and investments to generate our results on economic outcomes through the lens of a model, and examine its implications.

Institutions and Labor Mobility Why didn't the UFC take the approach of destroying workers' outside options? Work by (Acemoglu and Wolitzky, 2009) on labor coercion suggests an alternative approach to retain workers: preventing them from leaving or reducing their mobility. There were several reasons that prevented this from happening in our setting. First, throughout the 20th century, democratic institutions in Costa Rica were much stronger than in other developing countries,[22] which possibly played a role in protecting workers' rights. Second, the Costa Rican elite included many coffee producers who needed labor during the coffee harvesting season, which gave them an incentive to protect workers' mobility. Third,

[22]See (Bucheli and Kim, 2012) for a detailed comparison of political institutions between countries in Central America.

given political competition, there was an effort by particular political groups to enlarge their winning coalition by protecting UFC workers (Bucheli and Kim, 2012). These circumstances were not present in other Latin American countries were the UFC operated, like Santa Marta and Cienega in Colombia, where armed forced prevented workers from forming unions and leaving the plantations.[23] Today, these cities are among the poorest in the country, which does not contradict our findings: as our mechanism — labor market dynamics as an incentive for the company to invest — did not seem to be present in these other cases.

6.2 Ruling-Out Other Plausible Mechanisms as Main Drivers

Positively Selected Migration During UFC's Tenure It might have been the case that outcomes are better within the UFC because it attracted positively selected migrants. To consider if selective migration is generating the differences in living standards between the two regions, we take three different approaches. In our first approach, we reestimate equations 1 and 2 using a restricted sample of the full dataset in which we drop all migrant households. We classify a household as migrant if any household member lived in a different place of residence five years before the census took place.[24] Appendix Appendix H.5.1 document that the results are similar to the estimates in Tables 2 and D.5, and we cannot reject that the estimates are the same at the 10% significance level.

In our second approach, we look at observables of migrants to the UFC sub-region where we ran our regressions, and compare them to observables of migrants to our control group in 1973 (while the UFC is still operating). We find that, on average, migrants to the UFC have 4.2 months less years of schooling than migrants to the control group. This suggests that, if anything, migrants to the UFC were negatively selected.

Our third approach complements the second one by ruling-out that, maybe, migrants were not good students but were exceptional farmers. We compare the UFC effect for households engaged in the agricultural sector versus other economic sectors. We consider a household as an agricultural household if any of its members work in agriculture.[25] If ability in agriculture production is highly heritable and selective migration is driving our results, then the UFC effect should be stronger for the households engaged in the agricultural sector relative to

[23]See (Bucheli, 2005) for more details on this coercion and the "Banana Massacre". Bucheli refers to the Colombian authorities as a " business-friendly government". The Costa Rican army, on its part, was abolished on 1948.

[24]Our results remain unchanged if we instead classify a household as migrant if the head of household lived in a different place of residence five years before the census took place (see Appendix H.5.2)

[25]Our results remain unchanged if we instead consider a household as an agricultural household as migrant if its head works in agriculture (see Table H.29).

other economic activities. Nevertheless, Appendix H.28 shows that this is not the case, and for each outcome we consider, we cannot reject at the 10% level that the estimates are the same across both groups (further, the coefficients themselves are very similar). In summary, the two approaches we take suggest that selective migration is unlikely be the main channel behind the differences between the regions we observe.

To the extent that initial waves of migration to the UFC's region in the early 1900s might have been selective, and certain skills, physical strength, or other relevant characteristics are heritable (so that initial differences could persist across generations), historical migration could contribute to the estimated UFC effect. However, the scarcity of data and complex patterns of heritability that would link this early selective migration to our results using data on recent decades, unfortunately place further investigation substantially beyond the scope of this paper.

Positively Selected Migration at the Time of Each Census Differential rates of migration at the time of each census are relevant for our long-run analysis. Each census contains information about individuals' place of residence 5 years before the census took place. In census-blocks located in UFC areas, 9.35% of individuals migrated from a former non-UFC municipality, while in the non-UFC areas 11.90% of individuals migrated from a UFC municipality. Table 3 shows that the migration rates are decreasing over time and their difference is not statistically significant. As a robustness check, we examine the influence of migration in the estimates, with no change in our conclusions.

Table 3: Migration Rates in UFC and Non-UFC census-blocks (Percentage)

Census	UFC (1)	Non-UFC (2)	P-value of the difference (3)
1973	16.83	32.74	0.37
1984	14.62	13.48	0.79
2000	7.45	10.25	0.24
2011	6.20	6.73	0.69
All	9.35	11.90	0.30

Notes: The p-values in the third column are for the test of the hypothesis that the rates of migration in the UFC and non-UFC areas are equal. The p-values are clustered at the census-block level.

Negative Spillovers from the UFC to Neighboring Regions Another possible concern, is that our results are driven by our "control group" having particularly bad outcomes,

potentially because of negative spillovers from the firm to this adjacent region. First, we find migrants to the control group had statistically more years of schooling (2.52 months) than migrants to other nearby comparable rural regions in 1973 (while the company was still operating), as documented in Appendix F.2. Second, also in 1973, the average years of schooling of individuals the control group is higher than that of other comparable rural regions as shown in Appendix F.2. Third, 1973 outcomes (sanitation, consumption, housing, probability of being poor) are statistically equal to those in other comparable rural regions in the country on 1973, while the UFC was still operating, as documented in Appendix F.1. Fourth, we find that the control region received the same amount of government spending per capita than other rural regions. This is discussed in Appendix E where we compare spending per capita between UFC municipalities and other rural municipalities during the UFC's tenure. Therefore, if anything, the "control region" seems like a relatively strong/mean location within the country. Finally, given Costa Rica was considered a poster child of good governance at the time, and income per capita was among the highest in the area, the control region is particularly strong within Latin America.

6.3 Discussion

In summary, levels of investment in local amenities such as hospitals and schools inside the UFC were significantly higher than public investments undertaken by the government in comparable regions. Company reports suggest that these strong investments were at least partially driven by the need to attract and maintain a sizable workforce. The latter is supported by a positive correlation between the intensity of company investments and the levels of outside options for workers in regions near the UFC. Our hypothesis is that these investments are likely to be the main drivers behind the income gap we found empirically. Moreover, as maximizing profits was the UFC's main objective, it is likely that the level of their investments in physical and human capital would have been lower in the absence of competition for labor. It is worth mentioning that this mechanism would allow us to can reconcile our results with findings on the effects of colonial concessions, like Nunn (2008), Dell (2010), and Lowes and Montero (2016). In these cases, labor was coerced, highly immobile and with a very low outside option. Thus, potentially, the producer extracting resources had little or no incentive to invest in local amenities or "public goods" to retain workers; and this under-provision might be partially explaining the persistent negative effects found by these studies. We also find no evidence in support of selective migration or negative spillovers from the company to neighboring regions being the main channels behind the observed difference

in outcomes.

These findings motivatee the general equilibrium model we develop in the next section: a dynamic spatial model in which the degree of local monopsony power of a firm *within* a location depends on how mobile workers are *across* locations, and where we allow firms to invest in local amenities.

7 Dynamic Model

The evidence on the mechanism behind our results suggests a relationship between labor mobility, monopsony and investments that was crucial in determining the firm's effect. In light of this evidence, and given the large literature on monopsony power, we now lay out a dynamic general equilibrium framework that incorporates these new channels, and in which labor market power relates to worker mobility. The model captures observable spatial frictions, spillovers, and is consistent with local estimates from our empirical analysis. This framework allows us to quantify the difference between the firm's local and country-level effects, and run several counterfactual exercises to understand the relevance of labor mobility and of the local labor market structure.

In what follows, we outline the theoretical framework. Section 7.2 describes the model's calibration and Section 7.3 presents the results of our counterfactual exercises.

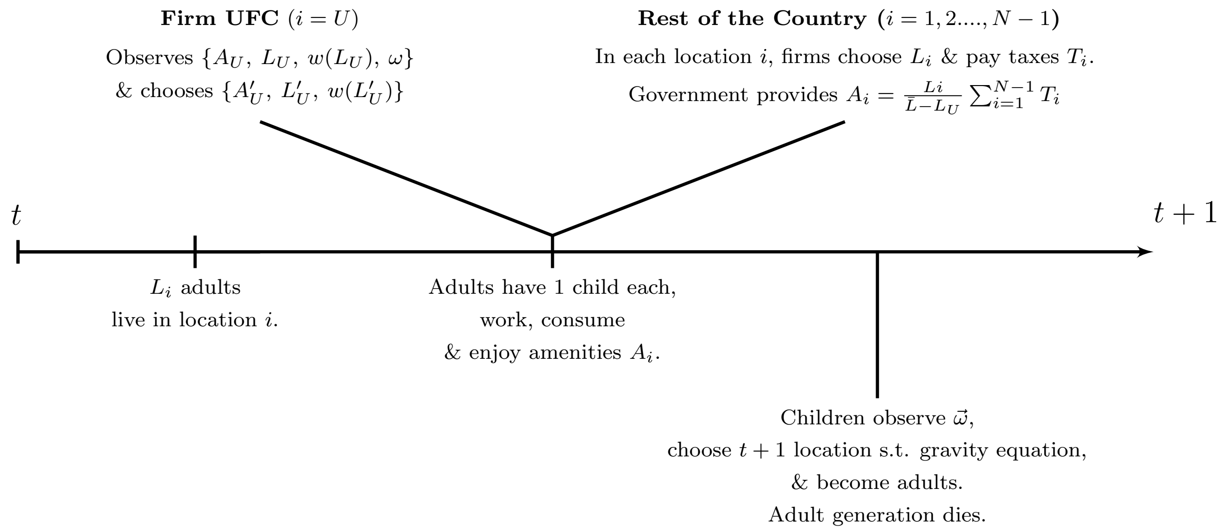
7.1 Theoretical Framework

There are $i \in \{1, ..., N\}$ locations and time is discrete. Throughout, we use a prime to denote next-period values. Each individual lives for two periods. In the first period ("childhood"), agent are born where their parent lives and chooses where to live as an adult. In the second period ("adulthood"), an individual supplies a unit of labor inelastically to produce the differentiated variety in the location she lives, consumes, and has a child. The total number of workers is normalized in each period and initial population is exogenous. To ease exposition, Figure 7 summarizes the timing of the events that will be described in detail below.

7.1.1 Household Preferences and Consumption

Following (Allen and Donaldson, 2018), adult workers are the only agents that consume and derive utility. Workers living in region i have constant elasticity of substitution (CES) prefer-

Figure 7: Model's Timing



ence with elasticity σ across differentiated domestic (c) and foreign (m) goods. Additionally, they derive utility from the per capita local amenities of the region where they live.

The deterministic component of welfare – defined as welfare up to an idiosyncratic shock that we will introduce below – of a worker residing in location i is given by $\mathcal{U}(c_{ij},\ m_i,\ \tilde{a}_i) = \tilde{a}_i[\sum_{j=1}^{N} c_{ij}^{\frac{\sigma-1}{\sigma}} + m_i^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}}$, where $\tilde{a}_i = (A_i/L_i)^{\alpha_A}$ captures the utility derived from per capita local amenities.[26] Each worker supplies one unit of labor inelastically and earns a nominal wage (w_i). Letting P_i be the CES price index[27], the *equilibrium* deterministic utility of a worker in location i can be expressed as

$$W_i = \tilde{a}_i \frac{w_i}{P_i}. \tag{3}$$

7.1.2 Migration, Shocks and Location Choice

As previously stated, the utility of a worker in region i has a deterministic component given by W_i in equilibrium. Further, we allow for bilateral moving costs $\lambda_{ij} \geq 1$, where any value larger than one implies there are migration frictions. Thus, the deterministic utility of a

[26] We assume there is perfect congestion in local amenities (i.e. $\tilde{a}_i = (A_i/L_i^{\rho})^{\alpha_A}$ with $\rho = 1$). As will become clear in the next subsection, a model with imperfect congestion ($\rho < 1$), would lead to larger investments in local amenities from the UFC (given the increasing returns to investment) and stronger welfare effects. However, to abstract from this additional agglomeration force and focus on mobility frictions and productivity spillovers, we set $\rho = 1$ and, in this sense, take the effects we find as a lower bound.

[27] As is standard, the CES price index is given by $P_i = \left(\sum_{n=1}^{N} (\tau_{ni} p_n)^{1-\sigma} + p_w^{1-\sigma}\right)^{1/(1+\sigma)}$, where p_n denotes the price of the variety produced in region n, p_w is the exogenous price of the composite foreign good and τ_{ni} represents bilateral iceberg trade costs (as described below).

worker who migrates from location i to location j is given by $\frac{W_j}{\lambda_{ij}}$.

Finally, the last component of the utility function is given by idiosyncratic taste differences, denoted by vector $\vec{\omega}$. Therefore, the ultimate utility of a worker living in location i who is *not moving* will depend on the idiosyncratic shock ω_j, and is given by $W_i\omega_i$, while the utility of a resident of location i *moving* to location j is denoted as

$$W_{ij}(\vec{\omega}) = \frac{W_i\omega_i}{\lambda_{ij}}. \tag{4}$$

Thus, each period, a worker in location i chooses his location solving

$$\max_j \left\{ W_{ij}(\vec{\omega}) \right\} = \max_j \left\{ \frac{W_i\omega_i}{\lambda_{ij}} \right\}. \tag{5}$$

We further assume that the idiosyncratic utility shifter, $\vec{\omega}$, follows a Frechet extreme value distribution with shape parameter θ. Let L_i denote the number of workers who live in location i at time t. It follows that the outflow of children in region i in a given period who will choose to work in region j the next period (L'_{ij}) can be described as

$$\frac{L'_{ij}}{L_i} = \frac{\left(\frac{W'_j}{\lambda'_{ij}}\right)^\theta}{\sum_{n=1}^N \left(\frac{W'_n}{\lambda'_{in}}\right)^\theta}. \tag{6}$$

Finally, we can derive a the gravity equation describing the bilateral migration flows from location i as a function of current population, expected utility in i and utility in other locations, as follows:

$$L'_{ij} = (\lambda'_{ij}\Omega'_i)^{-\theta}(W'_j)^\theta L_i, \tag{7}$$

where $\Omega_i = \left[\sum_{n=1}^N \left(\frac{W'_n}{\lambda'_{in}}\right)^\theta\right]^{\frac{1}{\theta}}$ denotes the expected utility of an individual in his childhood living in location i.

Trade Local bilateral trade flows from region i to region j incur an iceberg trade cost, $\tau_{ij} \geq 1$, where $\tau_{ij} = 1$ corresponds to frictionless trade. Thus, bilateral trade flows are governed by a standard gravity equation: $X_{ij} = \tau_{ij}^{1-\sigma}\frac{w_i}{P_j}w_jL_j$. We assume imported goods are purchased at an exogenous price p_w, that is calibrated to match observed terms of trade in the data.

7.1.3 Producers

The country is has N regions: one producing bananas where the UFC operates (denoted 'U'), and other $N-1$ locations ($i \in \{1, 2, ..., N-1\}$) producing domestic differentiated goods as in Armington (1969). We assume bananas are pure export good, while domestic goods are consumed both locally and abroad. We proceed by describing these regions and their production schemes.

The UFC Region (U) The banana producer is a profit maximizer, and the sole employer within its location. Besides wage, the firm may also provide local amenities as part of the worker's compensation bundle, and solves the following dynamic problem

$$V(A_U, L_U) = \max_{\{A'_U, L'_U\}} \{p_U q_U - w_U(L_U)L_U - P_A[A'_U - (1-\delta)A_U]\} + \beta V(A'_U, L'_U)$$

such that

$$L'_U = L_U - \sum_{n=1}^{N-1} L_{Ui} + \sum_{n=1}^{N-1} L_{iU} \tag{8}$$

where L_{Ui} and L_{iU} satisfy Equation (7). In particular, we assume that $q_U = A_U^{\chi} L_U^{\phi}$, where χ measures the strength of the productivity spillovers.[28]

This means that the firm will provide workers with enough utility as compared with their "outside option" to make next period's labor supply optimal, given bilateral migration flows. *In this sense, the firm is a local monopsonist, whose degree of monopsony power will depend on workers' mobility, which is governed by θ.* High values of θ imply higher worker mobility and less monopsony power for the firm, thus, attracting the same number of workers ($Ł'_U$) would be more costly: The firm will have to provide workers with a higher utility level, either through higher wages or more local amenities. Conversely, an extreme value of $\theta = 0$, which from Equation (7) implies no mobility ($L' = L$) would lead to a perfectly inelastic labor supply and a case of pure monopsony within this region.

[28] Costa Rican banana production represented, on average, less than 2 percent of the total world banana production from 1956-1984 (sample used in our calibration), which is why we are not considering p_U—the world banana price—as a function of q_U—bananas produced in Costa Rica. This also allows us to focus on monopsony forces that seemed to have been key, as explained in our empirical analysis.

Firms in the Rest of the Country Each of the $N-1$ regions in the rest of the country produce a unique good. Producers in location $i \in \{1, ..., N-1\}$ maximize profits in a competitive market and pay taxes to the government, solving

$$\max_{\{L_i\}} \Pi_i(L_i) = \max_{\{L_i\}} p_i(A_i)^{\chi} L_i^{\gamma} - w_i L_i - T_i.$$

We will denote total ouput per location in a given period as $Q_i = A_i^{\chi} L_i^{\gamma}$.

Foreign Producers The foreign composite good (M) is produced abroad and imported at an exogenously determined price P_W. This good is consumed in both regions, and the value of these imports must equal the value of exported goods in equilibrium.

Local Amenities For simplicity, we assume that local amenities can be purchased at an exogenous price P_A in all regions.

7.1.4 Government

The government collects taxes T from firms in the "Rest of the Country", and provides local amenities to this region so that

$$P_A(A_i' - (1-\delta)A_i) = \frac{L_i}{\bar{L} - L_U} \sum_{i=1}^{N-1} T_i = \frac{L_i}{\bar{L} - L_U} \sum_{i=1}^{N-1} t P_i(A_i)^{\chi} L_i^{\phi},$$

where $\bar{L}$ is the total adult population in the country. As shown, we assume the government has no access to borrowing in foreign capital markets, and is therefore its provision of amenities is constrained at every point in time by $\sum_{i=1}^{N-1} T_i$, where each T_i is a fixed proportion t of the sales in region i. We also assume that revenue is spent on local amenities according to the labor share in each region. Appendix A.1.3 goes into the historical details behind these assumptions.

7.1.5 Dynamic Equilibrium

A recursive competitive equilibrium in this economy consists of prices $\{w_i, p_i\}_{i=1}^{N}$, and $\{P_A\}$; policy functions $\{A_U', L_U'\}$; value function $\{V^U\}$; and labor supply $\{L_i,\}_{i=1}^{N}$ such that: All firms and households optimize; trade is balanced; labor flows are consistent across regions $L_i' = \sum_j L_{ji}'$ and $L_i = \sum_j L_{ij}'$; and the labor, domestic good, foreign good, and UFC fruit market clear. The solution of the system of equations implied by this equilibrium, and

the proof of its uniqueness closely follows Allen and Donaldson (2018), who in turn use techniques derived from Allen et al. (2015).

7.2 Estimation

We calibrate the model to the historical reference equilibrium corresponding to the observed level of economic activity and trade. We preset the discount factor and depreciation parameters to standard values, and assume that trade costs have the form $\ln \tau_{ij} = \zeta \ln dist_{ij} + e_{ij}$, where $dist_{ij}$ is the great circle distance between districts. We the use (Allen and Arkolakis, 2014) estimate for ζ and set trade costs to $\tau_{ij} = dist_{ij}^{\zeta}$. Using data on total output from the UFC annual reports, along with data on world banana prices, we estimate the inverse demand function as

$$\ln(p_{Ut}) = \varepsilon - \eta \ln(q_{Ut}) + \epsilon_t,$$

our results deliver that $\varepsilon = 7.261$

Our strategy to recover other parameters has several steps. Our first step assumes migration costs of the standard form $\ln(\lambda_{ij}) = \mu \ln(dist_{ij})$. We substitute these into Equation 6, and obtain

$$\ln(L_{ijt}) = -\theta\mu \ln(dist_{ij}) + \rho_{it} + \pi_{jt} + \varepsilon_{ijt},$$

where $i \in R$, $j \in U$ and δ_{it}, π_{jt} are location fixed-effects. From these equations, we can estimate $\theta\mu$ jointly using data on migration of adults (20-65 years old) across districts and distances between districts for 1956-1984 – years in which the data is available. The second step relies on the following proposition[29] from (Allen and Donaldson, 2018): given observed data on $\{Y_{it}, L_{it}, L_{it-1}\}$ and identified values of $\{\lambda_{ij}^{-\theta}\} = \{dist_{ij}^{-\theta\mu}\}$, it is possible to recover unique values of $\{W_t^{\theta}, P_{it}^{\sigma-1}\}$.

Having identified $\{W_t^{\theta}, P_{it}^{\sigma-1}\}$, our third step consists of manipulating Equation 3 to obtain

$$ln(W_{it}^{\theta}) = \theta \ln w_{it} + (1-\sigma)^{-1} \ln(P_{it}^{1-\sigma}) + \theta \bar{a}_{it}. \tag{9}$$

Even with all the variables from Equation 9 at hand, endogeneity is a concern, given the correlation between unobserved $\bar{a}_{it}$, the prices used as regressors and the regression residual. Therefore, we use model-based simulations to construct instrumental variables (IVs) for the endogenous regressors. The procedure we follow is: (i) construct proxies for get proxies for $\bar{a}_{it}$ from invariant geographic characteristics (temperature, precipitation, slope); (ii)make a

[29]The application of this proposition, proven in Appendix A.3 of (Allen and Donaldson, 2018) to our case is straightforward.

guess of the elasticity parameters $\{\theta, \sigma\}$ based on values in the literature; (iii) using this guess, use a simulated method of moments (SMM) to obtain estimates of other parameters in the model; (iv) start the IV-generating model simulation at using the observed population shares in 1956 as the L_{i0}; (v) run the model forwards to generate simulations for $\{w_{it}, P_{it}^{1-\sigma}\}$; (vi) use these simulations to run the IV in Equation 9, controlling for geographical characteristics and initial population shares. Thus, the exclusion restriction is that the unobserved amenities are not correlated with the initial population shares or the geographic characteristics of other locations, conditional on own attributes. Finally, with new estimated elasticities, iterate on (ii)-(vi) until there is convergence and SMM estimates do not change significantly.

We identify $\theta = 6.46$ with a standard error of 1.562 as the labor mobility elasticity, and $\sigma = 4.63$ with a standard error of 0.899 as the elasticity of substitution. The results of our SMM[30] along with the sources, targets, and resulting values from the estimation are presented in Table 4. Other output from this estimation is reported in Appendix K.

Table 4: Calibration Results

	Preset Parameters				
	Definition	Value	Target	Data	Model
β	Discount Factor	0.96			
δ	Depreciation	0.07			
ϕ	UFCo share of L in factor payments	0.62	Company reports		
t	Share of taxes over GDP	0.13	National accounts		
	Jointly Calibrated Values at SS (SMM)				
γ	RoC share of L in factor payments	0.40	Mean L_U/L_R	0.14	0.18
α	Amenity spillover in $\mathcal{U}$	.048	% spent durables	.041	.048
p_W	Price of imports	0.85	Mean terms of trade	1.32	1.44
p_U	Price of banana exports	1.22	Share UFCo/total X	1.40	1.55
P_A	Price of local amenity	0.98	Share inv Gov/UFCo	0.30	0.24
χ	Productivity spillover	.061	Local welfare effect[31]	0.26	0.25

Notes: GDP does not include UFCo's production. Data for all targets is available for years 1956-1973.

7.3 Counterfactuals

No UFC and Perfectly Competitive Labor Markets in All Regions In our empirical analysis, we determined the UFC's effect on several local economic outcomes. In this counterfactual, we do an analogous exercise within the model, where we assume there is no UFC and quantify the impact on outcomes, both locally in the UFC region and for the

[30]For the SMM, given in data availability restrictions, we restrict the data used to generate the targets to 1956-1973; the period for which we have data for all targets.

country as a whole; both for the case where there is a monopsony in the UFC region, and for the case where there is a perfectly competitive labor market in both regions. Unlike our empirical estimates, these results account for potential spillovers across regions.

First, the third column in Table 34 shows how the magnitude of the UFC's local effect predicted by the model is in line with our empirical results, while out aggregate findings – albeit smaller than the local ones – are sizable, accounting for a 2.91 (2.79) percent increase in welfare measured as change in utility (consumption equivalent variation).

Second, while the effects on welfare are similar under both scenarios (monopsony and perfect competition), there is a big difference in the company's strategy to compensate workers. This is evident observing the last two rows of Table 5. The monopsonist compensates workers mainly through amenities, while keeping wages low (thus, in a counterfactual without a monopsonist UFC amenities are lower and wages are higher); while under perfect competition in the labor market the compensation is mostly through wages.

This leads to our third observation: welfare is higher under the monopsony than under perfect competition. The reason are mainly the productivity spillovers of local amenities paired with higher levels of amenities in the monopsony's case. Indeed, assuming amenities have no productivity spillovers ($\chi = 0$) leads to lower welfare levels in the case with monopsony compared with the case of perfectly competitive labor markets in all regions.[32]

Table 5: Company's Effect under Different Labor Market Structures

Outcome	%Δ w/Monopsony		%Δ w/Perfect Competition	
	Aggregate	UFCo Region	Aggregate	UFCo Region
Equiv. Δ (in C)	2.91	25.8	2.29	22.3
Welfare	2.79	23.5	2.04	19.8
Stock Amenities	5.63	38.6	1.68	11.5
Wages	-1.33	-8.2	1.90	15.3

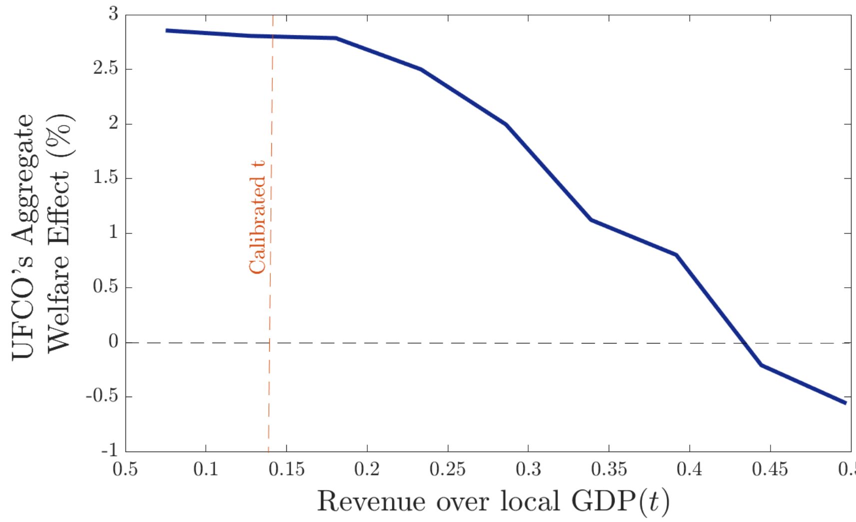
Notes: The table shows the change in steady state outcomes. Equivalent Variation is the % increase/decrease in consumption in steady state necessary to get the new utility level.

Role of the Government's Budget Constraint The government's budget constraint is an important determinant of the UFC's effect on welfare. As capacity to collect taxes increases, UFC's aggregate effect on welfare becomes negative. The intuition is as follows: the UFC is a monopsonist and is depressing wages, therefore, unless the government is somehow constrained and cannot provide the efficient level of local amenities on its own, the

[32]These results assuming $\chi = 0$ are shown in Table 34, Appendix L.

country would be better-off without the company. In developing countries, however, it has been historically difficult to raise taxes, with levels of tax revenue over GDP in the vicinity of 10 percent.

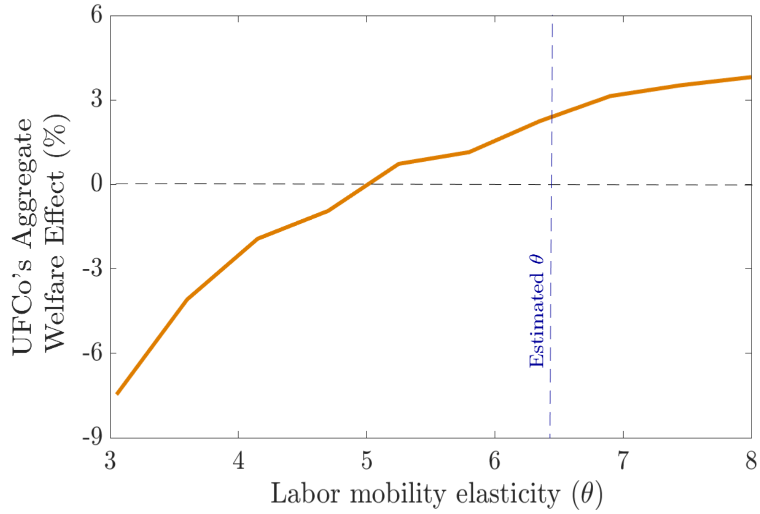
Figure 8: Changes in Aggregate Welfare and Public Tax Collection Capacity



Notes: The figure shows the how the UFC's effect on aggregate (country) welfare – measured by a consumption-equivalent % variation – changes as government's tax collection capacity (t) changes.

Labor Mobility as a Key Determinant of the UFC's Effect on Welfare In line with our mechanism, the UFC's effect on welfare is decreasing on labor mobility, which in turn is directly related to workers' outside option. Of particular interest however, a counterfactual exercise where labor mobility decreases can flip the sign of the UFC's effect. Further, as shown in Figure 9, the elasticity of the effect to the value of the labor mobility elasticity (θ) is significant. This highlights the importance of the local labor maker dynamics in determining the share of total profits that will stay and benefit the local economy, given large investment projects like this one.

Figure 9: Changes in Aggregate Welfare and Public Tax Collection Capacity



Notes: The figure shows the how the UFC's effect on aggregate (country) welfare – measured by a consumption-equivalent % variation – changes labor mobility changes.

8 Concluding Remarks

Understanding the implications of large-scale foreign investments is particularly relevant today. In the last 20 years, foreign private investors have acquired more than 26.7 million hectares of land in over 80 countries of Africa, Central and Southeast Asia, Eastern Europe and Latin America via leases (of up to 99 years) or purchases of farmland for agricultural investment ((Cotula et al., 2009); (Cotula and Vermeulen, 2009)). More than 400 of these concessions have been *larger* than the UFC's concession in Costa Rica. This recent wave of large-scale land acquisitions by foreigners in developing countries –known as "land grabs"– is devoted to growing food crops and mainly driven by concerns about food security and by the biofuels boom, and makes understanding what is the effect of such projects a matter of first-order importance.

This paper studies the impact of large private investment projects on local economic development, while analyzing how these effects interact with conditions in the local economy using evidence from the United Fruit Company in Costa Rica. In particular, we use a regression discontinuity design and find a positive and persistent effect on economic outcomes in areas where the company operated. Households in the former UFC areas have a better satisfaction of basic needs (housing, sanitation, education, and consumption capacity), are less likely of being poor, and have a lower number of unsatisfied basic needs.

Using data we have collected from primary sources, we test different potential mecha-

nisms, and find evidence that investments in physical and human capital carried out by the UFC were likely the drivers of the positive “UFC effect”. Studying company reports, we document that these high levels of investment were motivated by the need to attract and maintain a sizable workforce. An estimated general equilibrium model highlights how labor mobility is key in determining the sign and magnitude of the company’s effect. Indeed, for relatively low elasticities, both the local and aggregate effects of the company become negative, which is in line with the negative effects found by the literature on coercive (and relatively immobile) labor. The company’s effect is also decreasing in the ability of the local government to collect taxes and fund investment projects, stressing the role of domestic conditions in shaping the firm’s effect.

In future research, we plan to explore the potential technological spillovers from the company to locals, and whether potential productivity differences are persistent when comparing firms who were differentially exposed to the UFC using novel data on agricultural production, also with detailed geo-references.

References

Acemoglu, D. and Wolitzky, A. (2009). The economics of labor coercion. Working Paper 15581, National Bureau of Economic Research.

Aitken, B. J. and Harrison, A. E. (1999). Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela. *American Economic Review*, 89(3):605–618.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., and Sayek, S. (2003). FDI Spillovers, Financial Markets, and Economic Development .

Alfaro, L. and Charlton, A. (2007). Growth and the Quality of Foreign Direct Investment: Is All FDI Equal?

Allen, T. and Arkolakis, C. (2014). Trade and the Topography of the Spatial Economy. *The Quarterly Journal of Economics*, 129(3):1085–1140.

Allen, T., Arkolakis, C., and Li, X. (2015). On the Existence and Uniqueness of Trade Equilibria. *mimeo, Dartmouth and Yale Universities.*

Allen, T. and Donaldson, D. (2018). The Geography of Path Dependence.

ANCR (1904). National Archives of Costa Rica (*Archivo Nacional de Costa Rica*). *Serie Congreso, No. 3068, f.1.*

Armendáriz, B. and Larraín B., F. (2017). *The Economics of Contemporary Latin America.* Economics/Latin American Studies. MIT Press.

Armington, P. S. (1969). A theory of demand for products distinguished by place of production. *IMF Staff Papers*, 16(1):159–178.

Autor, D., Dorn, D., Katz, L. F., Patterson, C., and Van Reenen, J. (2017). The fall of the labor share and the rise of superstar firms. Working Paper 23396, National Bureau of Economic Research.

Berger, D., Herkenhoff, K., and Mongey, S. (2018). Labor Market Power. Technical report.

Black, D. and Loewenstein, M. (1991). Self-enforcing labor contracts with costly mobility: The subgame perfect solution to the chairman's problem. *Research in Labor Economics*, 12:63–83.

Blomstrom, M. (1986). Foreign Investment and Productive Efficiency: The Case of Mexico. *Journal of Industrial Economics*, 35(1):97–110.

Blomstrom, M. and Wolff, E. N. (1989). Multinational Corporations and Productivity Convergence in Mexico. Working Paper 3141, National Bureau of Economic Research.

Bobonis, G. and Morrow, P. (2013). Labor Coercion and the Accumulation of Human Capital .

Bonilla, R. and Rosero, L. (2008). Rasterización de los censos de población y vivienda de 1973, 1984 y 2000. In Rodríguez, A. and Saborío, M., editors, *Lo rural es diverso: evidencia para el caso de Costa Rica*, pages 135–151. San José, Costa Rica.

Borensztein, E., De Gregorio, J., and Lee, J.-W. (1995). How Does Foreign Direct Investment Affect Economic Growth? Working Paper 5057, National Bureau of Economic Research.

Bucheli, M. (2005). *Bananas and Business: The United Fruit Company in Colombia, 1899-2000*. New York University Press.

Bucheli, M. and Kim, M.-Y. (2012). Political institutional change, obsolescing legitimacy, and multinational corporations: The case of the central american banana industry. *MIR: Management International Review*, 52(6):847–877.

Casey, J. (1979). *Limón 1880-1940*. Editorial Costa Rica, San José.

Cerdas Albertazzi, A. L. (1993). El surgimiento del enclave bananero en el Pacífico Sur. *Revista de Historia*, (28):117–159.

Chen, X. and Nordhaus, W. D. (2011). Using Luminosity Data as a Proxy for Economic Statistics. *Proceedings of the National Academy of Sciences*.

Conley, T. (1999). GMM Estimation with Cross Sectional Dependence. *Journal of Econometrics*, 92(1):1–45.

Cotula and Vermeulen (2009). Land grabs' in Africa: can the deals work for development? 17069iied, IIED Briefing Papers.

Cotula, Vermeulen, and Keeley (2009). Land Grab or Development Opportunity? Agricultural Investment and International Land Deals in Africa. Isbn: 978-1-84369-741-1., IIED/FAO/IFAD, London/Rome.

Deeks, W. E. (1924). Activities of the Medical Department of the United Fruit Company. In *Proceedings of the International Conference on Health Problems in Tropical America Held at Kingston, Jamaica, B.W.I., July 22 to August 1, 1924: By Invitation of the Medical Department, United Fruit Company*, Boston, pages 1006–1010.

Dell, M. (2010). The Persistent Effects of Peru's Mining Mita. *Econometrica*, 78(6):1863–1903.

Dell, M., Lane, N., and Querubin, P. (2015). State Capacity, Local Governance, and Economic Development in Vietnam.

Dell, M. and Olken, B. (2017). The Development Effects of the Extractive Colonial Economy: The Dutch Cultivation System in Java.

Ellis, F. (1983). *Las transnacionales del banano en Centroamérica*. Editorial Universitaria Centroamericana (EDUCA).

Fallas-Paniagua, M. (2013). Cartografía censal en Costa Rica: de lo análogo a lo digital. *Revista Geográfica de América Central*, 1(50):113–140.

Feres, J. C. and Mancero, X. (2001). El método de las necesidades básicas insatisfechas (NBI) y sus aplicaciones en América Latina. Series Estudios Estadísticos y Prospectivos, CEPAL, UN.

Freund, C. and Pierola, M. D. (2015). Export Superstars. *The Review of Economics and Statistics*, 97(5):1023–1032.

Gelman, A. and Imbens, G. (2017). Why High-Order Polynomials Should Not Be Used in Regression Discontinuity Designs. *Journal of Business & Economic Statistics*.

Gutiérrez, G. and Philippon, T. (2017). Declining competition and investment in the u.s. Working Paper 23583, National Bureau of Economic Research.

Harpelle, R. (2001). *West Indians of Costa Rica: Race, Class, and the Integration of an Ethnic Minority*. Mcgill-Queen's Studies in Ethnic History. McGill-Queen's University Press.

Harrison, A. and Rodríguez-Clare, A. (2009). Trade, Foreign Investment, and Industrial Policy for Developing Countries. Working Paper 15261, National Bureau of Economic Research.

Henderson, J. V., Storeygard, A., and Weil, D. N. (2012). Measuring Economic Growth from Outer Space. *American Economic Review*, 102(2):994–1028.

Hijmans, R. J., Cameron, S. E., Parra, J. L., Jones, P. G., and Jarvis, A. (2005). Very High Resolution Interpolated Climate Surfaces For Global Land Areas. *International Journal of Climatology*, 25(15):1965–1978.

Hodler, R. and Raschky, P. A. (2014). Regional Favoritism. *The Quarterly Journal of Economics*, 129(2):995–1033.

Holmes, T. J. (2011). The diffusion of wal-mart and economies of density. Technical Report 79, Econometrica.

Jones, C. F. and Morrison, P. C. (1952). Evolution of the Banana Industry of Costa Rica. *Economic Geography*, 28(1):1–19.

Kahn, M. E. and Tracy, J. (2019). Monopsony in spatial equilibrium. Working Paper 26295, National Bureau of Economic Research.

Keith, M. C. (1886). *Mr. Keith's letter to the Costa Rica bondholders. June, 1886*. London.

Lipsey, R. E. (2002). Home and Host Country Effects of FDI. Working Paper 9293, National Bureau of Economic Research.

Lipsey, R. E. (2006). Measuring the impacts of fdi in central and eastern europe. Working Paper 12808, National Bureau of Economic Research.

Lowes, S. and Montero, E. (2016). Blood Rubber: The Effects of Labor Coercion on Institutions and Culture in the Democratic Republic of Congo. Job Market Paper 2 (Economic History; Political Economy).

Lucassen, J. (2004). A multinational and its labor force: The dutch east india company, 1595-1795. *International Labor and Working-Class History*, (66):12–39.

May, S. and Lasso, G. (1958). *The United Fruit Company in Latin America*. Number no. 7 in American business abroad. National Planning Association.

McCoskey, S. K. (2011). Foreign direct investment and entrepreneurial capture in pre-conflict liberia. *Journal of Small Business & Entrepreneurship*, 24(2):197–216.

Michalopoulos, S. and Papaioannou, E. (2014). National Institutions and Subnational Development in Africa. *The Quarterly Journal of Economics*, 129(1):151–213.

Molina, I. (2017). *Estadísticas de financiamiento, salarios docentes, matrícula, cobertura y graduación en la educación costarricense: Una contribución documental (1827-2016).* Vicerrectoría de Investigación : Centro de Investigaciones Históricas de América Central, San José, Costa Rica.

Morgan, L. (1993). *Community Participation in Health: The Politics of Primary Care in Costa Rica*. Cambridge Studies in Medical Anthropology. Cambridge University Press.

Méndez, F. and Bravo, O. (2014). Costa Rica: Mapas de pobreza 2011. In Instituto Nacional de Estadística y Censos (INEC), editor, *Costa Rica a la luz del Censo 2011*, page 9–39.

Méndez, F. and Trejos, J. D. (2004). Costa Rica: Un mapa de carencias críticas para el año 2000. In Instituto Nacional de Estadística y Censos (INEC), editor, *Costa Rica a la luz del Censo 2000*, page 205–233.

Neumark, D., Zhang, J., and Ciccarella, S. (2008). The effects of wal-mart on local labor markets. *Journal of Urban Economics*, 63:405–430.

Nunn, N. (2008). The Long-term Effects of Africa's Slave Trades. *The Quarterly Journal of Economics*, 123(1):139–176.

Oficina Central de Estadística (1868). *Censo de Población 1864*. Imprenta Nacional.

Pope, D. G. and Pope, J. C. (2015). When walmart comes to town: Always low housing prices? always? Working Paper 37, Journal of Urban Economics.

Ransom, M. R. (1993). Seniority and monopsony in the academic labor market. *The American Economic Review*, 83(1):221–233.

Royo, A. (2009). *Crisis de dependencia en la Zona Sur: Desarrollo agrario y migraciones internas en el Cantón de Osa 1973-2000*. Editorial UCR, Universidad de Costa Rica, San José.

Sanou, O. and Quesada, F. (1998). Orden, progreso y civilización (1871-1914). Transformaciones urbanas y arquitectónicas. In Fonseca, E. and Garnier, J., editors, *Historia de la Arquitectura en Costa Rica*, pages 219–317. San José, Fundación Museos del Banco Central de Costa Rica.

Smarzynska Javorcik, B. (2004). Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages. *American Economic Review*, 94(3):605–627.

Soley, T. (1940). *Compendio de historia económica y hacendaria de Costa Rica*. Serie Escolar "Costa Rica" Nº 2. Editorial Soley y Valverde.

UFCo (1916). *United Fruit Company. Medical Department Annual Report*. Boston.

UFCo (1921). *United Fruit Company. Medical Department Annual Report*. Boston.

UFCo (1925). *United Fruit Company Annual Report, Medical Department*. Boston.

UFCo (1929). *United Fruit Company Annual Report, Medical Department*. Boston.

Vail, L. (1976). Mozambique's chartered companies: The rule of the feeble. *The Journal of African History*, 17(3):389–416.

Viales, R. (1998). *Después del enclave 1927-1950: Un estudio de la región atlántica costarricense*. Colección Nueva historia. Editorial de la Universidad de Costa Rica.

Viales, R. (2012). La colonización agrícola del Atlántico (Caribe) costarricense entre 1870 y 1930. El peso de la política agraria Liberal y de las diversas formas de apropiación territorial. *Anuario de Estudios Centroamericanos*, 27(2):57–100.

Viales, R. and Montero, A. (2013). El impacto ambiental del cultivo del banano en la región Atlántico/Caribe de Costa Rica. Limón durante su segundo ciclo bananero (1960-2010). In Viales, R., editor, *La conformación histórica de la región Atlántico/Caribe costarricense: (re)interpretaciones sobre su trayectoria entre el siglo XVI y el siglo XXI*, pages 477–521. San José: Editorial Nuevas Perspectivas.

Wiley, J. (2008). *The Banana: Empires, Trade Wars, and Globalization*. At Table. University of Nebraska Press.

Xu, B. (2000). Multinational Enterprises, Technology Diffusion, and Host Country Productivity Growth. *Journal of Development Economics*, 62(2):477 – 493.

Appendix A. Historical Details

A.1 The UFC in Costa Rica

This subsection provides more details on the role and decay of the UFC in Costa Rica and complements the historical background presented in Section 2.

Figure 10 shows how, after 1880 banana production in Costa Rica increased in volume and importance. By 1905 bananas had reached the same place in Costa Rica's exporting value than coffee (Costa Rica's main export product at the time).

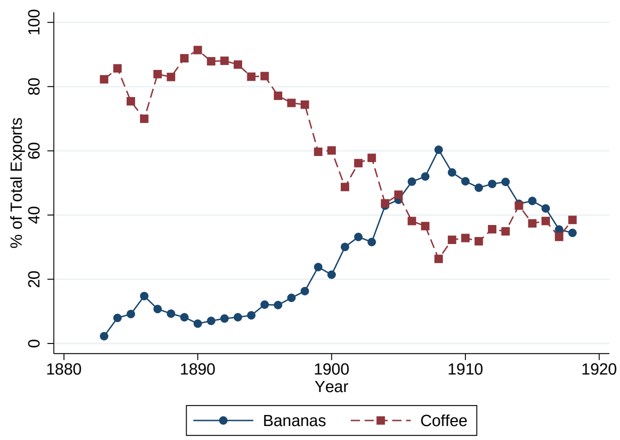


Figure 10: Banana and coffee as percent of total exports, 1883-1918

Source: Authors' calculations based on the "Statistical Summary, years 1883 to 1910: trade, agriculture, industry" and 1911 to 1918 Costa Rican Statistic Yearbooks.

The railroad construction and the banana activity stimulated population growth in Limón, the province where our paper restricts attention. Table A.1 shows the dynamics of population growth in Limón using census data from 1883 to 1963, while Table A.2 shows the role of foreigners in these population dynamics.

Table A.1: Population and Growth Rates

	Census									
	1883		1892		1927		1950		1963	
	Pop.	G.R	Pop.	G.R	Pop.	G.R	Pop.	G.R	Pop.	G.R
Limón Province	1,858	-	7,484	16.74	32,278	4.26	41,360	1.08	68,385	3.94
Rest of Costa Rica	180,215	-	235,721	3.03	439,246	1.79	759,515	2.41	1,267,889	4.02

Source: Authors' calculations based on 1883, 1892, 1927, 1950, and 1963 Costa Rican Census.
Notes: Pop= Population. G.R= Annual population growth rate (percentage).

Table A.2: Percentage of Foreigners in the Population

	Census				
	1883	1892	1927	1950	1963
Limón Province	68.51	14.04	68.75	26.84	7.53
Rest of Costa Rica	1.80	2.15	4.67	2.96	2.25

Source: Authors' calculations based on 1883, 1892, 1927, 1950, and 1963 Costa Rican Census.

Figure 11 illustrates the evolution of UFC employment in Costa Rica. On average, between 1912 and 1931 the UFC employee around 7.96% of the total agricultural workers in the country and 4.82% of the entire labor force. Between 1946 and 1976, the numbers were 6.93% and 3.50% respectively.

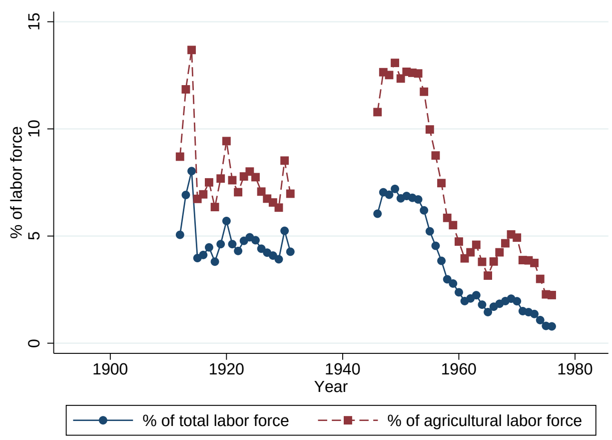


Figure 11: UFC employees as percentage of Costa Rican labor force, 1912-1976

Source: Authors' calculations based on United Fruit Company Medical Department Annual Report for 1912-1931, Ellis (1983) for 1946-1976, and 1892, 1927, 1950, 1963, 1973, and 1984 Costa Rican Census.

The UFC produced bananas in the Caribbean Coast until 1938, when the Panama disease forced the company to shift operations to the Pacific Coast. Figure 12 shows how the ports located on the Pacific Coast took a predominant role in the banana exports, while the ports in the Atlantic Coast lost relevance. However, although the enclave structure and the banana production moved to the Pacific Coast, the UFC kept landholdings in the Caribbean Coast and continued growing alternative products such as cacao and rubber (Viales, 1998). In 1976 the UFC, now organized under the United Brands name, returned banana production to the Caribbean Coast. By then, new entrants in the banana market prevented the UFC of having the protagonist role and monopoly power that it had at the beginning of the century

(Viales and Montero, 2013). Finally, due to labor conflicts, soil exhaustion, increases in production costs, and a corporate strategy that divested in the production process to focus on marketing, the UFC abandoned banana production in the Pacific Coast in 1984 (Royo, 2009, p. 37). The overall production pattern is evident in Figure 13, which documents the total land destined to banana grow.

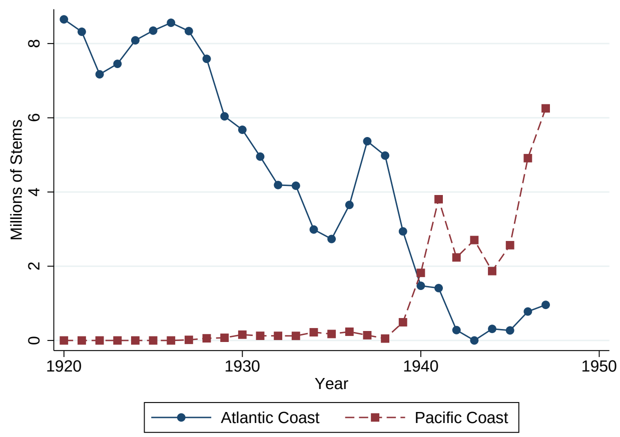


Figure 12: Banana exports by coast of origin, 1920-1947

Source: "Statistical Summary, years 1883 to 1910: trade, agriculture, industry", 1911 to 1926 Costa Rican Statistic Yearbooks, and "Export Bulletin 1941-1947".

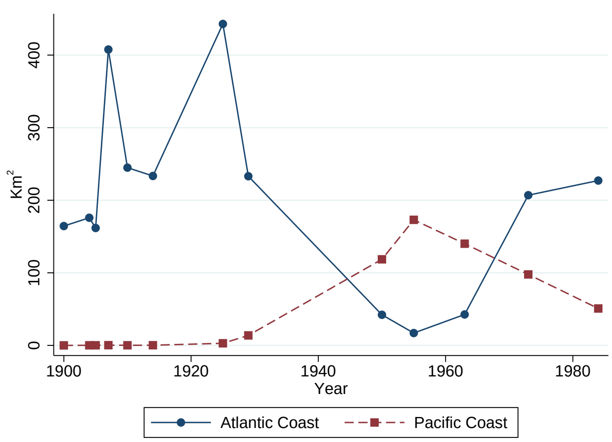


Figure 13: Squared kilometers of banana plantations, 1900-1984

Source: 1900 to 1984 Costa Rican agricultural censuses.

A.1.1 The UFC and its Differential Effect on Schooling

To assess the impact of the UFC educational investments on current human capital accumulation, we estimate equation 1 using educational attainment as the outcome variable. The results are presented in Table A.3, restricting the sample to non-migrants. Column (1) shows a positive UFC effect on human capital accumulation. Consistent with the emphasis on primary education by the company, column (2) shows a positive UFC effect on primary education attainment. Individuals in the former UFC areas are 5.3 percentage points more likely of completing primary education. On the other hand, in column (3) the effect of the UFC presence on secondary education attainment is zero, in line with the higher costs of completing higher education levels.

Table A.3: Human Capital Accumulation

	Years of schooling	Primary	Secondary
	(1)	(2)	(3)
UFC	0.269	0.053	0.003
	(0.130)**	(0.018)***	(0.009)
	[0.143]*	[0.020]**	[0.007]
Adjusted R^2	0.240	0.204	0.042
N	24,587	24,587	24,587
Clusters	198	198	198
Mean	4.595	0.462	0.056

Notes: The unit of observation is the individual. The sample is restricted to non-migrants. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic (slope, elevation, and temperature), and individual (age, age squared, and gender) controls, census FE, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.1.2 Monopsony Power vs Perfect Competition

Monopsony vs Perfect Competition Most of the agricultural production during the 20th Century in Costa Rica consisted of coffee farms, which were not only many, but owned by many different small producers (approximately 25 000 coffee farms owned by 21500 different producers, on average,from 1900-1925 according to the national Coffee Census). On its part, the banana company employed 14 percent of the total agricultural workforce, and was the only employer within its lands. These facts stand behind our assumptions of monopsony in the banana region, and perfect competition in the rest of the country.

We can measure the degree of monopsony of the UFC using the variation in the company's employment (1912-1976), and the variation in world banana prices (as shocks to the UFC's marginal productivity of labor in Costa Rica). Namely, we consider the following regression

$$ln(UFC\ employment_t) = \alpha + \beta ln(P^W_{Bt}) + \varepsilon_t, \tag{10}$$

where P^W_B stands for the world banana price. Elasticity β would then measure the degree of monopsony. Assuming decreasing returns to scale, under perfect competition $\beta > 1$, while under monopsony it is possible to find elasticities below 1 (the extreme being a perfectly inelastic labor supply).[33]

Our estimation finds $\beta = 0.397$ with a robust standard error of 0.089 (thus the coefficient is significant at 1 percent). This suggests that the company indeed faced an upward sloping labor supply, which is consistent with the historical accounts on it being the sole employer within its concession.

A.1.3 Local Government Budget Constraints

The Costa Rican government during the first half of the 20th Century had very limited access to capital markets. In the 1870s, the government entered into \$15 million of external debt with an 18% interest rate (sovereign bonds sold in England and France). At the time, the service of this external debt represented between 50 and 20% of value of exports (Marichal, 1988). This burden proved to be too large, and on 1874 the first default on payments occurred. At this time, debt was restructured with a longer maturity and a higher interest rate. A similar story repeated itself on 1901 and 1933. By this time, the debt had increased to \$21 millions of external debt, as new debt emitted to cover delayed interest payments. The country then entered a moratorium that lasted more than a decade (1935-1946) with payments being defaulted throughout the period. Therefore, the very high loan in the late 1800s and the local inability to serve the interest of this debt, incurred a penalty on the interest rates and borrowing ability. We therefore assume the local government had to finance local amenities using collected taxes and is intertemporally constrained.

[33] The intuition behind this known result is the following: If the price of the product increases, the value of the marginal product of labor increases. If the firm cannot influence the wage, it adjusts by increasing employment, and with decreasing returns to scale, this change in employment must be more to proportional to the change in price. This result holds both if the firm has market power in the final product market and if it does not.

Appendix B. Unsatisfied Basic Needs (UBN) Index Construction

To specify the set of basic needs that we consider in the paper and the threshold for attaining those needs, we follow the methodology proposed by Méndez and Trejos (2004) for Costa Rica. Méndez and Trejos constructed the index based on information from the 2000 Census. The method can be applied straightforwardly to the 2011 Census, given the similarity of the questions between the 2000 and 2011 censuses (Méndez and Bravo, 2014). To adapt the method to the 1973 and 1984 Census, we use only the subset of the components for which similar variables are available in all four censuses. . Table B shows which census variables constitute each basic need, and describes the standards under which the need is considered unsatisfied. For instance, the basic housing need is considered unsatisfied if the household is living in a temporary shelter or slum, if it is living in a dwelling with bad conditions in roof, wall, and floor simultaneously, *or* if the dwelling's roof, wall, and floor as described as being in bad conditions simultaneously.

Appendix I shows that if we use the index proposed by Méndez and Trejos only for the census where it can be directly applied (2000 and 2011 Census) and including all its original components (we used only the ones for which similar variables are available in all four censuses), the main results of the paper are preserved.

Table B.4: Definition and Classification of Basic Needs

Dimension	Component	Variable from Census
Housing	House Quality	Household living in a temporary shelter or slum Household living in a dwelling with waste material in wall, roof or dirt floor Household living in a dwelling with bad conditions in roof, wall, and floor simultaneously
	Overcrowding	Household with more than two persons per room
Sanitation		Urban household where the sanitary service is connected to ditch, trench, river, estuary, cesspit, or latrine, or without sanitary service Rural household where the sanitary service is connected to direct connection to ditch, trench, river, estuary, or without sanitary service
Education	School Attendance	Household with at least one member from 7 to 17 years old not attending school
	School Achievement	Household with at least one member from 7 to 17 years old attending school regularly, but with a school backwardness higher than 2 years

Continued on next page

Table B.4 – continued from previous page

Dimension	Component	Variable from Census
Consumption	Consumption Capacity	Household without regular income recipients (employed, pensioners or rentiers) and whose head is 50 years old or older and with: • 3.59 years of schooling or less for Census 1973. • 5 years of schooling or less for Census 1984. • 6 years of schooling or less for Census 2000. • 6.39 years of schooling or less for Census 2011. Urban household with three or more dependents and one income recipient with less than: • 3.59 years of schooling for Census 1973. • 5 years of schooling for Census 1984. • 6 years of schooling for Census 2000. • 6.39 years of schooling for Census 2011. Urban household with three or more dependents and two income recipients whose on average have less than: • 2.59 years of schooling for Census 1973. • 4 years of schooling for Census 1984. • 5 years of schooling for Census 2000. • 5.39 years of schooling for Census 2011. Urban household with three or more dependents and three or more income recipients whose on average have less than: • 1.59 years of schooling for Census 1973. • 3 years of schooling for Census 1984. • 4 years of schooling for Census 2000. • 4.39 years of schooling for Census 2011.

Continued on next page

Table B.4 – continued from previous page

Dimension	Component	Variable from Census
		Rural household with three or more dependents and one income recipient with less than: • 1.59 years of schooling for Census 1973. • 3 years of schooling for Census 1984. • 4 years of schooling for Census 2000. • 4.39 years of schooling for Census 2011. Rural household with three or more dependents and two income recipients whose on average have less than: • 0.59 years of schooling for Census 1973. • 2 years of schooling for Census 1984. • 3 years of schooling for Census 2000. • 3.39 years of schooling for Census 2011. Rural household with three or more dependents and three or more income recipients whose on average have: • 0 years of schooling for Census 1973. • Less than 1 years of schooling for Census 1984. • Less than 2 years of schooling for Census 2000. • Less than 2.39 years of schooling for Census 2011.

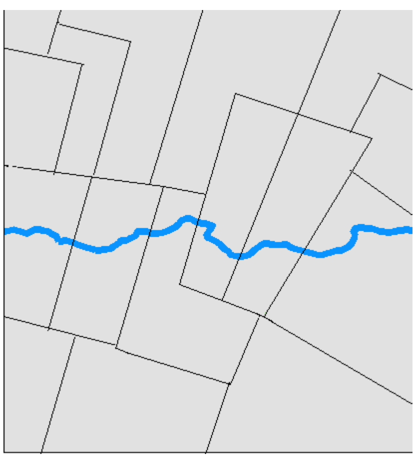
Appendix C. Additional Figures

Figure 14 provides an example of one of the original maps from the National Archives of Costa Rica that we collected, scanned, and digitized.

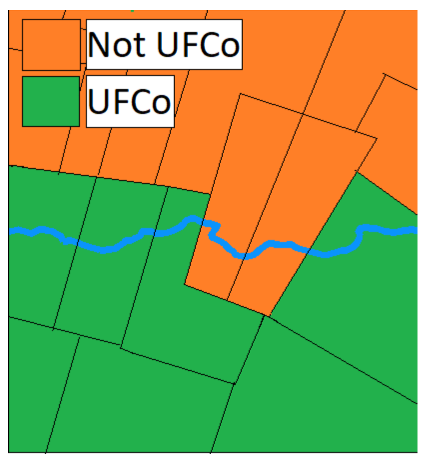
Figure 14: One of the Original Maps from the National Archives of Costa Rica.

Notes: One of the maps collected form the national arcades. *Source*: National Archives of Costa Rica. Fondo: Mapa. Signatura: 17849.

Figure 15: The UFC Boundary Follows the River Closely but not Exactly



(a) River and Pre-existing Plots in 1904



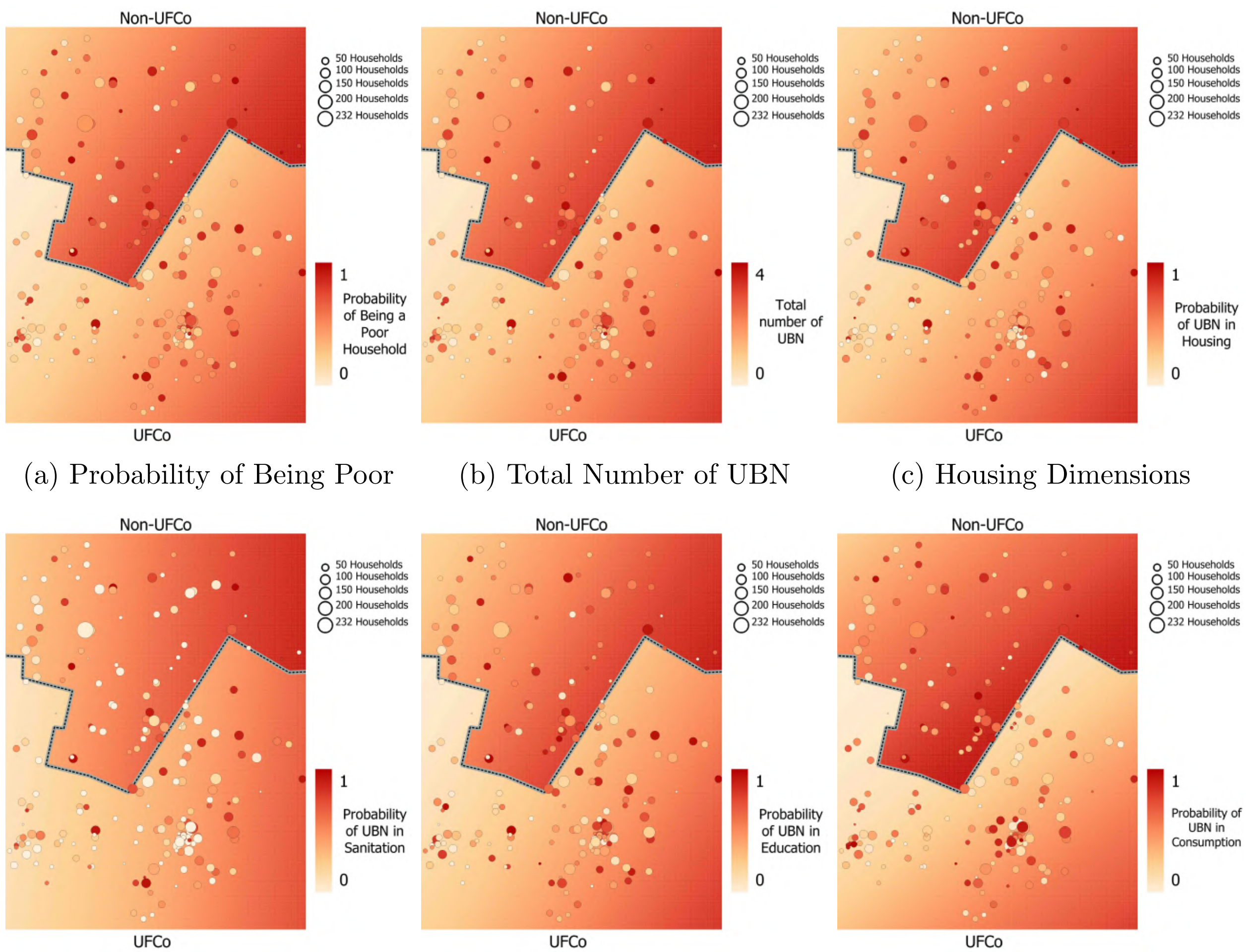
(b) Final Boundary

Notes: The Figure shows an example of how the boundary follows a natural landmark (the river) closely, but not exactly, as it was jointly determined by the river and preexisting plots. In 1904 the government forbid, by law, to sell the plots in orange back to the company (or any foreigner), therefore this boundary was kept constant during the company's tenure.

Appendix D. Additional Results

Figure 16 shows the study boundary, with UFC territories being South. Each dot represents a census-block's centroid. Dot-color indicates the average outcome value for households, and dot-size represents the number of households in each census-block. As shown, lighter colors stand for better economic outcomes. Panels 16c, 16d, 16e, and 16f presents the probability of having a UBN in housing, sanitation, education, and consumption respectively. Panel 16a shows the probability of being classified as a poor household and Panel 16b shows the total number of UBN.

Figure 16: Plots of the UFC Effect on Contemporary Household Outcomes



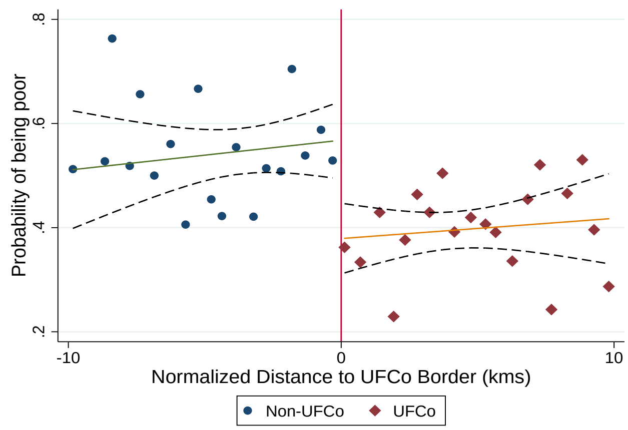
(a) Probability of Being Poor (b) Total Number of UBN (c) Housing Dimensions

(d) Sanitation Dimension (e) Education Dimension (f) Consumption Dimension

Notes: The figure shows the study boundary, with UFC territories being South. Each dot represents a census-block's centroid. Dot-color indicates the average outcome value for households, and dot-size represents the number of households in each census-block. As shown, lighter colors stand for better economic outcomes.

Figure 17 shows how the probability of being poor changes depending on the household's distance to the boundary. This figure shows a sharp discontinuity in the probability of being poor at the study boundary, with the probability being lower for households treated by the UFC (to the right). Slopes of the fitted lines are .011 (non-UFCo) and .008 (UFCo).

Figure 17: Probability of Being Poor vs Distance to the UFC Boundary



Notes: This figure shows how the probability of being poor changes depending on the household's distance to the boundary. The probability is lower to the right of the boundary (UFC households) than to its left.

As a robustness test, we also calculate the effects of the UFC using the entire border, obtained by estimating Equation (1), using all four censuses' data. For this regression, we consider that a household is located in a former UFC region following two criteria. First, an extensive margin of the UFC presence is provided by a dummy variable equal to one if the UFC had any landholding in the district where the household is located, and zero otherwise. Second, an extensive margin of the UFC presence is provided by using the fraction of total district land that was part of UFC landholdings.[34]

The results in Table D.6 suggest that in both cases, households located in a district where the UFC operated, have better outcomes and living standards, with similar –sometimes statistically equal– results to the ones in our main regression. Although these results are in line with the conclusions draw from our analysis of the areas where the UFC presence was exogenous, this naive approach only provides suggestive evidence of a positive UFC effect, as they are contaminated by the ex-ante difference in land before the treatment.

[34]This analysis is done at the district-level as our confidential data with the census-block level reference pertains only the subset of households in our main specification.

Table D.5: Contemporary Household Outcomes: Dynamics Across Years

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.202	-0.272	-0.069	-0.125	-0.229	-0.668
	(0.064)***	(0.081)***	(0.043)	(0.048)***	(0.070)***	(0.164)***
	[0.066]***	[0.081]***	[0.034]**	[0.045]***	[0.054]***	[0.149]***
UFC_{1984}	-0.056	0.013	-0.086	-0.067	-0.081	-0.196
	(0.048)	(0.028)	(0.028)***	(0.049)*	(0.046)**	(0.093)**
	[0.034]*	[0.013]	[0.027]***	[0.030]**	[0.032]**	[0.063]***
UFC_{2000}	-0.079	0.020	-0.057	-0.132	-0.132	-0.199
	(0.032)**	(0.017)	(0.022)**	(0.036)***	(0.036)***	(0.059)***
	[0.029]***	[0.017]	[0.019]***	[0.024]***	[0.031]***	[0.053]***
UFC_{2011}	-0.093	0.021	-0.039	-0.014	-0.101	-0.126
	(0.030)***	(0.016)	(0.030)	(0.037)	(0.038)***	(0.064)**
	[0.033]***	[0.020]	[0.031]	[0.055]	[0.053]*	[0.095]
Adjusted R^2	0.103	0.199	0.241	0.017	0.116	0.206
N	8,786	8,786	8,786	8,786	8,786	8,786
Clusters	200	200	200	200	200	200
$Mean_{1973}$	0.462	0.353	0.393	0.208	0.777	1.416
$Mean_{1984}$	0.209	0.060	0.362	0.201	0.579	0.832
$Mean_{2000}$	0.145	0.031	0.230	0.178	0.452	0.584
$Mean_{2011}$	0.124	0.018	0.156	0.215	0.402	0.512

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic (slope, elevation, temperature) and demographic (number of adults, children, infants per household) controls; census FE, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D.6: Contemporary Household Outcomes: Average UFC Effect in the Entire Border

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
Intensive Margin: Fraction of the district's area that belonged to the UFC						
UFC	-0.080	-0.026	-0.037	-0.047	-0.095	-0.190
	(0.017)***	(0.011)**	(0.016)**	(0.014)***	(0.023)***	(0.044)***
	[0.029]***	[0.015]	[0.019]***	[0.025]**	[0.026]***	[0.051]***
% Variation	**41.5**	**35.6**	**17.7**	**34.9**	**29.3**	**41.4**
Adjusted R^2	0.097	0.109	0.248	0.017	0.116	0.193
Extensive Margin: The UFC had landholdings in the district						
UFC	-0.023	-0.010	-0.021	-0.022	-0.048	-0.076
	(0.016)	(0.012)	(0.009)**	(0.010)**	(0.018)***	(0.039)*
	[0.029]***	[0.015]	[0.019]***	[0.025]**	[0.026]***	[0.051]***
% Variation	11.9	13.7	10.0	16.3	13.2	16.6
Adjusted R^2	0.096	0.109	0.247	0.016	0.114	0.191
N	672,102	672,102	672,102	672,102	672,102	672,102
Clusters	398	398	398	398	398	398
Mean	0.193	0.073	0.209	0.135	0.324	0.459

Notes: UBN= Unsatisfied Basic Need. Percentage variations with respect to the sample mean expressed as "% Variation". The unit of observation is the household. The sample is restricted to directly neighboring districts (districts sharing a border), with and without UFC landholdings. Robust standard errors, adjusted for clustering by district-year, are in parentheses. Conley standard errors are in brackets. All regressions include geographic controls for slope, elevation, and temperature; demographic controls for the number of adults, children, and infants in the household; census fixed effects, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix E. Details on Government Expenditures

In this section, we discuss in more detail how government expenditures in regions around the UFC were not low with respect to the rest of the country. To do so, we gathered data on government spending per canton from annual reports from the Comptroller General of the Republic of Costa Rica (*Contraloría General de la República de Costa Rica*) published

between 1951 and 1984,[35]and estimate spending per capita. Table E.7 compares government spending per capita between municipalities around the UFC and all other rural municipalities in the country. As shown, we do not find any significant differences between the treatment our "control region" received from the government in terms of spending and the one received by other rural regions in the country.

Table E.7: Comparison of Government Spending per Capita (Log)

UFC	0.004	-0.006
	(0.084)	(0.086)
Adjusted R^2	-0.001	0.349
Year FE	No	Yes

Notes: Dependent variable is in logs. N=669 and # of clusters=50. The unit of observation is the municipality. Robust SE, clustering by municipality, in parentheses.

Appendix F. Comparison: Control Group vs Other Rural Regions

In this section, we compare the control group with nearby regions to grasp what is the direction of the spillovers from the company to this neighboring region, and to make sure that this region is not in the "left tail" of the distribution of districts in the country and this is not driving the gap we documented. Namely, we compare this control group with rural regions on a belt around it; regions that are relatively similar but are further away from the UFC. The choice of this belt's bandwidth is constrained by data availability; as the Costa Rican Census Bureau (INEC) only gave us clearance for the census-block geo-reference of households that are approximately 22.5 kms from the UFC border. Thus, we use all the households in the control group and compare them with non-UFC households within 17.5 kms of our control group, therefore using a belt as wide as possible.

[35]Although the publication was annual, the records on government spending per canton appear for 15 years between 1951 (the first publication year) and 1984 (when the UFC ended operations).

F.1 Main Outcomes

We run the following regression for a belt of non-UFC regions around our control group for the year 1973, while the company was still operating:

$$y_{ig1973} = \gamma \textit{counterfactual}_g + f(\textit{geographic location}_g) + \mathbf{X}_{ig1973}\beta + \mathbf{X}_g\Gamma + \varepsilon_{ig1973}, , \quad (11)$$

where $\textit{counterfactual}_g$ is a dummy that is equal to 1 if region g lies within the counterfactual region (within 5km from the boundary shown in Figure 3) and zero otherwise. Other variables follow a similar notation as in Equation 1, namely, y_{ig1973} is an outcome of individual or household i in district g in 1973 (we use district-level data as our administrative census-block geo-referenced data only covers the subsample around the UFC boundary); $f(\text{geographic location}_g)$ is a RD polynomial, which is a smooth function on latitude and longitude that controls for the geographic location of census-block g. $\mathbf{X}_{ig1973}$ is a vector of covariates (number of adults, children, infants per household) for individual or household i. $\mathbf{X}_g$ is a vector of geographic characteristics (slope, elevation, temperature) for district g.

The results of this equation are presented in Table F.8, showing that outcomes are better within the control group for all outcomes except education. However, Section F.2 “unpacks” the education index, and studies years of schooling (the index includes other less traditional aspects like school attendance and school backwardness), finding that individuals in the control group actually have more years of schooling than individuals in the control group (although, as shown by the index, regular attendance is lower).

Table F.8: Counterfactual Region vs Other RuraL Regions

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.514	-0.612	- 0.124	-0.221	-0.420	-1.222
	(0.027)***	(0.028)***	(0.030)**	(0.029)***	(0.006)***	(0.058)***
	[0..025]***	[0.026]***	[0.028]**	[0.027]***	[0.006]***	[0.053]***
Adjusted R^2	0.098	0.198	0.415	0.072	0.076	0.166

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a quadratic polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

F.2 Years of Schooling

Comparing Migrants We compare the years of schooling of migrants to our control group with the years of schooling of migrants to other nearby rural regions, again, to grasp what is the direction of the spillovers from the company to this neighboring region: Is the control group attracting particularly "bad" migrants? Is this driving our result? The answer to both questions is no. If anything, the control group is attracting relatively skilled migrants with 2.52 months more years of schooling than migrants to other nearby regions.

Comparing Average Years of Schooling To see this, we run the following regression:

$$yrs\ schooling_{ig1973} = \gamma counterfactual_g + f(geographic\ location_g) + \mathbf{X}_{ig1973}\beta + \mathbf{X}_g\Gamma + \varepsilon_{ig1973}, \tag{12}$$

where $counterfactual_g$ is a dummy that is equal to 1 if region g lies within the counterfactual region (within 5km from the boundary shown in Figure 3) and zero otherwise. Other variables follow a similar notation as in Equation 11. Results are shown in Table F.9, showing that years of schooling were 1.453 years higher in the control group during UFC times than in other nearby rural areas.

Table F.9: Years of Schooling: Control Group vs Nearby Non-UFC Rural Regions

	Years of Schooling
counterfactual	1.453
	(0.036)***
	[0.033]***
Adjusted R^2	0.083
Observations	2,067

Notes: he unit of observation is the individual. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a quadratic polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix G. Falsification Test

In this section we present the results of a falsification test, where we shift our study boundary 2km up, and rerun all our estimations within 2km of the placebo boundary (so that all observations lie above the true border), and then do the same shifting the boundary 2km down. All our estimated are not significant in this placebo test, providing additional evidence that the effect we are capturing is indeed driven by the UFC.

Table G.10: Average UFC Effect: Placebo Test

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Placebo at +2km			
UFC	0.022	-0.009	0.027	-0.010	0.008	0.031
	(0.034)	(0.019)	(0.018)	(0.030)	(0.040)	(0.066)
	[0.039]	[0.017]	[0.021]	[0.020]	[0.031]	[0.067]
Adjusted R^2	0.098	0.173	0.240	0.014	0.111	0.195
			Panel B: Placebo at -2km			
UFC	-0.030	0.008	-0.006	0.005	-0.008	-0.023
	(0.025)	(0.019)	(0.019)	(0.024)	(0.030)	(0.056)
	[0.031]	[0.019]	[0.019]	[0.027]	[0.029]	[0.054]
Adjusted R^2	0.098	0.173	0.239	0.014	0.111	0.195

Notes: N =8,786 and # of clusters=200 for both panels. UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix H. Additional Robustness Checks

Our additional robustness checks presented in this Section include: changing the specifications of the latitude-longitude polynomial, ignoring geographic and/or demographic controls, running our regressions at different distances from the boundary, using only subsamples of non-migrants and comparing the results of subsamples where individuals worked in agricultural versus non-agricultural activities.

H.1 Varying Specifications for the Latitude-Longitude Polynomial

In our original results, we used a linear polynomial in latitude and longitude. In this section we test the robustness of our results to different specifications for the polynomial in latitude and longitude. First, using a quadratic polynomial, we reestimate both the *average* UFC effect, and the *yearly* UFC effect. We then do the same using a linear polynomial in latitude, longitude *and* distance to the boundary.

H.1.1 Quadratic Latitude-Longitude Polynomial

Table H.11: Average UFC Effect-Quadratic Latitude-Longitude Polynomial

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.097	-0.013	-0.058	-0.059	-0.122	-0.226
	(0.028)***	(0.019)	(0.022)**	(0.025)**	(0.032)***	(0.060)***
	[0.033]***	[0.015]	[0.012]***	[0.025]**	[0.027]***	[0.055]***
Adjusted R^2	0.102	0.173	0.241	0.015	0.115	0.200
N	8,786	8,786	8,786	8,786	8,786	8,786
Clusters	200	200	200	200	200	200
Mean	0.176	0.060	0.235	0.200	0.481	0.670

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a quadratic polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table H.12: Dynamics Across Years-Quadratic Latitude-Longitude Polynomial

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.204	-0.277	-0.064	-0.127	-0.225	-0.672
	(0.068)***	(0.080)***	(0.041)	(0.046)***	(0.070)***	(0.164)***
	[0.071]***	[0.078]***	[0.031]**	[0.050]**	[0.054]***	[0.148]***
UFC_{1984}	-0.059	0.016	-0.087	-0.065	-0.079	-0.194
	(0.050)	(0.027)	(0.028)***	(0.036)*	(0.049)	(0.095)**
	[0.035]*	[0.010]*	[0.022]***	[0.030]**	[0.032]**	[0.060]***
UFC_{2000}	-0.084	0.020	-0.062	-0.085	-0.136	-0.210
	(0.033)**	(0.019)	(0.022)***	(0.027)***	(0.038)***	(0.062)***
	[0.032]***	[0.019]	[0.012]***	[0.024]***	[0.032]***	[0.054]***
UFC_{2011}	-0.095	0.021	-0.039	-0.013	-0.099	-0.126
	(0.031)***	(0.017)	(0.036)	(0.037)	(0.039)**	(0.064)*
	[0.034]***	[0.021]	[0.027]	[0.054]	[0.052]*	[0.093]
Adjusted R^2	0.103	0.199	0.241	0.017	0.116	0.207
$Mean_{1973}$	0.462	0.353	0.393	0.208	0.777	1.416
$Mean_{1984}$	0.209	0.060	0.362	0.201	0.579	0.832
$Mean_{2000}$	0.145	0.031	0.230	0.178	0.452	0.584
$Mean_{2011}$	0.124	0.018	0.156	0.215	0.402	0.512

Notes: UBN= Unsatisfied Basic Need. N=8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a quadratic polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.1.2 Linear Polynomial in Latitude, Longitude and Distance to the Boundary

Table H.13: Contemporary Household Outcomes: Dynamics Across Years-Linear polynomial in latitude, longitude and distance to the boundary

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.200	-0.275	-0.064	-0.127	-0.227	-0.666
	(0.066)***	(0.080)***	(0.041)	(0.048)***	(0.071)***	(0.165)***
	[0.069]***	[0.081]***	[0.034]*	[0.045]***	[0.057]***	[0.153]***
UFC_{1984}	-0.055	0.013	-0.084	-0.068	-0.080	-0.195
	(0.048)	(0.028)	(0.028)***	(0.036)*	(0.049)	(0.093)**
	[0.033]*	[0.014]	[0.026]***	[0.030]**	[0.032]**	[0.063]***
UFC_{2000}	-0.079	0.020	-0.057	-0.082	-0.132	-0.199
	(0.032)**	(0.017)	(0.058)***	(0.026)***	(0.036)***	(0.062)***
	[0.029]***	[0.017]	[0.018]***	[0.024]***	[0.031]***	[0.053]***
UFC_{2011}	-0.093	0.020	-0.038	-0.015	-0.101	-0.125
	(0.030)***	(0.016)	(0.030)	(0.037)	(0.038)**	(0.063)**
	[0.033]***	[0.020]	[0.031]	[0.056]	[0.053]*	[0.095]
Adjusted R^2	0.103	0.199	0.241	0.017	0.116	0.206
N	8,786	8,786	8,786	8,786	8,786	8,786
Clusters	200	200	200	200	200	200
$Mean_{1973}$	0.462	0.353	0.393	0.208	0.777	1.416
$Mean_{1984}$	0.209	0.060	0.362	0.201	0.579	0.832
$Mean_{2000}$	0.145	0.031	0.230	0.178	0.452	0.584
$Mean_{2011}$	0.124	0.018	0.156	0.215	0.402	0.512

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a linear polynomial in latitude, longitude and distance to the UFC boundary.
We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table H.14: Contemporary Household Outcomes: Average UFC Effect-Linear polynomial in latitude, longitude and distance to the boundary

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.095	-0.016	-0.055	-0.060	-0.123	-0.226
	(0.026)***	(0.017)	(0.022)**	(0.025)**	(0.030)***	(0.056)***
	[0.029]***	[0.014]	[0.018]***	[0.026]**	[0.026]***	[0.051]***
Adjusted R^2	0.102	0.173	0.241	0.015	0.115	0.200
Mean	0.176	0.060	0.235	0.200	0.481	0.670

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude and distance to the UFC boundary.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.2 Ignoring Demographic and Geographic Controls

H.2.1 No Demographic Controls

Table H.15: Average UFC Effect-No Demographic Controls

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.102	-0.014	-0.086	-0.062	-0.142	-0.264
	(0.027)***	(0.017)	(0.025)***	(0.025)**	(0.033)***	(0.063)***
	[0.032]***	[0.014]	[0.014]***	[0.023]***	[0.025]***	[0.055]***
Adjusted R^2	0.071	0.166	0.044	0.003	0.057	0.111
Mean	0.176	0.060	0.235	0.200	0.481	0.670

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude and distance to the UFC boundary.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table H.16: Contemporary Household Outcomes: Dynamics Across Years-No Demographic Controls

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.209	-0.269	-0.098	-0.127	-0.247	-0.703
	(0.066)***	(0.081)***	(0.055)*	(0.052)**	(0.073)***	(0.175)***
	[0.067]***	[0.081]***	[0.052]*	[0.049]**	[0.058]***	[0.160]***
UFC_{1984}	-0.056	0.013	-0.089	-0.068	-0.082	-0.200
	(0.051)	(0.027)	(0.034)***	(0.037)*	(0.057)	(0.109)*
	[0.040]	[0.014]	[0.027]***	[0.030]**	[0.035]**	[0.074]***
UFC_{2000}	-0.089	0.023	-0.092	-0.085	-0.155	-0.244
	(0.031)***	(0.018)	(0.027)***	(0.026)***	(0.039)***	(0.062)***
	[0.032]***	[0.017]	[0.017]***	[0.022]***	[0.034]***	[0.059]***
UFC_{2011}	-0.099	0.023	-0.075	-0.017	-0.123	-0.168
	(0.031)***	(0.016)	(0.030)**	(0.037)	(0.039)***	(0.064)***
	[0.035]***	[0.020]	[0.021]***	[0.053]	[0.047]***	[0.083]**
Adjusted R^2	0.072	0.192	0.044	0.005	0.059	0.117
$Mean_{1973}$	0.462	0.353	0.393	0.208	0.777	1.416
$Mean_{1984}$	0.209	0.060	0.362	0.201	0.579	0.832
$Mean_{2000}$	0.145	0.031	0.230	0.178	0.452	0.584
$Mean_{2011}$	0.124	0.018	0.156	0.215	0.402	0.512

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic controls for slope, elevation, and temperature; census FE, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.2.2 No Geographic Controls

Table H.17: Contemporary Household Outcomes: Dynamics Across Years-No Geographic Controls

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.219	-0.288	-0.054	-0.132	-0.247	-0.693
	(0.062)***	(0.079)***	(0.045)	(0.047)***	(0.067)***	(0.158)***
	[0.066]***	[0.078]***	[0.035]	[0.048]***	[0.053]***	[0.146]***
UFC_{1984}	-0.062	0.010	-0.083	-0.088	-0.082	-0.207
	(0.048)	(0.028)	(0.027)***	(0.035)**	(0.046)*	(0.092)**
	[0.035]*	[0.016]	[0.023]***	[0.031]**	[0.033]***	[0.068]***
UFC_{2000}	-0.082	0.018	-0.055	-0.085	-0.136	-0.204
	(0.031)***	(0.018)	(0.023)**	(0.026)***	(0.036)***	(0.059)***
	[0.029]***	[0.017]	[0.018]***	[0.025]***	[0.030]***	[0.051]***
UFC_{2011}	-0.101	0.017	-0.036	-0.020	-0.110	-0.140
	(0.030)***	(0.017)	(0.030)	(0.035)	(0.037)***	(0.062)**
	[0.032]***	[0.020]	[0.031]	[0.050]	[0.049]**	[0.087]
Adjusted R^2	0.103	0.198	0.240	0.017	0.116	0.206
$Mean_{1973}$	0.462	0.353	0.393	0.208	0.777	1.416
$Mean_{1984}$	0.209	0.060	0.362	0.201	0.579	0.832
$Mean_{2000}$	0.145	0.031	0.230	0.178	0.452	0.584
$Mean_{2011}$	0.124	0.018	0.156	0.215	0.402	0.512

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include demographic controls for the number of adults, children, and infants in the household; census FE, and a linear polynomial in latitude and longitude.

We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table H.18: Average UFC Effect-No Geographic Control

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.103	-0.021	-0.052	-0.062	-0.131	-0.238
	(0.026)***	(0.017)	(0.023)**	(0.024)**	(0.030)***	(0.057)***
	[0.031]***	[0.017]	[0.018]***	[0.024]***	[0.025]***	[0.052]***
Adjusted R^2	0.101	0.168	0.240	0.015	0.115	0.199
Mean	0.176	0.060	0.235	0.200	0.481	0.670

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.2.3 No Demographic or Geographic Controls

Table H.19: Average UFC Effect-No Demographic or Geographic Controls

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.108	-0.018	-0.080	-0.064	-0.148	-0.271
	(0.027)***	(0.017)	(0.025)***	(0.025)**	(0.033)***	(0.064)***
	[0.034]***	[0.016]	[0.012]***	[0.023]***	[0.025]***	[0.057]***
Adjusted R^2	0.070	0.161	0.044	0.003	0.057	0.110
Mean	0.176	0.060	0.235	0.200	0.481	0.670

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table H.20: Dynamics Across Years-No Demographic or Geographic Controls

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.225	-0.285	-0.080	-0.133	-0.263	-0.722
	(0.064)***	(0.079)***	(0.058)	(0.050)***	(0.071)***	(0.170)***
	[0.068]***	[0.078]***	[0.050]	[0.051]***	[0.059]***	[0.158]***
UFC_{1984}	-0.062	0.010	-0.085	-0.072	-0.089	-0.209
	(0.051)	(0.028)	(0.035)**	(0.036)**	(0.055)	(0.108)*
	[0.042]	[0.017]	[0.026]***	[0.031]**	[0.037]**	[0.079]***
UFC_{2000}	-0.092	0.022	-0.090	-0.088	-0.159	-0.248
	(0.031)***	(0.018)	(0.028)**	(0.026)***	(0.039)***	(0.062)***
	[0.032]***	[0.017]	[0.016]***	[0.023]***	[0.034]***	[0.057]***
UFC_{2011}	-0.106	0.020	-0.071	-0.022	-0.131	-0.179
	(0.031)***	(0.017)	(0.030)**	(0.034)	(0.038)***	(0.062)***
	[0.034]***	[0.020]	[0.021]***	[0.048]	[0.043]***	[0.075]**
Adjusted R^2	0.072	0.191	0.043	0.005	0.058	0.117
$Mean_{1973}$	0.462	0.353	0.393	0.208	0.777	1.416
$Mean_{1984}$	0.209	0.060	0.362	0.201	0.579	0.832
$Mean_{2000}$	0.145	0.031	0.230	0.178	0.452	0.584
$Mean_{2011}$	0.124	0.018	0.156	0.215	0.402	0.512

Notes: UBN= Unsatisfied Basic Need. N= 8786 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.3 The River vs the Boundary

In this Subsection we present our average and yearly results restricting our observations to units on the "worng side" of the river that closely follows our boundary. Our results hold even within these narrower neighborhoods.

Table H.21: Dynamics of the UFC-Effect Across Years-River Test: Restricted 1km

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.123	-0.226	-0.058	-0.089	-0.132	-0.496
	(0.066)*	(0.059)***	(0.053)	(0.033)***	(0.069)*	(0.103)***
	[0.047]***	[0.061]***	[0.048]	[0.029]***	[0.054]**	[0.084]***
UFC_{1984}	0.027	0.025	-0.092	-0.103	-0.063	-0.142
	(0.082)	(0.038)	(0.061)	(0.042)**	(0.072)	(0.129)
	[0.080]	[0.025]	[0.065]	[0.038]***	[0.054]	[0.109]
UFC_{2000}	-0.103	0.002	-0.085	-0.042	-0.121	-0.229
	(0.044)**	(0.030)	(0.029)***	(0.027)	(0.059)**	(0.089)**
	[0.030]***	[0.025]	[0.017]***	[0.034]	[0.043]***	[0.059]***
UFC_{2011}	-0.104	-0.000	-0.089	-0.117	-0.181	-0.310
	(0.039)**	(0.028)	(0.042)**	(0.032)***	(0.054)***	(0.086)***
	[0.023]***	[0.013]	[0.042]**	[0.020]***	[0.052]***	[0.061]***
Adjusted R^2	0.146	0.238	0.273	0.030	0.157	0.270
$Mean_{1973}$	0.491	0.396	0.455	0.252	0.829	1.595
$Mean_{1984}$	0.265	0.053	0.357	0.186	0.563	0.861
$Mean_{2000}$	0.150	0.037	0.255	0.208	0.497	0.650
$Mean_{2011}$	0.134	0.018	0.164	0.197	0.405	0.513

Notes: UBN= Unsatisfied Basic Need. N= 1937 and # of clusters=44. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table H.22: Average UFC Effect–River Test: Restricted 1km

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
UFC	-0.100	-0.014	-0.085	-0.084	-0.149	-0.284
	(0.034)***	(0.030)	(0.030)***	(0.024)***	(0.046)***	(0.074)***
	[0.022]***	[0.010]	[0.018]***	[0.019]***	[0.024]***	[0.027]***
Adjusted R^2	0.144	0.224	0.274	0.031	0.157	0.269
Mean	0.176	0.060	0.235	0.200	0.481	0.670

Notes: UBN= Unsatisfied Basic Need. N= 1937 and # of clusters=44. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.

H.4 Different Bandwidth: Results Eliminating Units within 3 kms of the Boundary.

In this Subsection we present our average and yearly results restricting our observations to units 3km away from the boundary. That is, we eliminate all observations that are relatively close to the boundary and run our regressions in the remaining ones (units).

Table H.23: Average UFC Effect– Eliminating observations close to the Boundary

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
UFC	-0.095	-0.016	-0.056	-0.059	-0.124	-0.228
	(0.026)***	(0.017)	(0.022)**	(0.031)***	(0.056)***	(0.074)***
	[0.031]***	[0.020]	[0.023]***	[0.042]**	[0.030]***	[0.071]***
Adjusted R^2	0.103	0.174	0.241	0.017	0.116	0.201
Mean	0.150	0.066	0.178	0.159	0.250	0.698

Notes: UBN= Unsatisfied Basic Need. N= 2,438 and # of clusters=200. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.

H.5 Assessing the Impact of Migration

In this Subsection we run our regressions on subsamples of households where (i) nobody migrated, and (ii) the head of household did not migrate; both within 5 years of each census. Our results persist, indicating that migration is not driving our estimations.

H.5.1 No member migrated within 5 years of the census.

Table H.24: Average UFC Effect-Any Migrant

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
UFC	-0.104	-0.004	-0.062	-0.055	-0.135	-0.225
	(0.027)***	(0.015)	(0.025)**	(0.025)**	(0.030)***	(0.052)***
	[0.031]***	[0.015]	[0.023]***	[0.028]**	[0.027]***	[0.049]***
Adjusted R^2	0.077	0.145	0.226	0.012	0.102	0.165
Mean	0.158	0.050	0.220	0.205	0.466	0.632
P-value for difference	0.49	0.19	0.64	0.78	0.43	0.94

Notes: UBN= Unsatisfied Basic Need. N= 6451 and # of clusters=198. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. P-values in the last row test whether the UFC coefficient is the same than the corresponding in Table 2. P-values are clustered at the census-block level.

Table H.25: Dynamics of the UFC-Effect Across Years-Any Migrant

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.252	-0.301	-0.070	-0.144	-0.285	-0.767
	(0.067)***	(0.100)***	(0.042)*	(0.035)***	(0.093)***	(0.191)***
	[0.080]***	[0.102]***	[0.031]**	[0.040]***	[0.080]***	[0.183]***
UFC_{1984}	-0.084	-0.000	-0.107	-0.084	-0.131	-0.275
	(0.048)*	(0.029)	(0.033)***	(0.043)*	(0.050)***	(0.094)***
	[0.044]**	[0.019]	[0.026]***	[0.036]**	[0.031]***	[0.062]***
UFC_{2000}	-0.085	0.008	-0.052	-0.098	-0.144	-0.226
	(0.031)***	(0.017)	(0.026)**	(0.030)***	(0.036)***	(0.057)***
	[0.029]***	[0.017]	[0.026]**	[0.028]***	[0.031]***	[0.051]***
UFC_{2011}	-0.110	0.019	-0.053	0.001	-0.113	-0.143
	(0.031)***	(0.016)	(0.033)	(0.035)	(0.037)***	(0.061)**
	[0.036]***	[0.016]	[0.033]	[0.051]	[0.044]**	[0.077]*
Adjusted R^2	0.079	0.168	0.227	0.016	0.102	0.171
N	6,451	6,451	6,451	6,451	6,451	6,451
Clusters	198	198	198	198	198	198
$Mean_{1973}$	0.434	0.360	0.342	0.204	0.758	1.339
$Mean_{1984}$	0.212	0.061	0.369	0.232	0.604	0.875
$Mean_{2000}$	0.135	0.033	0.224	0.179	0.446	0.571
$Mean_{2011}$	0.121	0.018	0.154	0.216	0.400	0.509

Notes: UBN= Unsatisfied Basic Need. N= 6451 and # of clusters=198. The sample is restricted to households whose any of its members is non-migrant. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.5.2 Head-of-household did not migrate within 5 years of the census

Table H.26: Dynamics of the UFC-Effect Across Years-Head Migrant

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{1973}	-0.250	-0.315	-0.076	-0.141	-0.308	-0.782
	(0.075)***	(0.102)***	(0.036)**	(0.041)***	(0.086)***	(0.180)***
	[0.087]***	[0.104]***	[0.026]***	[0.048]***	[0.075]***	[0.177]***
UFC_{1984}	-0.087	-0.002	-0.106	-0.094	-0.133	-0.290
	(0.048)*	(0.027)	(0.033)***	(0.041)**	(0.047)***	(0.092)***
	[0.038]**	[0.018]	[0.024]***	[0.038]**	[0.031]***	[0.062]***
UFC_{2000}	-0.089	0.010	-0.060	-0.104	-0.150	-0.242
	(0.030)***	(0.017)	(0.025)**	(0.028)***	(0.035)***	(0.055)***
	[0.028]***	[0.017]	[0.025]**	[0.027]***	[0.030]***	[0.052]***
UFC_{2011}	-0.112	0.018	-0.055	-0.005	-0.118	-0.155
	(0.030)***	(0.015)	(0.033)*	(0.035)	(0.036)***	(0.061)**
	[0.032]***	[0.015]	[0.036]	[0.055]	[0.047]**	[0.082]*
Adjusted R^2	0.084	0.183	0.224	0.017	0.106	0.174
$Mean_{1973}$	0.440	0.360	0.351	0.185	0.770	1.336
$Mean_{1984}$	0.213	0.057	0.379	0.219	0.603	0.868
$Mean_{2000}$	0.141	0.031	0.231	0.176	0.451	0.579
$Mean_{2011}$	0.124	0.018	0.158	0.216	0.404	0.515

Notes: UBN= Unsatisfied Basic Need. N= 7102 and # of clusters=198.The sample is restricted to households whose head of household is non-migrant. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table H.27: Average UFC Effect-Head Migrant

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.107	-0.006	-0.066	-0.062	-0.142	-0.241
	(0.026)***	(0.015)	(0.025)***	(0.025)**	(0.029)***	(0.050)***
	[0.028]***	[0.014]	[0.025]***	[0.031]**	[0.028]***	[0.051]***
Adjusted R^2	0.082	0.157	0.224	0.013	0.104	0.168
Mean	0.163	0.050	0.227	0.201	0.472	0.641
P-value for difference	0.25	0.22	0.37	0.86	0.18	0.69

Notes: UBN= Unsatisfied Basic Need. N= 7102 and # of clusters=198.The sample is restricted to households whose head of household is non-migrant. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic and demographic controls; census FE, and a linear polynomial in latitude, longitude.We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

H.6 Verifying that results are not driven by persistence of better abilities in agricultural activities

A concern might be that the higher productivity and better infrastructure in the UFC attracted people who were ex-ante better at growing crops; and that what we are capturing is the persistence of these abilities across generations. Therefore, in this subsection we compare the UFC effect in households that worked in agricultural activities with the effect on households devoted to other non-agricultural enterprises, and find no significant difference in the UFC effect.

Table H.28 compares our results for households where any member was employed in agricultural activities against all other households, and Table H.29 shows how households whose head works in agricultural activities deliver equivalent estimates to households where the head is employed in other activities.

Table H.28: Average UFC Effect-Comparison of households engaged in the agriculture sector versus other economic sectors.

		Probability of UBN in				Probability	Total number
		Housing	Sanitation	Education	Consumption	of being poor	of UBN
		(1)	(2)	(3)	(4)	(5)	(6)
Agricultural Sector	UFC	-0.097	-0.022	-0.052	-0.055	-0.123	-0.225
		(0.028)***	(0.018)	(0.024)**	(0.027)**	(0.033)***	(0.059)***
		[0.027]***	[0.014]	[0.023]**	[0.025]**	[0.024]***	[0.048]***
	Adjusted R^2	0.122	0.192	0.248	0.045	0.152	0.247
	N	6,190	6,190	6,190	6,190	6,190	6,190
	Clusters	200	200	200	200	200	200
	Mean	0.185	0.070	0.267	0.187	0.495	0.709
Non-Agricultural Sector	UFC	-0.094	0.002	-0.076	-0.065	-0.122	-0.233
		(0.037)**	(0.024)	(0.031)**	(0.049)	(0.052)**	(0.091)**
		[0.044]**	[0.026]	[0.023]***	[0.018]***	[0.034]***	[0.072]***
	Adjusted R^2	0.052	0.091	0.171	0.020	0.043	0.069
	N	2,596	2,596	2,596	2,596	2,596	2,596
	Clusters	193	193	193	193	193	193
	Mean	0.153	0.037	0.159	0.229	0.449	0.578
P-value for difference		0.94	0.32	0.48	0.85	0.98	0.93

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, adjusted for clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic controls and demographic controls; census FE, and a linear polynomial in latitude, longitude. P-values in the last row are for the test of the hypothesis that the UFC coefficient is the same between the two groups. P-values are clustered at the census-block level.

Table H.29: Contemporary Household Outcomes: Average UFC Effect-Comparison of households engaged in the agriculture sector versus other economic sectors

		Probability of UBN in				Probability	Total number
		Housing	Sanitation	Education	Consumption	of being poor	of UBN
		(1)	(2)	(3)	(4)	(5)	(6)
Agricultural Sector	UFC	-0.083	-0.025	-0.043	-0.039	-0.103	-0.191
		(0.030)***	(0.021)	(0.027)	(0.030)	(0.036)***	(0.065)***
		[0.025]***	[0.015]*	[0.029]	[0.025]	[0.030]***	[0.061]***
	Adjusted R^2	0.128	0.200	0.255	0.045	0.065	0.255
	N	5,337	5,337	5,337	5,337	5,337	5,337
	Clusters	200	200	200	200	200	200
	Mean	0.182	0.073	0.258	0.194	0.490	0.708
Non-Agricultural Sector	UFC	-0.120	0.000	-0.086	-0.092	-0.161	-0.299
		(0.033)***	(0.017)	(0.029)***	(0.040)**	(0.039)***	(0.064)***
		[0.044]***	[0.020]	[0.021]***	[0.025]***	[0.019]***	[0.054]***
	Adjusted R^2	0.066	0.091	0.209	0.013	0.066	0.104
	N	3,449	3,449	3,449	3,449	3,449	3,449
	Clusters	197	197	197	197	197	197
	Mean	0.166	0.039	0.200	0.208	0.467	0.612
P-value for difference		0.31	0.21	0.24	0.27	0.23	0.15

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust SE, adjusted for clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic controls and demographic controls; census FE, and a linear polynomial in latitude, longitude. P-values in the last row are for the test of the hypothesis that the UFC coefficient is the same between the two groups. P-values are clustered at the census-block level.

Appendix I.   Méndez & Trejos Index

Table I.30: Average UFC Effect-Méndez & Trejos Index

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.088	-0.031	-0.057	-0.020	-0.109	-0.197
	(0.030)***	(0.051)	(0.026)**	(0.019)	(0.043)**	(0.077)**
	[0.033]***	[0.034]	[0.028]**	[0.014]	[0.034]***	[0.069]***
Adjusted R^2	0.020	0.025	0.044	0.025	0.075	0.090
Mean	0.178	0.132	0.180	0.132	0.433	0.622

Notes: UBN= Unsatisfied Basic Need. N= 6623 and # of clusters=160. The unit of observation is the household. Robust SE, clustering by census-block, in parentheses. Conley SE in brackets. All regressions include geographic(slope, elevation, temperature) and demographic(number of adults, children, infants per household) controls; census FE, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I.31: Dynamics Across Years-Méndez & Trejos Index

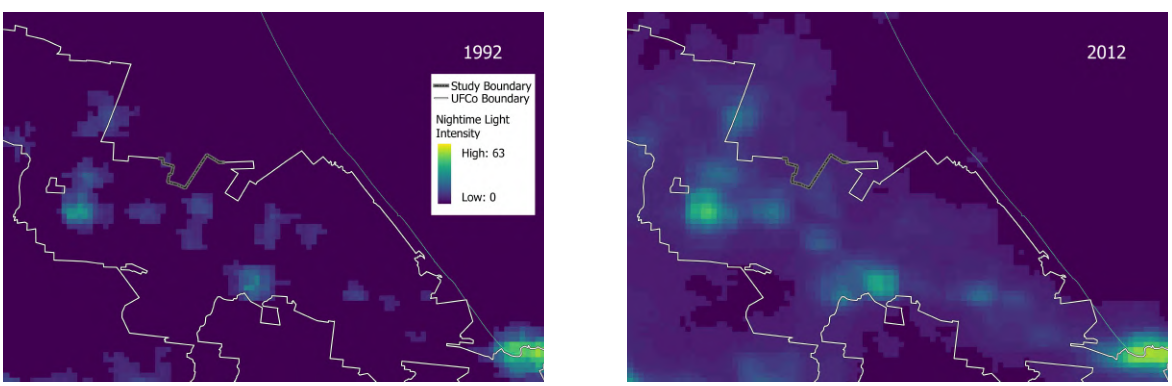
	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC_{2000}	-0.081	-0.022	-0.069	-0.038	-0.110	-0.210
	(0.036)**	(0.067)	(0.025)***	(0.022)*	(0.052)**	(0.102)**
	[0.035]**	[0.053]	[0.025]***	[0.016]**	[0.044]**	[0.084]**
UFC_{2011}	-0.094	-0.039	-0.047	-0.005	-0.109	-0.186
	(0.032)***	(0.052)	(0.033)	(0.022)	(0.045)**	(0.074)**
	[0.037]***	[0.035]	[0.035]	[0.020]	[0.039]***	[0.076]**
Adjusted R^2	0.020	0.025	0.146	0.025	0.075	0.090
$Mean_{2000}$	0.164	0.172	0.230	0.178	0.511	0.744
$Mean_{2011}$	0.128	0.101	0.156	0.099	0.365	0.484

Notes: All definitions ans specifications coincide with the ones in Table I.30.

Appendix J. Luminosity Data

We use nighttime lights data[36] as a robustness check of our main results, treating satellite-recorded data on nighttime lights as a proxy for income and economic activity. A series of papers that have shown a strong correlation between nighttime lights and economic activity (Chen and Nordhaus (2011); Henderson et al. (2012); Michalopoulos and Papaioannou (2014); Hodler and Raschky (2014)). For each grid cell, an integer between 0 (no light) and 63 represents its light intensity. The table and figures below present our results after we account for observations with a value of zero by adding 0.01 to the data on luminosity and luminosity per capita.[37] Column (1) in Table J.32 shows that nighttime light intensity is 21% (exp(0.193)-1=0.212) higher in the former UFC plantations. To give a sense of the economic significance of this estimate, if we assume an elasticity between nighttime light intensity and GDP of 0.3 (consistent with the findings in Henderson et al. (2012) and Hodler and Raschky (2014)), the 21% difference in nighttime light intensity implies that the output in the former UFC plantations is about 6.37% higher. Column (2) shows that luminosity per capita is 18% (exp(0.165)-1=0.18) higher in the former UFC plantations. Column (3) shows that the annual growth rate of luminosity per capita is 2.064 percentage points higher in the former UFC areas. All estimates are significant at least at the 5% significance level. In general, the nighttime lights results are consistent with the estimates from our main specification.

Figure 18: Lights near the study boundary in 1992 and 2012



[36]The data on nighttime light is collected by the US Air Force Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS) and is processed by the National Oceanic and Atmospheric Agency's (NOAA) National Geophysical Data Center (NGDC). The data covers the years 1992 to 2013 at a spatial resolution of 30 arc-seconds.

[37]A total of 9.2% observations in our luminosity data have a value equal to zero. The zero value can be due to a light that is too low for detection by the satellite, or because it corresponds to a sparsely populated area.

Table J.32: Luminosity Data

	Light	Light per Capita	Growth Rate Light per Capita	Log (.01 + Light)	Log (.01 + Light per Capita)
UFC	0.193	0.165	2.064	0.342	0.215
	(0.006)***	(0.051)***	(0.781)***	(0.035)***	(0.046)***
	[0.017]***	[0.065]**	[0.953]**	[0.072]***	[0.059]***
Adjusted R^2	0.377	0.036	0.282	0.463	0.122
Observations	5,588	2,061	1,679	6,154	2,210

Notes: Light and light per capita are in logs, and growth rates are annual. The units of observation are 1x1 km grid cells located within 5 km of UFC boundary. Robust SE in parentheses. Conley SE in brackets. All regressions include year FE. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

K Output from Model Calibration

In this section we present the output from the estimation of some of the model's parameters. In particular, Table 33 shows the first and second stages of the estimation of Equation 9 using data on wages for 1973 for all districts in the country (484), and the equivalent cross-section generated by the model.

Table 33: Estimating Elasticities

First stage	
	Wage
Model log wage	0.23***
	(0.019)
Second stage	
Elasticity of substitution (σ)	6.46***
	(1.562)
Labor mobility elasticity (θ)	4.63***
	(0.899)

Notes: The table shows the change in steady state outcomes. Equivalent Variation is the % increase/decrease in consumption in steady state necessary to get the new utility level.

L Results Assuming No Productivity Spillovers

Table 34 shows the welfare effects of the company under different labor market structures — monopsony vs perfectly competitive labor markets in all regions — assuming amenities

have no productivity spillovers ($\chi = 0$).

Table 34: Company's Effect under Different Labor Market Structures and no Productivity Spillovers

Outcome	%Δ w/Monopsony		%Δ w/Perfect Competition	
	Aggregate	UFC Region	Aggregate	UFC Region
Equiv. Δ (in C)	2.19	22.1	4.22	30.9
Welfare	2.04	19.8	3.72	26.5
Stock Amenities	4.93	34.7	2.48	15.5
Wages	-2.02	-10.1	2.29	16.2

Notes: The table shows the change in steady state outcomes. Equivalent Variation is the % increase/decrease in consumption in steady state necessary to get the new utility level.