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

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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 (UFCo). The firm was given a large land concession in Costa Rica—one of the so-called "Banana Republics"—from 1899 to 1984. Using administrative census data with census-block geo-references from 1973 to 2011, we implement a geographic regression discontinuity design that exploits a quasi-random assignment of land. We find that the firm had a positive and persistent effect on living standards. 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 can account for our result. Consistent with this mechanism, we show, empirically and through a proposed model, that the firm's welfare effect is increasing in worker mobility.

Keywords: long-run development, monopsony power, foreign firms
JEL Classification: F23, N16, O43.

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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). On the other hand, 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 monopsony power and of the spatial structure of the labor market in determining the direction and persistence of these effects. To do so, we use evidence from one of the largest multinationals of the 20th century: the United Fruit Company (UFCo), the infamous firm hosted by the so-called "Banana Republics." This American firm was given a large land concession in Costa Rica, and was the only employer in this region—where it required workers to live—from 1899 to 1984. In this sense, the firm appeared to function as a *local* monopsonist.[1]

The concession had a well-defined boundary, and 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 (RD) 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 UFCo boundary. Our data spans over a decade before the company stops operating, and almost three decades after its

[1]This concession's extension was 455,800 hectares (ha), approximately 9% of the national territory. For reference, since 2000, over 30 land acquisitions by transnational companies in Africa, Central and Southeast Asia, Eastern Europe, and Latin America have been *larger* than the UFCo's concession in Costa Rica, accounting for over 26 million ha (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.

closure (1973-2011), which allows us to document how the UFCo effect evolves.

We find that households living within the former UFCo regions have had better economic outcomes (housing, health and sanitation, education, and consumption capacity), and were 33% less likely to be poor than households living outside. This effect is persistent over time: Since 1973 the treated and untreated regions have converged slowly, with only 59% of the income gap closing over the following four decades.[3]

The results along this redrawn boundary segment are consistent with findings of an RD using the entirety of the concession's border. In fact, we run the RD along the UFCo's entire boundary at many different distances from the border.[4] The results are very similar—and often statistically equal—to those of our main specification where land was randomly allocated, and which is more restricted and well-identified.

Historical data, collected and hand-digitized from primary sources, suggests that investments in local amenities carried out by the UFCo—hospitals, schools, roads—are the main drivers of our results. For instance, we document that investments per student and per patient in UFCo-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 UFCo workers who were required to live within the plantation. This might explain the sharp discontinuity in outcomes right at the boundary. We do not find evidence of other channels, such as selective migration or negative spillovers on the control region (just outside the UFCo), being the main mechanisms behind our results. In fact, our analysis—using census micro-data dating as far back as 1927—actually suggests that migrants to the UFCo were consistently *negatively* selected.[5]

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 incur in other investments such as schooling. Evidence from 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.[6] For instance, a 1922 Annual Report highlights the

[3]Robustness checks include: a falsification test, in which we draw placebo borders and re-run our analysis; estimations using different bandwidths and considering different sub-samples of the population, such as only non-migrants; and estimations using the entire boundary, among others.

[4]We run the RD regression with bandwidths ranging from 5 km up to spanning the entire interior of the UFCo region (20 km on each side of the border). These 61 regressions per outcome—each with a bandwidth 250 m larger on each side than the previous one—are plotted in Figures 3 and 4.

[5]These and other alternative mechanisms are discussed in depth in Section 5.2.

[6]High turnover was a result of the workers' main outside option: coffee. Unlike bananas, coffee

constant overturn of labor and describes that "[the workers'] migratory habits do not permit them to remain on one plantation from year to year, but *as soon as they become physically efficient and acquire a little money they either return to their homes or migrate elsewhere and must be replaced by new laborers* [emphasis added]" (UFCo, 1923, p. 74). As a solution to retain workers, the UFCo increased its investments in local amenities beyond medical measures. A 1925 Annual Report pointed out that "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 the 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 may hope to retain their services indefinitely* [emphasis added]" (UFCo, 1926, p. 185).

Quantitative evidence is consistent with the qualitative evidence from the company reports. First, empirically, there is a causal relationship between the intensity of UFCo's investments in a location and 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 higher outside options in 1973 also had higher living standards in 2000 and 2011, on average. This is true after controlling for outside options in 2000 and 2011. For instance, a one percent increase in the average outside option of an UFCo region in 1973 is associated with a 0.72% lower likelihood of households being poor in this location in 2000 and 2011. Second, we build a model to have a better understanding of how the company's welfare effect changes in scenarios with less worker mobility or with a more competitive labor market. To incorporate the investment patterns that we documented empirically, we assume that the local monopsonist can choose workers' compensation bundle: a combination of wages and local amenities. We find that despite its market power, the firm's presence can be beneficial for the country unless labor mobility is too low. 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.[7]

The result of this analysis—that the firm could have had a negative impact on

is a seasonal crop, and workers could earn relatively high wages during the coffee harvesting season.

[7]This extreme case with immobile workers is historically relevant, as colonial and quasi-colonial arrangements featuring large firms often had high levels of labor coercion.

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 what is today the Democratic Republic of Congo (Lowes and Montero, 2016), or the Dutch Cultivation System (Dell and Olken, 2019). 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.[8] We thereby complement these studies by shedding light on the importance of workers' outside options in determining the direction of this effect.

Our work also contributes to the literature on the consequences of firms exercising market power. We document how 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. (2020), who document an increase in market power associated with declines in the labor share across many industries. Further, we study long-run outcomes and how persistent the effects of such an arrangement 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 on 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; Alfaro-Ureña et al. 2019), 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.

[8] An exception being Dell and Olken (2019), 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.

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 and empirical results in Section 4. Section 5 discusses the mechanisms behind our findings, both empirically and structurally, and Section 6 concludes.

2 Historical Background

2.1 Historical Overview

The history of banana plantations in Costa Rica dates back to the construction of a railroad from the capital city to the Caribbean Coast. In 1884, in exchange for completing the railroad, the government gave Minor C. Keith—an American contractor—a large concession of undeveloped land, which was virtually unpopulated at the time.[9] 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 UFCo was founded in 1899.

With its headquarters in Boston, the company eventually had operations in Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Nicaragua, and Panama (May and Lasso, 1958). According to the UFCo's Annual Reports to the Shareholders, by 1930, the company landholdings in Latin America reached 1,333,912 ha.

The UFCo transformed the acquired lowlands into plantations and towns, where it provided healthcare, housing, schooling, and sanitation to its workers and their families. The UFCo also invested in infrastructure, such as wireless communication systems to coordinate the whole production 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 fact, the UFCo was one of the most controversial multinationals in history, and inspired an extensive body of literature, including several fiction masterpieces.[10]

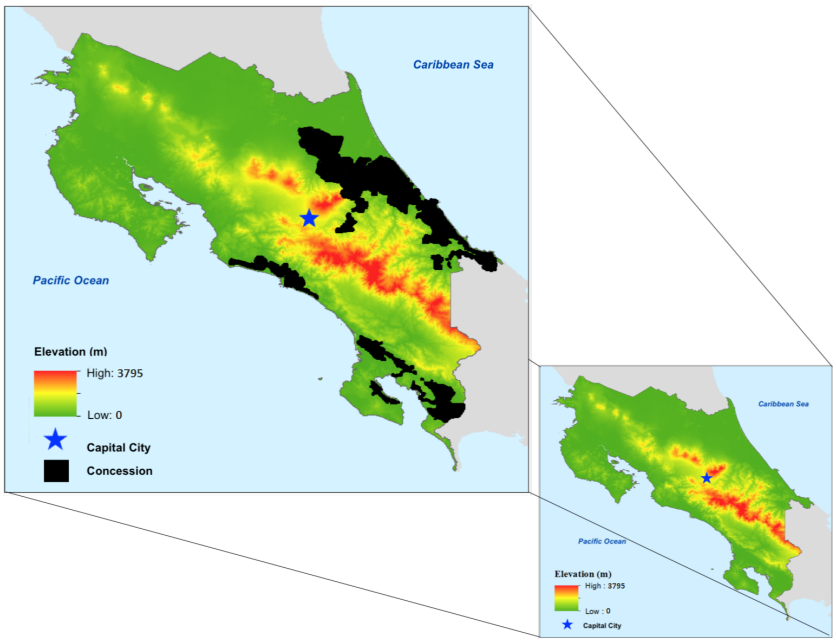
[9] This was the case for most Costa Rican rural areas at the time, as the expansion of the agricultural frontier outside of the Central Valley began in the late 19th century (León Sáenz, 2012).

[10] Some examples of novels inspired by the UFCo are: "Mamita Yunai" by Carlos Luis Fallas, the "Banana Republic Trilogy" ("Strong Wind", "Green Pope", and "The Eyes of the Interred") by Miguel Ángel Asturias, and "One Hundred Years of Solitude" by Gabriel García Márquez. In terms

In Costa Rica, the UFCo significantly transformed the local economy. The UFCo's landholdings in the country represented roughly 8.92% of the national territory (as shown in Figure 1). By 1950, it was responsible for 58% of the country's total exports. Moreover, the UFCo employed approximately 7% of the country's total labor force and 12% of its agricultural labor force, on average throughout its tenure.

In 1984 the UFCo began a general corporate strategy to stabilize profits that divested in the production process to focus on marketing. The corporate strategy was the consequence of challenges faced by the UFCo during the 1970s, which caused severe losses. These challenges included an exportation tax on bananas levied by a cartel formed by the host countries, the Hurricane Fifi that destroyed 70% of the company's plantations in Honduras, and scandals of corruption that significantly affected the firm's stock price. As a consequence, the UFCo abandoned banana production in Costa Rica. More historical details are discussed in Appendix A.

Figure 1: Costa Rica and the UFCo's boundary



Notes: The UFCo's land concession appears in black in this map of Costa Rica. Elevation is shown in the background. The concession area represents 8.92% of the national territory, and predominantly consists of flatlands near coastal areas.

of nonfiction and academic work, virtually all studies that rely on quantitative data consider the impact of the UFCo at the aggregate level, analyzing national or local trends in productivity, land use, and export levels (e.g., Casey 1979; Ellis 1983; Viales 1998; Royo 2009). To the best of our knowledge, our paper is the first analysis of the legacy of the UFCo using microeconomic data to estimate the firm's causal impact.

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 UFCo boundary, as shown in Figure 1.

One approach followed by the literature on geographic RDs, starting with Dell (2010), would be to focus on boundary segments where geographic characteristics balance. This, however, could be contaminated by unobservable characteristics that might be changing at the boundary. That is: if the land was the same quality on both sides of the border, why didn't the UFCo use it as well? To overcome this issue, we focus on a border segment where we identify an area where land was assigned quasi-randomly. Initially, due to ambiguities in the concession's contract, the UFCo 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 UFCo 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).[11]

The boundaries of the Astúa-Pirie region were chosen using features of the landscape as a reference. 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;" 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;" 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).[12]

This southern boundary—that defines the limit between the Astúa-Pirie region

[11]This is another benefit of focusing on this border segment: we are certain that it remained constant throughout the 85 years of the UFCo's tenure.

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

and the UFCo—ended up following the Reventazón River *closely but not exactly.* The reason being that expropriation was a very costly process, and preexisting plots of land that overlapped with the river were not broken apart.[13] Instead, plots were allocated either as UFCo property or government property to follow the river as closely as possible. Figure C.4 in Appendix C shows an example of how the boundary follows this natural landmark (the river)—closely but not exactly—as it was jointly determined by the river and the preexisting plots. In 1904 the government also forbid, by law, to sell the plots within the Astúa-Pirie region to the company (or any foreigner); therefore, this boundary was kept constant during the company's tenure.

In terms of preexisting demographic characteristics, note that these are trivially balanced at the start of the company's tenure, given the area remained unpopulated. This means that migrants' characteristics might be particularly relevant to understand differences in outcomes. In Section 5.2, we conduct a thorough analysis of how migrants to the UFCo compare to migrants to other comparable regions in the country, and find that migrants to the UFCo were consistently negatively selected throughout the firm's tenure, which points to our estimates being a lower bound of the firm's effect.

2.3 Commuting Between Regions

People who lived in regions near UFCo plantations, in general, did not commute and work for the company or used its services. Unlike other types of agricultural activities with seasonal demand for labor, the UFCo needed a permanent labor supply of around 150 workers per 324-ha 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 UFCo created camps within their farms for its workers (Cerdas Albertazzi, 1993). The typical farm consisted of a campsite, buildings, and 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.[14] Second, given concerns about malaria spreading from

[13]The expansion of the Costa Rican agricultural frontier started in the late 19th century.

[14]For people within the plantation, the company was omnipresent in their lives. Harpelle (2001,

outside the plantation, only workers were allowed to live within the UFCo, and flows of people were discouraged. Finally, people living in areas around the UFCo had restricted access to services provided by the company. For example, as we describe in Section 5.1.1, data on patients at UFCo 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.

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 what is today the Democratic Republic of Congo (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 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 bio-fuels 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

p. 67) mentions 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 UFCo] funeral car."

them involving hundreds of thousands of acres (Cotula and Vermeulen, 2009; Cotula et al., 2009). In fact, since 2006, over 64 million acres of land were assigned to foreigners to develop agricultural activities in developing countries, and more than 30 of these concessions were larger than the UFCo's concession in Costa Rica.

3 Data

3.1 Historical Data

To understand which census-blocks were directly affected by the UFCo, we collected and digitized maps of the company's properties, which were published by the UFCo Engineering Department and are available in the Costa Rican National Archive (*Archivo Nacional de Costa Rica*).[15] We also collected, digitized and geo-referenced maps of the administrative divisions of Costa Rica in order to geo-reference censuses from 1927-2011.

For a better understanding of living standards and investments during UFCo's tenure, we collected and digitized documents published by the company. From 1912 to 1931, the Medical Department of the UFCo issued an annual report describing the sanitation and health programs carried out by the company as well as the living conditions within the UFCo plantations. Moreover, the company regularly circulated reports with information about the number of employees, production, and investments in areas such as education, housing, and health. We obtained primary print copies of these documents from collections held by Cornell University, the University of Kansas, and the Center for Central American Historical Studies at the University of Costa Rica (*Centro de Investigaciones Históricas de América Central de la Universidad de Costa Rica*). The print quality of the historical documents makes automatic character recognition difficult, so the data had to be digitized by hand.

We also use data from 1864, 1892, 1927, 1950, and 1963 Costa Rican Population Censuses. Although these censuses do not contain enough spatial detail to be considered in our regression discontinuity design, the information allows us to analyze aggregated population patterns, such as migration before and during the UFCo

[15] Although the 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 C.5 in Appendix C provides an example of a map showing the UFCo landholdings in the Costa Rican Pacific Coast.

apogee, or the size and occupation of the country's labor force.

We also collected, and hand-digitized, data on expenditures, by municipality and by type, for all localities from 1955 to 1984 from official annual reports of the Comptroller General of the Republic of Costa Rica. Further, we hand-digitized data from Costa Rican Statistic Yearbooks containing information on the number of patients and health expenses carried out by hospitals in Costa Rica from 1907 to 1917, including the ones ran by the UFCo. We obtained export data from Costa Rican Statistic Yearbooks as well as Export Bulletins. Finally, we collected data from 19 agricultural censuses, which between 1900 and 1984 provide information to track changes in land use in the country and agricultural output.

3.2 Outcome Data

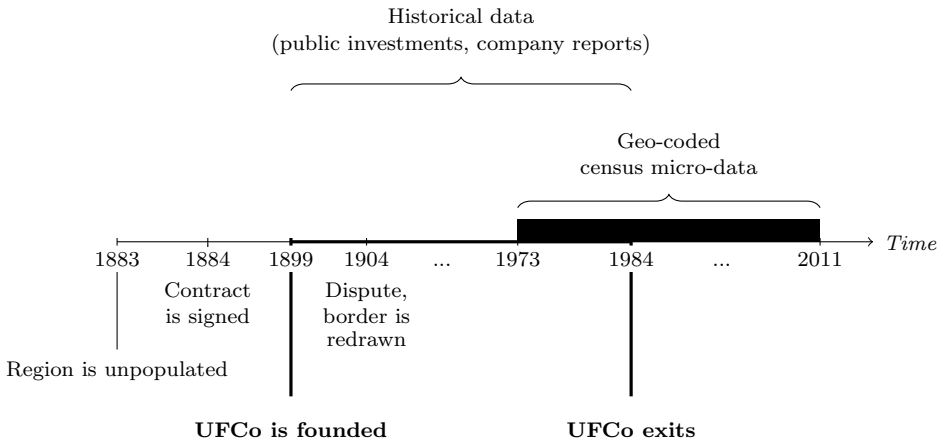
We examine the UFCo's long-run impact on economic development by testing whether it affects living standards today. To measure living standards, we obtained restricted-access microdata from Costa Rican Population and Housing Censuses collected by the National Institute of Statistics and Census (*Instituto Nacional de Estadística y Censos*) for years 1973, 1984, 2000, and 2011. As the UFCo 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 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.[16] Further, household

[16]Moreover, as will become clear later, wages alone are not a good proxy for real income within UFCo's landholdings, as a significant share of the workers' compensation package consisted of local amenities.

Figure 2: Main Events and Data Availability



surveys required to construct measures as in Elbers et al. (2003) are not available in Costa Rica before 2000. 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, to identify households in poverty without relying on income data (Feres and Mancero, 2001), and has the advantage of generating measures that are comparable across time, as it relies only on questions that are consistent and available across censuses. The method requires specifying a set of basic needs and a threshold to consider those needs as "satisfied" (Armendáriz and Larraín B., 2017). This methodology defines four basic needs dimensions: housing, health and sanitation, education, and consumption. Each dimension consists of components selected by their explanatory power for income in Costa Rican household surveys, once these were available in 2000. In this sense, the methodology is similar to that in Elbers et al. (2003), but constrained by the availability of data given the setting's historical nature.

Appendix B includes details on the components that constitute each of our dimensions, and the specific variables from the censuses that we use, which as mentioned earlier, were chosen based on their power to predict income based on the available household surveys. A general description of each dimension is the following: (i) housing: refers to the quality of the household dwelling's material and household overcrowding; (ii) health and 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. We construct each dimension as an indicator variable equal to one if the household does not meet the threshold to attain a need in some component, and zero otherwise.

We consider a household as poor if it has at least one unsatisfied need. Moreover, we estimate the severity of poverty through the total number of UBN. Namely, the total number of UBN is an index that ranges from 0 to 4, where each unsatisfied basic need adds one point to the index.

To provide complementary robustness, Appendix F discusses how results with the UBN method are also consistent with findings using nighttime lights data as a proxy for real income. Further, Appendix R shows that our findings using the UBN method align with results under the small area estimation methodology of Elbers et al. (2003), using the 2011 Census and the 2011 National Household Survey. Finally, Section 5.1.3 discusses how results using the UBN method align well with individual outcomes, like years of schooling.

4 Impact of the Company

4.1 Empirical Strategy

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

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

where y_{igt} is an outcome of individual or household i in census-block g and year t; and $UFCo_g$ is an indicator variable equal to one if the census-block g's centroid was inside a UFCo plantation, 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 in a comparable position. Following Gelman and Imbens (2017), and in line with recent work whose estimation framework relies on a geographical

RD design (Dell et al., 2015; Dell and Olken, 2019; Lowes and Montero, 2016), we use a linear polynomial in longitude–latitude and test for robustness to a variety of specifications.[17] $\mathbf{X}_{igt}$ is a vector of covariates for individual or household i. $\mathbf{X}_g$ is a vector of geographic characteristics for census-block g, and α_t is a year fixed effect.[18]

Furthermore, to analyze a *time-varying* UFCo effect, we allow for a different UFCo coefficient in every census, by estimating the following RD specification:

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

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

4.2 Naive Approach Considering UFCo's Entire Boundary

As a naive first approach, we run geographic RD designs along the UFCo's *entire* boundary in Costa Rica. To do so in the most general way possible, we run the RD multiple times at different distances from the border, ranging from 5 km to up to 20 km. A bandwidth of 20 km on each side of the border already spans the entire interior of the UFCo region. We then plot these 61 regressions per outcome—each with a bandwidth 250 m larger on each side than the previous one—for two cases: the average UFCo effect (equation (1)) and the dynamic UFCo effect by year (equation (2)).

4.2.1 Average Effect Pooling Across Years

Figure 3 explores whether households living in areas that were directly exposed to the UFCo are on average better-off than those living just across the border. The figure includes the results of estimating equation (1), using as dependent variables the probability of being poor, the probability of an unsatisfied basic need (UBN) in each dimension (housing, health and sanitation, education, and consumption), and the total number of UBNs. All regressions include geographic controls, demographic

[17] Panel A in Figures 5, D.8, and D.9 shows that our results are robust to alternative specifications of the RD polynomial.

[18] Panels B1 and B2 in Figures 5, D.8, and D.9 show that our main message is robust to alternative choices of control variables.

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. Following Conley (1999), we allow for spatial dependence of an unknown form. For comparison, we also report robust standard errors.[19] Results are robust to using no controls, only a subset of controls, or different specifications for the polynomial, instead of the proposed baseline.[20]

Figure 3 strongly suggests that the UFCo's effect does not vary significantly depending on how close to the border we run our RD estimation, and that households living in census-blocks within UFCo borders have better living standards, on average, than their counterparts outside the UFCo. For instance Panel (a) shows how the probability of being poor is on average 4 percentage points (pp) lower for households within UFCo borders than for households outside. The effect is flat and does not seem to depend on the bandwidth we choose when running our regression, as shown by the horizontal axis of each panel.

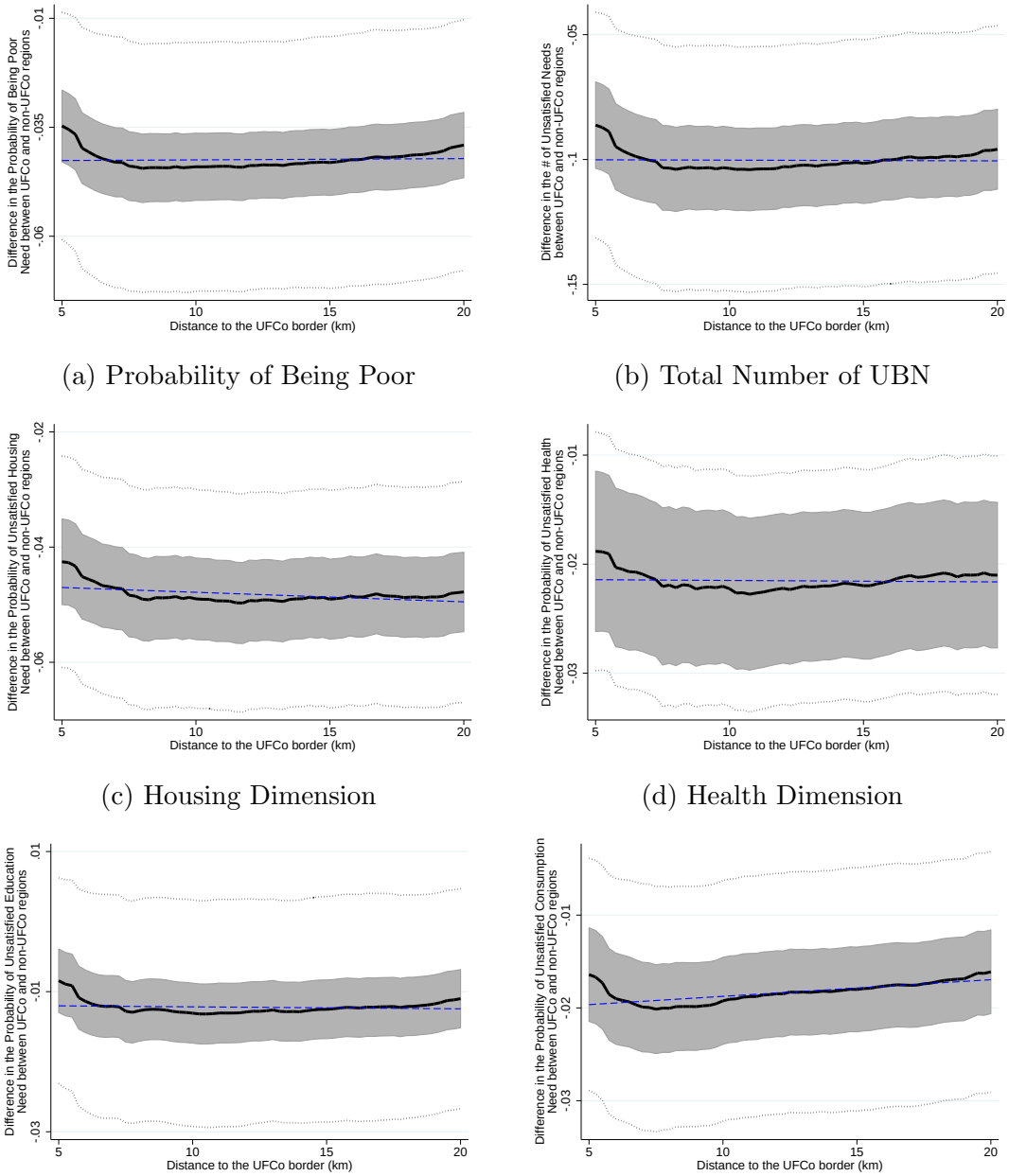
4.2.2 Time-Varying Effect

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 tenure, and also at different points in time after it stopped operating. Figure 4 shows how the UFCo effect changed over time using this first naive approach. Consistently with the previous figure, this time-varying effect also changes only slightly depending on the distance from the border (horizontal axis) for all outcomes. The figure also documents how the gap between UFCo and non-UFCo regions is largest in 1973, and then slowly narrows over time. For instance, Panel (a) shows how the probability of being poor was approximately 10 pp lower for households within the UFCo in 1973 (regardless of the bandwidth chosen to run the RD), and that the effect had decreased to approximately 2 pp by 2011.

[19] We compute Conley standard errors for all regressions at the cutoff distance of 2 km. We choose 2 km because it is the distance that *maximizes* standard errors for all outcomes, as shown in Figure D.7. Results are robust to alternative cutoffs (up to the maximum one allowed by the plantation's size), and to the placebo tests reported in Table E.6.

[20] Figure 5 shows robustness tests for our main specification. Robustness tests for this naive regression using the entire boundary deliver similar results, and are available upon request.

Figure 3: Average UFCo Effect Considering the Entire Concession's Border



(a) Probability of Being Poor

(b) Total Number of UBN

(c) Housing Dimension

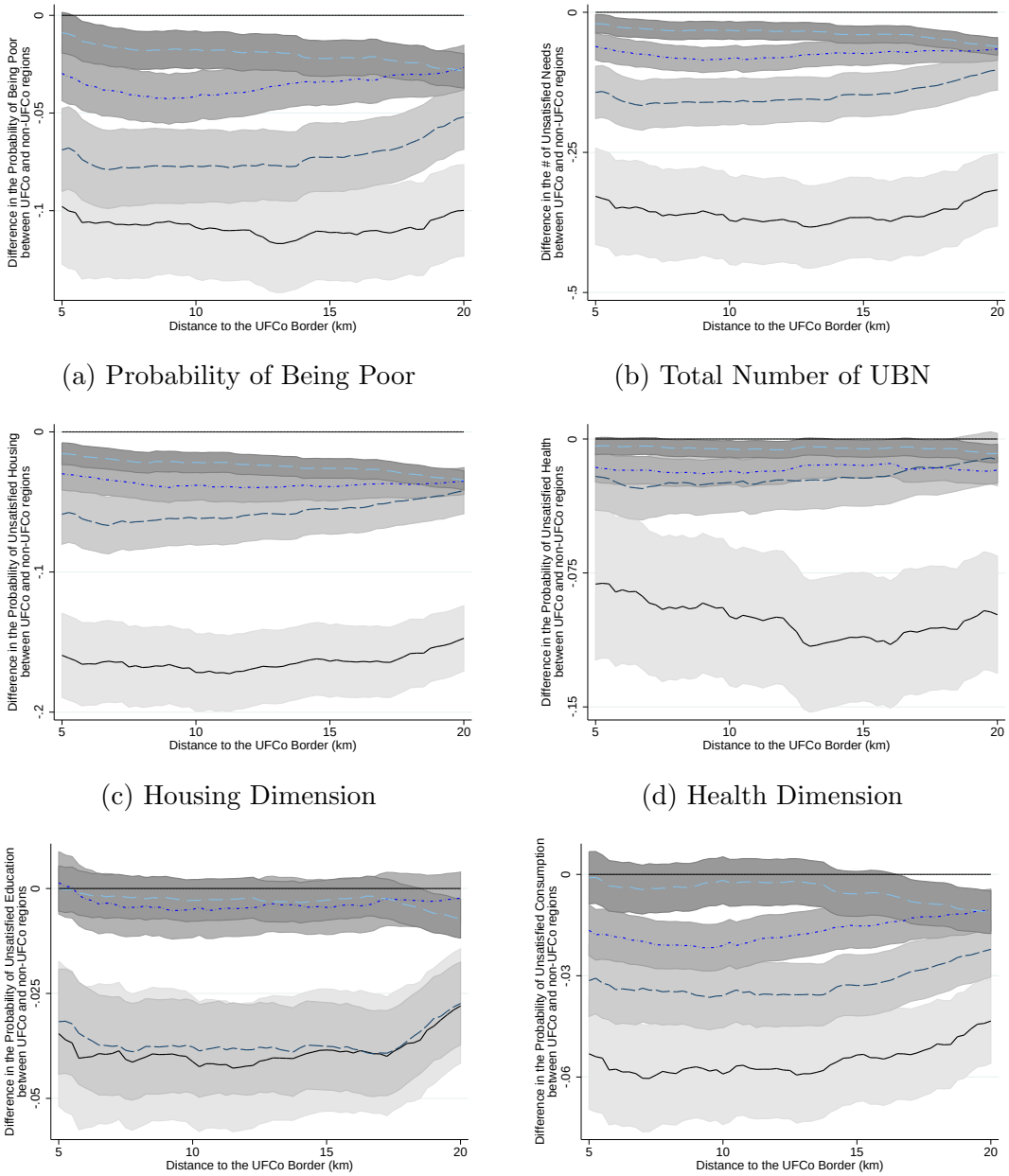
(d) Health Dimension

(e) Education Dimension

(f) Consumption Dimension

Notes: The figure shows how the UFCo effect varies depending on the maximum distance from the border that we allow in each regression (61 regressions per outcome). The effect is robust to varying distances. 95% confidence intervals in gray are based on robust standard errors clustered at the census-block level, while dotted lines denote Conley 95% confidence intervals.

Figure 4: Average UFCo Effect Considering the Entire Concession's Border



(a) Probability of Being Poor

(b) Total Number of UBN

(c) Housing Dimension

(d) Health Dimension

(e) Education Dimension

(f) Consumption Dimension

Notes: The figure shows the evolution of the UFCo effect across years for several outcome variables. The absolute effect is decreasing over time in all cases. 95% Confidence intervals (in gray) are based on robust standard errors clustered at the census-block level. While it is unfeasible to show Conley standard errors for all regressions graphically, they are available upon request.

4.3 Balance of Pre-Existing Characteristics and Random Land Assignment

After the previous section's naive RD, we proceed with two more sophisticated approaches. First, we restrict the analysis to areas where characteristics balance before UFCo's arrival. This is in line with the strategy most of the literature on geographic RD designs follows, starting with the seminal paper by Dell (2010), and including more recent work like Lowes and Montero (2020). The idea behind this approach is to account for pre-existing differences that might affect outcomes independently of whether the UFCo was present or not.

In terms of pre-existing social and economic characteristics, the study area was close to being uninhabited before the UFCo's arrival. 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 1883, just before the contract with the government was signed (see Figure 2)]"(Keith, 1886, p. 8). This was not "special" about this region, in fact, it was the case for most Costa Rican rural areas at the time, as the expansion of the Costa Rican agricultural frontier did not start until the late 19th century. This means that *demographic* characteristics (trivially) balance on both sides of the concession's border at the start of the firm's tenure. Thus, we begin by examining results in areas where *geographic* characteristics balance on both sides of the UFCo border.[21] Estimations corresponding with equations (1) and (2) are shown on Tables D.4 and D.5. Overall, our results are quite similar to those presented in the previous section: we consistently find that households within the UFCo have higher living standards than their neighbors outside, even after limiting the sample to areas with comparable pre-existing observable characteristics.

While this is the standard approach, potentially there could still be unobservable elements changing right at the border, which are not captured by measures of pre-existing characteristics. In other words: if the land right outside the UFCo border was just as good to produce as the one inside the concession, why didn't the company try to include this land in the concession as well? Thus, for our preferred specifications,

[21] Table D.2 shows the results of the balance test in these areas.

we take a step forward with respect to the standard in the literature, and exploit exogenous variation in the land assignment to address this potential issue.

To do so, we exploit the redrawing of the boundary that was described in Section 2.2, and conduct the RD analysis only in segments *of the redrawn border* where geographic characteristics are balanced. In line with the latter, we test a null hypothesis of no geographical differences on both sides of this segment of the UFCo boundary, and we fail to reject this null in the segment shown in Figure C.3. In this area, two things are true: (i) geographic characteristics on both sides of the border balance, *and* (ii) the border was redrawn arbitrarily, depending on how a river intersected pre-existing plots of land.[22] *This is our preferred specification.*

Table D.3 shows that elevation, slope, and temperature do not change discretely across this segment of the UFCo boundary.[23] As in the previous section, we allow for spatial dependence of an unknown form (reported in brackets), and report robust standard errors (in parentheses).[24] This table also shows that as we move 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 more than 9,000 households even within this specific subregion—and not to contaminate the analysis that might be very sensitive to changes in the landscape (most economic activities were 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 UFCo boundary; where we know the border was arbitrary and observable geographic features are balanced. Consistent with the very stable coefficients that we documented in Section 4.2, results change very little as we increase our bandwidth beyond 5 km. In

[22]Figure C.4 shows an example of how the study 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.

[23]The unit of analysis to examine the geographic characteristics is a 1x1 km grid cell. Results are statistically equal if we use 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.

[24]Conley standard errors are computed using a cutoff distance of 2 km, and this distance *maximizes* standard errors for all outcomes, as shown in D.7. Results are robust to alternative cutoffs ranging from 2 to 10 km (the maximum allowed by the plantation's size), and to the placebo tests reported in Table E.6.

fact, as shown in Figures 3 and 4, within this redrawn segment, when we re-run the estimates increasing the distance from the border from 5 km to 20 km (250 m at a time) regressions deliver extremely similar coefficients.[25] That is, our results are not driven by the fact that we focus on this area, although restricting the analysis to this area allows us to have a clean regression and exploit exogenous variation in the land assignment.

4.3.1 Average Effect Pooling Across Years

Table 1 explores whether households living in areas that were directly exposed to the UFCo 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, health and sanitation, education, and consumption), the probability of being poor, and the total number of UBNs as dependent variables. All regressions include geographic and demographic controls, 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 1: Average UFCo Effect

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFCo	-0.102	-0.022	-0.054	-0.066	-0.133	-0.244
	(0.026)***	(0.017)	(0.022)**	(0.024)***	(0.030)***	(0.056)***
	[0.031]***	[0.015]	[0.016]***	[0.025]***	[0.026]***	[0.054]***
Adjusted R^2	0.101	0.169	0.238	0.015	0.115	0.198
Observations	9,179	9,179	9,179	9,179	9,179	9,179
Clusters	206	206	206	206	206	206
Mean	0.171	0.058	0.232	0.199	0.475	0.658
% Variation w.r.t. Mean	**-60.0**	**-39.0**	**-23.2**	**-33.0**	**-27.9**	**-37.1**

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 standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic controls (slope, elevation, 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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The estimates suggest that the households located in the former UFCo region are in general better off. Columns (1) to (4) of Table 1 show that UFCo households have

[25] We stop at a bandwidth of 20 km on each side of the border, as with this distance the RD already spans the entire interior of the UFCo's concession.

had 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 their sample mean (last row) is sizable. For instance, the first coefficient of Column (1) implies that households within former UFCo areas had 10.2 pp lower probability of having an unsatisfied housing need than their neighbors outside UFCo lands between 1973 and 2011; a 60 percent decrease with respect to the sample's mean. These households also had 2.2 pp, 5.4 pp, and 6.6 pp lower probability of having an unsatisfied need in health, education, and consumption, respectively.

Households in former UFCo areas also had a 13.3 pp lower probability of being poor (Column (5)); a 28 percent variation with respect to the sample's mean. Column (6)—the number of UBN—should be read differently than other columns, as it takes values that range from 0 to 4, and implies that the severity of poverty was lower within former UFCo areas, where the households had, on average, 0.244 fewer unsatisfied needs than the households in the non-UFCo control region.

Figure D.6 in Appendix D summarizes these results in three-dimensional plots. The figure shows the spatial distribution of the centroids of the census-blocks and the study boundary across space. The sharp discontinuity at the UFCo boundary is noticeable for each of our outcomes, with better outcomes coinciding with former UFCo regions in every case.

Importantly, *these results in the border segment where the random assignment happened are very similar—and in many cases statistically equal—to those presented in Section 4.2*, where we considered the entire boundary and different bandwidths. Thus, they do not seem to be specific to this border segment, but valid for the broader UFCo area.

4.3.2 Time-Varying Effect

We now study how the company's effect evolved across time, between 1973 and 2011, both during the firm's tenure (before 1984), and also after it stopped operating (from 1984 onwards). Table 2 documents how the UFCo effect changed over time. The magnitudes of the UFCo effect are particularly high given the mean probabilities for the entire region (bottom panel). The probability of being poor and the total number of UBN are quite persistent over time. The probability of an unsatisfied housing need is also very persistent across years; Column (1) shows how, in 2011, approximately 30 years after the UFCo left, households within UFCo former lands

are 8.9 percentage points less likely of having a UBN in housing relative to households outside. The effect on health and sanitation rapidly vanishes and is insignificant after 1973. Finally, education and consumption are always worse outside the UFCo, but the significance of the coefficients disappears after 2000.

Table 2 also shows how, since 1973, the treated and untreated regions have converged slowly, with only 59% of the poverty gap closing over the following four decades. More generally, the *severity* of poverty—measured by the number of UBN—has decreased over time: while in 1973 a household within the UFCo landholdings had 0.704 less UBN than a household outside, in 2011 this difference was, albeit significant, down to 0.127.

Table 2: Contemporary Household Outcomes: Dynamics Across Years

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
$UFCo_{1973}$	-0.224	-0.288	-0.056	-0.135	-0.254	-0.704
	(0.062)***	(0.079)***	(0.045)	(0.045)***	(0.067)***	(0.157)***
	[0.065]***	[0.077]***	[0.035]*	[0.047]***	[0.053]***	[0.145]***
$UFCo_{1984}$	-0.068	-0.009	-0.084	-0.076	-0.094	-0.218
	(0.047)	(0.028)	(0.028)***	(0.035)**	(0.047)**	(0.092)**
	[0.033]**	[0.013]	[0.023]***	[0.031]**	[0.034]***	[0.068]***
$UFCo_{2000}$	-0.089	0.017	-0.055	-0.090	-0.143	-0.217
	(0.031)***	(0.017)	(0.022)**	(0.027)***	(0.037)***	(0.059)***
	[0.031]***	[0.015]	[0.015]***	[0.026]***	[0.032]***	[0.055]***
$UFCo_{2011}$	-0.089	0.019	-0.038	-0.019	-0.103	-0.127
	(0.031)***	(0.016)	(0.029)	(0.035)	(0.038)***	(0.063)**
	[0.030]***	[0.018]	[0.029]	[0.053]	[0.051]**	[0.092]
Adjusted R^2	0.103	0.198	0.238	0.017	0.117	0.206
Observations	9,179	9,179	9,179	9,179	9,179	9,179
Clusters	206	206	206	206	206	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
$Mean_{2011}$	0.118	0.016	0.156	0.211	0.396	0.501

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic controls (slope, elevation, 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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

These time-varying results in the border segment where the random assignment happened are very similar—and in many cases statistically equal—to those presented in Section 4.2, where we considered both the entire boundary and many different bandwidths. They are also consistent with estimates that, instead of focusing on

the segment where the border was redrawn, consider *all* the border segments where geographic characteristics balance. Thus, they do not seem to be specific to this border segment, but valid for the broader UFCo area.

4.4 Robustness

While we postpone the discussion on the role of migration and spillovers to Section 5.2, which studies potential mechanisms that could have led to the gap in outcomes between regions that we documented, this section discusses additional robustness checks for our RD.

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 and 4 km both inwards and outwards of the actual UFCo border, so the analysis compares households on the same side of the boundary.[26] Table E.6 presents the results, showing that our placebo tests deliver insignificant coefficients in every case, both economically and statistically. Hence, our main regression is capturing an effect that only appears as we cross the actual UFCo boundary, and not just spatial autocorrelation, as warned by Kelly (2019).

Effect of the River: A possible concern is that the presence of a river 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 (1,937 units), that is, units that are North of the river and belong to the UFCo, and units that are South the river and did not belong to the company (see Figure C.4), Panel D1 in Figure 5 presents the results. In this limited sample, we are comparing only households located very close to each other (1 km from the boundary, at most), and we still find estimates that are consistent with our main results. As with the falsification test results, this finding is also reassuring that what we are capturing is an effect that shows up precisely as we cross the boundary and not spatial autocorrelation.

Different Bandwidth and Polynomials: As an additional robustness check, we eliminate observations close to the boundary in case there might have been some

[26] More precisely, for instance, we shift the border 4 km North, and rerun our RD within 4 km of the placebo border—such that all observations are on one side of the true border. We show four of these shifts North and South, and in magnitudes of 2 and 4 km.

negative spillover from the company to the outside. Note that when exploring the river's effect, we do the opposite, we limit the analysis to observations close to the boundary. Results are presented in Panel D2 and D3 in Figure 5, and Panels C1 and C2 in Figures D.8 and D.9. Overall, the coefficients are very similar to the ones of our main regression.

Similarly, although in Tables 1 and 2 we use a linear polynomial in latitude and longitude, our results are robust to alternative specifications of the RD polynomial. Panel A in Figures 5, D.8, and D.9 shows how our results are robust to different specifications on $f(location)$.

Different Control Variables and Distance to a Railroad: Besides the specification of the RD polynomial, we also analyze how the results change to varying the control variables. Panels B1 and B2 in Figures 5, D.8, and D.9 show that the results are robust to excluding demographic controls, geographic controls, or both. Our results are also robust to controlling for distance to a railroad, which we do in Panel B3 in the same figures.[27]

Alternative Income Measures: Nighttime Lights Data and Small Area Estimation Methodology of Elbers et al. (2003): We use nighttime lights data as a proxy of income to confirm our findings through an alternative measure of economic development. Figure F.10 in Appendix F shows a satellite image in which areas inside the former UFCo landholdings display higher luminosity. Results in Table F.9 in Appendix F confirm this difference in luminosity, by showing that nighttime light intensity is 21% higher in the former UFCo plantations (statistically significant at the 1% level). 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 UFCo plantations is about 6.37% higher.

Similarly, Appendix R computes income through an small area estimation methodology. This method imputes income and consumption for each household in the population census, using a prediction model obtained from household surveys. We show that the per capita net income is 8.3% higher for households within the UFCo borders, which is consistent with the estimate using luminosity data; and that their

[27] Distance to a railroad is an important control to check, as access to railroads might itself increase real income (Donaldson, 2018).

probability of having earnings below the poverty line is 10.5 pp lower, which is in line with our main results.

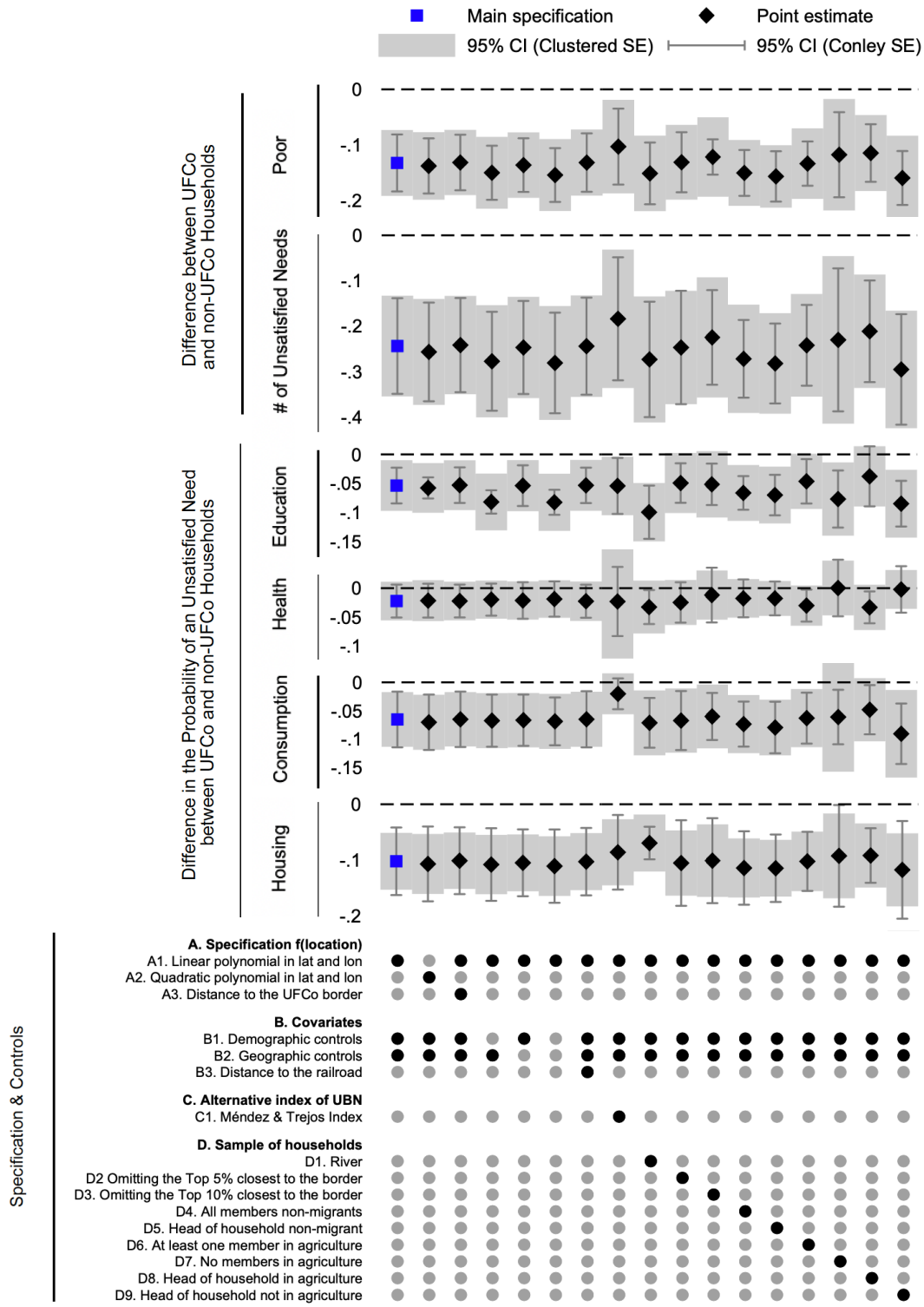
Alternative Index of UBN: Our Unsatisfied Basic Needs (UBN) are a modified version of the ones proposed by Méndez and Trejos (2004). Because Méndez and Trejos constructed the index using information from the 2000 and 2011 censuses, our modification consists of selecting the variables whose information 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 censuses and using the Unsatisfied Basic Needs (UBN) as proposed by Méndez and Trejos. Table L.14 in Appendix L shows that our main message is robust to this alternative definition of UBN.

5 Mechanisms

The results documented so far can be somewhat surprising. In fact, they go against the narrative that surrounds the UFCo in many Latin American countries. To understand the channels that led to the difference between regions that we found with our empirical strategy, we collected data on a variety of outcomes from primary sources spanning the firm's 85 years of tenure, and digitized it.[28] In Section 5.1, we document the mechanism for which we find more evidence: investments in local amenities (such as schools and hospitals) being much larger within the UFCo landholdings than in nearby regions throughout the firm's tenure. What are the economics that led to these investments in the first place? Studying company reports, in Section 5.1.4, we show how the bulk of these investments arose from the need to attract and maintain a sizable workforce. Section 5.2 studies and rules-out, one by one, other plausible mechanisms that might have led to our results, including selective migration and negative spillovers from the company to neighboring regions. Finally, having established what the relevant mechanism is, Section 5.4 proposes a model that incorporates this mechanism, and where we allow the firm to invest in local amenities as a way to attract workers. This framework allows us to have a better understanding of the company's aggregate effect, and to run counterfactual exercises to shed light on how

[28] Almost all of this data had to be scanned, was not machine-readable, and had to be imputed by hand and double-checked.

Figure 5: Robustness checks for the Main Specification: Average UFCo Effect



Notes: In the bottom panel, black dots indicate the controls added in each regression that is vertically aligned with these dots. Figures D.8 and D.9 show similar checks for the effect **by year** (1973-2011). Individual tables with these regressions are reported in the supplementary Online Appendix for the authors' websites.

the firm's impact changes in scenarios with dramatically less worker mobility. The latter is a word of warning of how a setting with a larger degree of coercion—like what might have occurred in other Latin American countries—can lead to worse economic outcomes, and highlights the key role of labor mobility in determining local outcomes.

5.1 Investments in Local Amenities

5.1.1 Investment in Healthcare and Sanitation

Approximately five thousand workers died constructing the railroad to the Caribbean Coast in Costa Rica, due to the unhealthy and dangerous conditions of the tropical forest (Bucheli, 2005). This experience, along with lessons from the Panama Canal's construction, taught managers about the importance of sanitation and healthcare to sustain a large workforce in an environment threatened by tropical diseases. As a consequence, the UFCo invested in sanitation infrastructure, launched health programs, and provided medical attention to its employees.

Infrastructure investments included pipes, drinking water systems, sewage systems, street lighting, macadamized roads, and dikes (Sanou and Quesada, 1998). In 1905 the UFCo established a Medical Department in Costa Rica to carry out sanitation programs and medical research on tropical diseases. By 1942 three company hospitals operated in the country. Their staff included doctors, sanitary inspectors, and nurses from the United States and other Central American countries (Morgan, 1993). Each hospital had up-to-date surgical and X-ray equipment, laboratory, outpatient department, and steam laundry (Deeks, 1924).

Employees and their dependents had access to medical and surgical treatment, including medicines in the case of employees, without any additional charge (UFCo, 1917).[29] Moreover, neighbors from non-UFCo 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 were classified as payroll and attended a UFCo hospital (dashed line) received more than twice the spending per patient than people who attended UFCo hospitals but were *not* in its the payroll (dotted line). Although a higher level of spending does not necessarily imply a higher quality of health care, UFCo's medical services were known of being among the best in the country (Casey,

[29] To cover healthcare for employees and their dependents, the UFCo deducted a mandatory fee equivalent to 2% from their salary.

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 UFCo's hospital.[30]

Despite the positive impact of the UFCo programs, its benefits were restricted to employees and their immediate families (Chomsky, 1996; Kepner, 1936). The general manager of the Medical Department explained that given the size of the UFCo 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 where our employees are located" (UFCo, 1922, p. 6). In fact, to increase sanitary benefits, company doctors suggested preventing workers from traveling between plantations and surrounding villages, which were unscreened.

5.1.2 Investments in Housing Infrastructure

Given the remoteness of the plantations and to reduce transportation costs, the UFCo 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 UFCo's divisions consisted of farms, and each farm had a camp where workers lived.

Usually, 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). These barrack structures exceeded the standards of many surrounding communities (Wiley, 2008).

Related to the sanitary programs impulsed by the UFCo, 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 UFCo provided basic services *for its employees* within each camp, such as schools, commissaries, dispensaries, and recreational facilities. May and Lasso (1958, p. 209) claim that "the places of worship, recreational facilities, and athletic fields and equipment provided for

[30]Moreover, although non-employees could receive medical attention in the UFCo healthcare network, they had to pay high fees.

United's workers are upon a scale matched by few, if any, locally owned agricultural enterprises."

5.1.3 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,[31] spending per student in schools operated by the UFCo was consistently higher than public spending in primary education between 1947 and 1963.[32] 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. Although the UFCo did not provide directly secondary education, it subsidized it in some cases.[33] Despite this subsidy, however, secondary and tertiary education were costly and out of reach for most children.

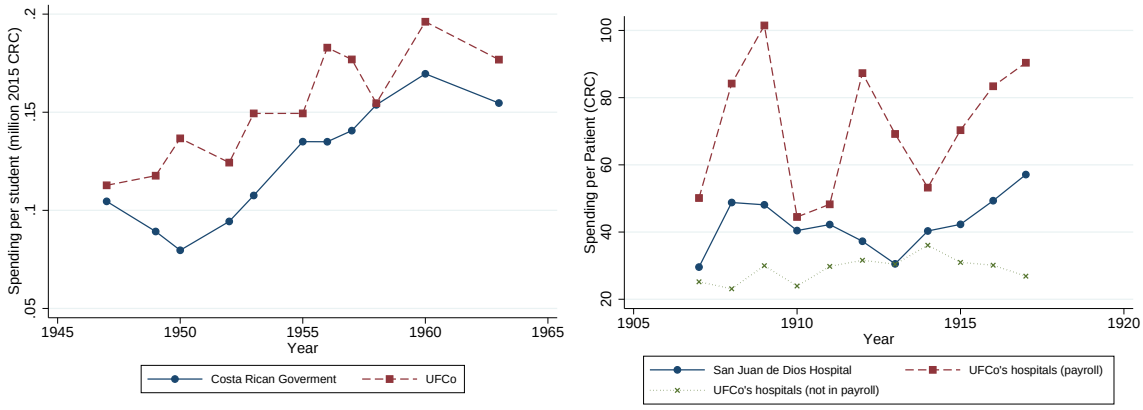
To assess the impact of UFCo's educational investments on current human capital accumulation, we estimate equation (1) using educational attainment as the outcome variable. Table E.7 finds a positive and statistically significant UFCo effect on human capital accumulation and primary education attainment: we document that individuals within the former UFCo landholdings had 0.223 more years of schooling and were 4.8 pp more likely to have completed primary education, while—consistent with the narrative in the last paragraph—the effect on secondary is not significant.

[31] 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 = 100*); and (iv) Consumer Price Index Base June 2015 = 100 (*Índice de precios al consumidor Base Junio 2015 = 100*).

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

[33] If the parents could afford the first two years of secondary education of their children in the United States, the UFCo 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 UFCo provided a building and furniture (May and Lasso, 1958).

Figure 6: Differences in Spending UFCo vs Government



(a) Spending per Student

(b) Spending per Patient

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

5.1.4 Why So Much Investment? Outside Options and Worker Turnover

While it is easier to conceive the benefits that the company could derive from investing in hospitals and having healthy workers, it is less clear why it would benefit from more educated children or from other local amenities it provided, such as churches and recreational facilities. In general, the UFCo gave prominent consideration to its employee's family life and leisure time. An article describing the activities of the company states:

> "The welfare work of the Company in the Tropics has assumed large proportions and has a direct bearing on the health and contentment of the employees. The Company has built and maintains churches and schools ..., and has erected and equipped club houses and amusement halls to provide entertainment for employees. It has also provided baseball grounds, and tennis courts" (Deeks, 1924, p. 1008).

A series of company publications suggest that the firm's welfare program was motivated by the need to attract and maintain a sizable workforce. High turnover was common, given the workers' outside option: coffee. Unlike bananas, coffee is a seasonal crop and offered high wages during its harvesting season. During and before

the 1920s, United Fruit Company's Annual Reports consistently recognized worker turnover as being an important problem to address. For instance, the 1923 Annual Report states:

> "The greatest difficulty encountered in our work among employees is attributable to the fact that a large percentage of the labor, particularly in new land-cultivations, is migratory. The Superintendent of Agriculture in one of the divisions estimates that a laborer's length of stay in that division averages less than two months." (UFCo, 1924, p. 45)

The 1922 Annual Report also states:

> "The inhabitants in stable communities can be kept under more strict control, and can be educated to take better care of themselves and to observe more closely the necessary precautions for maintaining health than is possible with the mixed and fluctuating populations on our plantations. ...There is a constant overturn of labor and we are periodically importing new laborers ...Their innate migratory habits do not permit them to remain on one plantation from year to year, but *as soon as they become physically efficient and acquire a little money they either return to their homes or migrate elsewhere and must be replaced* [emphasis added]." (UFCo, 1923, pp. 74-75)

As a solution to the high turnover rates, the reports recommended to increase investments in local amenities beyond medical measures. According to the 1925 Annual Report:

> "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 the 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 may hope to retain their services indefinitely* [emphasis added]." (UFCo, 1926, p. 185)

Consequently, the company intensified investments in local amenities in the mid-1920s. These investments proved to be successful in decreasing turnover. In 1929 a farm superintendent wrote: "sanitary measures have helped to stabilize labor and

increase their ability to perform work [...] during recent years with little or no influx of labor we have not experienced the recurrent shortages of labor that used to occur in previous years" (UFCo, 1930, p. 10). Although the Great Depression temporarily constrained the investments, the UFCo continued them in the late 1930s.

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 employees, which led to an increase in investments in "welfare" (local amenities), which could explain the positive effect on development we previously documented. We explore the mechanism described in these reports empirically and quantitatively. Namely, we test the existence of a positive relationship between better long-term outcomes and workers' outside options during the UFCo times. Intuitively, higher outside options while the UFCo was still operating would have lead to higher UFCo investments to retain workers, and consequently, to more favorable economic outcomes in the long term.[34]

To proxy for the outside option of workers *within* an UFCo district j *during* UFCo times, we propose to use the sum of the average agricultural real wage in each district k *outside* the UFCo region, weighted by the inverse of the distance between j and k. We consider data on real agricultural wages from the population census that dates back to 1973, while the UFCo was still operating. Further, as outside options in 1973 might be correlated with outside options today, we control for *current* real agricultural wages, which are measured using matched employer-employee data from the Costa Rican Social Security Fund (*Caja Costarricense del Seguro Social*).[35] Specifically, we consider the following specification:

$$\begin{aligned} y_{ijt} =& \beta \ln \sum_{k \notin \text{UFCo}} \frac{wage_{k,1973}}{price_{k,1973}} \frac{(dist_{jk})^{-1}}{\sum_n (dist_{jn})^{-1}} + \gamma \ln \sum_{k \neq i} \frac{wage_{k,t}}{price_{k,t}} \frac{(dist_{jk})^{-1}}{\sum_n (dist_{jn})^{-1}} \\ &+ f(\text{geographic location}_g) + \mathbf{X}_{igt}\psi + \mathbf{X}_g\Gamma + \alpha_t + \varepsilon_{ijt}, \text{ for } j \in \text{UFCo}; \end{aligned} \tag{3}$$

where $y^i_{j,t}$ denotes the outcome of household i in district j (within the UFCo region) and t will stand for outcomes years after the UFCo stoppped operations; in particular,

[34] We take this indirect approach, instead of comparing outside options with investments, as data on UFCo investments is too aggregated to exploit spatial variation.

[35] This data includes the occupation, wage, and location of the universe of formal workers in the country. The earliest year in which this data is available is 2006. Thus, we use 2006 as a proxy of the distribution of wages in 2000. For 2011, we consider 2011 wages. All results hold if we only consider 2011.

we will consider $t \in \{2000, 2011\}$. Other controls—in the equation's second row—have the same definitions as in our main specification (equation (1)).

The results of this first approach are reported in Table 3. Indeed, we find that areas where UFCo workers had better outside options in 1973, exhibit disproportionately better outcomes in recent years. For instance, from Column (5), we see that a one percent increase in the outside option of workers in an UFCo region in 1973 is associated with 2.25 pp lower probability of being poor for households in that region in 2011 and 2000.

Table 3: Outside Option in 1973 for UFCo Workers and Outcomes in 2000 and 2011 within the UFCo

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
ln Outside	-2.366	-0.627	-1.088	-0.320	-2.250	-4.402
Option in 1973	(0.750)***	(0.216)***	(0.668)	(0.659)	(1.134)*	(2.073)**
	[1.016]**	[0.247]**	[0.884]	[0.852]	[1.811]	[2.795]
Adjusted R^2	0.033	0.011	0.152	0.013	0.055	0.085
Observations	341,665	341,665	341,665	341,665	341,665	341,665
Clusters	114	114	114	114	114	114
Mean	0.151	0.034	0.154	0.178	0.391	0.518

Notes: UBN = Unsatisfied Basic Need. The unit of observation is the individual. Robust standard errors, adjusted for clustering by district-year, are in parentheses. All regressions control for current outside options, and controls for contemporaneous outside options; the number of adults, children, and infants in the household; census fixed effects, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A potential endogeneity concern given these results, however, is that UFCo investments might have increased real wages in relatively close regions. To address this, we use an instrumental variables strategy. In our first stage, we propose a region's suitability to grow coffee as an instrument for its real agricultural wages. Along with banana production, coffee was the main economic activity in Costa Rica, and the main alternative source of employment for agricultural workers. Moreover, coffee and bananas grow optimally under different geographic and climatic conditions: While coffee is grown in highlands because higher elevation increases coffee's acidity and its commercial value, bananas slow down their growth rate as the elevation increases (Viales and Montero, 2015).

The idea behind this instrument is that regions more suitable to grow coffee in

1973—which grows in a different climate and altitude than banana—should offer higher wages for agricultural workers. Thus, the closest an UFCo region is to a place suitable to grow coffee, the higher the outside option will be for UFCo workers in this area, which in turn, would have led to more UFCo investments and hence better outcomes in 2000 and 2011.[36]

To measure an area's suitability to grow coffee, we regress coffee intensity in district j—defined as the fraction of agricultural land used for cultivating coffee in district j—in 1973, during UFCo times, on geographic characteristics (slope, temperature, elevation) and a linear polynomial in latitude and longitude. Data on cultivated area is consistent with FAO's statistics, however, FAO coffee suitability data for Costa Rica is too spatially aggregated and not available for 1973, which led us to create this similar measure ourselves, using yields and area from the agricultural census that is geo-referenced at higher spatial frequencies.[37] Data on agricultural wages comes from the 1973 Population Census, while data on coffee production is obtained from the 1973 Agricultural Census. The first panel of Table 4 shows the result of this first stage. A one percent increase in the coffee intensity of (distance-weighted) neighboring regions is associated with 0.20% higher wages in 1973.[38] The effect is statistically significant at the 5% level.[39]

For our second stage, we regress economic outcomes in 2000 and 2011 for household i in region j on our distance-weighted measure of the coffee-intensity of nearby regions in 1973, along with all the controls present in Equation (3). The second panel of Table 4 displays the results of our IV strategy. All coefficients are consistent with, albeit smaller than, the ones of the OLS regression in Table 3. We find that a higher outside option in 1973 is associated with better contemporary outcomes in all cases. For instance, according to the coefficient in Column (5), an increase in one percent in the average outside option of an UFCo region in 1973 is associated with a 0.717 pp lower probability of being poor in the long term (2000 and 2011). These results are shown graphically in Figure P.1, in which locations where workers had better outside options during the UFCo's tenure are consistently associated with higher living standards in

[36]Note that we are already controlling for agricultural wages in non-UFCo coffee-suitable areas in 2000 and 2011.

[37]FAO data is *only* available as a 30-year average, that considers many years after the UFCo stopped operations.

[38]$\exp(0.178) - 1 \approx 0.20$

[39]Moreover, the first-stage F-statistic is in the order of 32, reducing concerns that coffee suitability is a weak instrument at predicting variation in agricultural wages (Stock et al., 2002).

2000 and 2011.

Table 4: IV Strategy: Outside Options in 1973 for UFCo Workers and Outcomes in 2000 and 2011 within the UFCo

First Stage (*Dependent Variable:* ln *1973 Real Wages)*						
ln Distance-Weighted	Coefficient	Clustered SE	Clusters	F-Statistic	Adj-R^2	Observations
Coffee Intensity	0.178	(0.071)**	354	31.751	0.265	86,949

Second Stage (*Dependent Variables: 2000-2011 Outcomes)*						
	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
ln Outside	-0.746	-0.258	-0.278	-0.116	-0.717	-1.400
Option in 1973	(0.200)***	(0.070)***	(0.175)	(0.184)	(0.375)*	(0.573)**
	[1.269]***	[0.083]***	[0.231]	[0.227]	[0.503]	[0.763]*
Adjusted R^2	0.033	0.011	0.152	0.013	0.055	0.085
Observations	341,665	341,665	341,665	341,665	341,665	341,665
Clusters	114	114	114	114	114	114
Mean	0.151	0.034	0.154	0.178	0.391	0.518

Notes: First stage: coffee intensity and wages are measured at district level. Second stage: UBN = Unsatisfied Basic Need. The unit of observation is the individual. Robust standard errors, adjusted for clustering by district-year, are in parentheses. All regressions (both stages) include controls for contemporaneous outside options; the number of adults, children, and infants in the household; census fixed effects, and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Institutions and Labor Mobility Why didn't the UFCo take the approach of destroying workers' outside options? Work by Acemoglu and Wolitzky (2011) on labor coercion suggests an alternative approach to retain workers: preventing them from leaving or reducing their mobility. Several reasons 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, which possibly played a role in protecting workers' rights.[40] 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, given the larger political competition in Costa Rica, there was an effort by particular political groups to enlarge their winning coalition by protecting UFCo workers (Bucheli and Kim, 2012). These circumstances

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

were not present in other Latin American countries where the UFCo operated, like Colombia, where armed forces prevented workers from forming unions and leaving the plantations in Santa Marta and Ciénaga.[41] 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.

This section analyzed both qualitative and quantitative evidence on the key role of labor mobility, market power, and investments in explaining better the short- and long-run outcomes within the UFCo. Later on, in Section 5.4—after ruling out other potential mechanisms in the next section—we will assess the potential of this mechanism to generate our results on economic outcomes through the lens of a model, and examine its implications via a counterfactual analysis.

5.2 Ruling-Out Other Plausible Mechanisms as Main Drivers

Positively Selected Migration During UFCo's Tenure It might have been the case that outcomes are better within the UFCo because it attracted positively selected migrants. To consider if selective migration is generating the differences in living standards between the two regions, we take four different approaches. In our first approach, we re-estimate equations (1) and (2) using a restricted sample, in which we drop all migrant households. We classify a household as non-migrant in two alternative ways: (i) if all members lived in the same location five years before the census took place, and (ii) if the head of household lived in the same location five years before the census took place. Panels C3 and C4 in Figures D.8 and D.9 show that our results remain statistically equal in all cases, and in particular, for year 1973—while the UFCo is still operating.

In our second approach, we look at observables of migrants to the UFCo sub-region where we ran our regressions, and compare them to observables of migrants to our control region in 1973 (while the UFCo was still operating). That is, we are looking exactly at migrants on both sides of the border segment where we run all our main results. As documented in Table E.8, we find that, on average, migrants to the UFCo have lower years of schooling and a lower probability of completing primary

[41] 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 in 1948.

school than migrants to the control group. This suggests that, if anything, migrants to the UFCo were negatively selected.

While the 1973 Population Census data is detailed and geo-referenced at the census-block level, it captures migrant patterns many years after the company began operations. To explore earlier waves of migration, our third approach resorts to earlier census data. Namely, we compare observable characteristics of migrants to UFCo regions with those of migrants to other Costa Rican regions in 1927, the earliest census for which micro-data is available.[42] Consistent with the results from 1973, we find that migrants to the UFCo were negatively selected in terms of schooling. Compared to migrants to other Costa Rican regions, migrants to the UFCo were on average 6.8 pp less likely of having primary education, 1.6 pp less likely of having secondary education, and 4.7 pp less likely of being able to read and write. Moreover, the results from the 1927 Population Census also show that migrants to the UFCo regions were on average 10.3 pp less likely to own real state than migrants that moved to other Costa Rican regions. This negative selection aligns with more recent findings like those of Lagakos et al. (2018), and is robust to restricting our sample and comparing migrants to UFCo cantons with migrants to neighboring cantons around UFCo plantations only. The results of this analysis are available in Appendix G.

Our fourth approach complements the second and third ones by ruling-out that, maybe, although migrants to the UFCo accumulated less human capital than other migrants at the time, they might have been exceptional farmers (a measure that is not captured by education attainment). To explore this, we compare the UFCo effect for households engaged in the agricultural sector versus other economic sectors.[43] If ability in agriculture production is highly inheritable and selection in these abilities is driving our results, then the UFCo effect should be stronger for households engaged in the agricultural sector relative to households in other economic activities. Nevertheless, Panels D6, D7, D8, and D9 in Figure 5 show that this is not the case: 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 extremely similar).[44]

[42]For 1927, the census micro-data is a representative sample geo-referenced at the canton level.

[43]We consider a household as an agricultural household if any of its members work in agriculture. Our results remain unchanged if we instead consider a household as an agricultural household if its head works in agriculture.

[44]Individual tables with details about each regression are available in the supplementary Online Appendix for the authors' websites.

In summary, all four approaches suggest that selective migration is unlikely to generate the observed differences between regions, and if anything, it appears that migrants to the UFCo were negatively selected.

Positively Selected Migration at the Time of Each Census Each census contains information about individuals' place of residence five years before the census took place. Table N.18 shows that the migration rates in census blocks in the UFCo and the control region (just outside) are statistically equal at every point in time. Further, Panels D4 and D5 in Figure 5, and Panels C3 and C4 in Figures D.8 and D.9 show that all our results remain unchanged when considering only households that are not composed by migrants. This holds regardless of how we define migration: whether we consider only households where no member is a migrant, or where only the head of household is not a migrant.

Negative Spillovers from the UFCo to Neighboring Regions Another possible concern is that negative spillovers from the UFCo to our control group generate the gap in outcomes between the regions. However, it is unlikely to be the case. First, in Appendix H, we document that in 1973, while the company was still operating, the economic outcomes for the control region (right outside the UFCo) were better than in other rural Costa Rican regions outside the UFCo. As Table H.11 shows, households in the counterfactual region had a lower probability of a UBN in housing, health, education, and consumption; and a lower probability of being poor.

Second, in the right panel of Table H.12, we show that in 1973, the accumulation of human capital was higher for individuals in the control group than in individuals in other nearby regions outside the UFCo. Individuals in the counterfactual region had 1.453 more years of schooling, were 25.9 pp more likely of completing primary education, and 2.9 pp more likely of completing secondary education. Further, the left panel of the same table documents that migrants to the control region—right outside the UFCo—were *positively* selected in terms of human capital with respect to migrants to other non-UFCo rural regions. If anything, this selection would work *against* our findings.

Third, in Appendix I, we document how public investment per capita in the region outside the UFCo boundary during the company's tenure was not significantly different from that on average Costa Rican rural areas. In particular, we gathered data

on government spending per municipality from annual reports from the Comptroller General of the Republic of Costa Rica (*Contraloría General de la República de Costa Rica*), and we compare the spending per capita between UFCo municipalities and other rural municipalities.

Thus, our control region seems like an average location—if anything, a relatively strong one 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, in this sense the control region is particularly strong within Latin America.

5.3 Discussion

In summary, levels of investment in local amenities such as hospitals and schools inside the UFCo 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 UFCo. We show that these investments are likely to be the main drivers behind the gaps in living standards that we documented empirically. Moreover, as maximizing profits was the UFCo's main objective, the level of their investments in physical and human capital would likely have been lower in the absence of competition for labor. It is worth mentioning that this mechanism would allow us to 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.

Importantly, although we document the positive effects of the UFCo in Costa Rica, one must be cautious and not overly-optimistic. As we will learn from the model in the next section, the company's welfare effect is increasing in worker mobility, and that it can be *negative* if worker mobility is too low. The latter is a word of warning of how

even the same company in a different setting—for instance, one with a larger degree of coercion, like what might have occurred in other Latin American countries—can lead to worse economic outcomes, and highlights how labor mobility is key in determining local outcomes.

5.4 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, Appendix J lays out the framework and calibration of a model that incorporates these new channels, and in which labor market power relates to worker mobility. In the model, the company is a local monopsony in one location, while workers are mobile across locations.[45] 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 patterns 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, but increase workers' utility and make them more productive.

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 a migration gravity equation, along with an instrumental variables strategy, to obtain an estimate of the migration elasticity.

In our empirical analysis, we determined the UFCo's effect on several local economic outcomes. One of the most useful exercises that our proposed model allows us to do is to estimate the firm's aggregate impact on welfare, where we account for general equilibrium effects, and conduct a counterfactual exercise to understand how this aggregate welfare effect depends on workers' outside options and the firm's degree of monopsony power.

Under our baseline calibration, we find that the UFCo increases aggregate welfare by 3.66%, as compared with a scenario where the UFCo region looks exactly any other location.[46] We find it informative to compare steady states, as otherwise, our

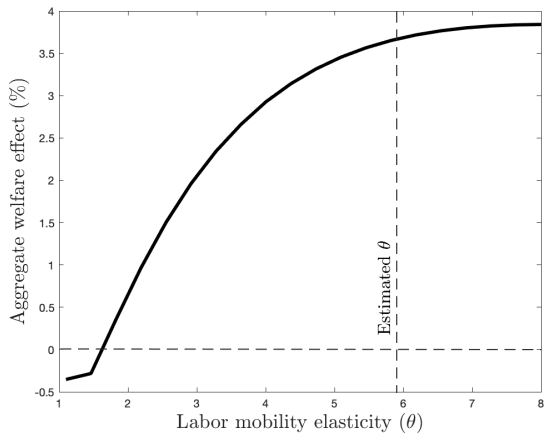
[45] By local monopsonist, we mean that the UFCo is a profit maximizer and the sole employer within its location. Thus, our model departs from standard spatial models where firms are price-takers.

[46] It produces a domestic good using the same technology as the locals, and the government is the

results would depend crucially on the initial labor allocation.[47]

In line with the mechanism we documented in Section 4, and in particular in Figure P.1, in our model, the UFCo's effect on welfare is decreasing in labor mobility, which in turn is directly related to workers' outside options. If the elasticity of labor mobility (θ) is low (high), workers are relatively insensitive (sensitive) to differences in utility across regions, perceiving their outside option as relatively low (high).

Figure 7: Aggregate Welfare and Labor Mobility



Notes: The figure shows how the aggregate welfare of the UFCo changes as labor mobility changes. The company's aggregate welfare effect is computed by comparing the scenario with UFCo with a one where the UFCo's location has exactly the same characteristics as the rest of the country.

Figure 7 displays a counterfactual exercise where we change the value of the labor mobility elasticity (θ). The UFCo's effect is sensitive to the value of the labor mobility elasticity, and low values of this elasticity can flip the sign of the UFCo's effect, such that the firm's presence might harm locals.[48] As we discussed in Section 5.1.4, this might have been the case in other Latin American countries where the company operated that are very poor today and where mobility seems to have been extremely low, or in cases documented by the literature where labor was coerced (e.g., Nunn 2008, Dell 2010, Lowes and Montero 2016).[49] This exercise highlights the importance

provider of amenities. Note that this means we have a conservative estimate as (i) the UFCo's land required a lot of investment before becoming productive (initially swampy and prone to mosquitoes and diseases), but we assume it is as productive as coffee regions, and (ii) in the scenario where the UFCo's region starts producing a local good, there is a new variety entering the CES utility function.

[47]This is possible given the model's structure, which is similar in spirit to an OLG model.

[48]This would be impossible in a case with perfect mobility across regions, where the country's labor market would feature perfect competition. However, with low labor mobility, workers within the UFCo region can be negatively affected by the firm's market power.

[49]In line with this narrative, as workers' outside option increases (i.e., with larger values of the labor mobility elasticity), their compensation represents a larger share of the UFCo's total profits.

of the local labor market dynamics in determining how much the domestic economy might benefit (or be hurt) by large investment projects like this one.

6 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 64 million acres 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 and Vermeulen, 2009; Cotula et al., 2009). More than 30 of these concessions have been *larger* than the UFCo'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. Consequently, a better comprehension of the effect of such projects is 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 UFCo areas have a better satisfaction of basic needs (housing, sanitation, education, and consumption capacity) and are less likely to be poor than households in comparable locations that were not under the firm's direct influence.

Data that we collected from primary sources allowed us to test different potential mechanisms, and to find evidence that investments in physical and human capital carried out by the UFCo were likely the drivers of the positive "UFCo effect." Studying company reports, we documented 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, the aggregate effect of the company becomes negative, which is in line with the negative effects found by the literature studying arrangements where labor was coerced (and relatively immobile).

Finally, many of the economic forces we studied apply to a broader set of arrangements beyond multinational corporations. However, we note that the case of multinational enterprises—where most profits do not stay domestically, especially in cases where firms pay little or no taxes like in our setting—is a scenario in which it is particularly hard to think of domestic aggregate positive effects. We highlight how, even in this situation, the mechanism we describe is strong enough that it can lead to positive and very persistent effects on domestic living standards.

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Online Appendix for

Multinationals, Monopsony, and Local Development:

Evidence from the United Fruit Company

March 3th, 2021

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Central Bank of Costa Rica

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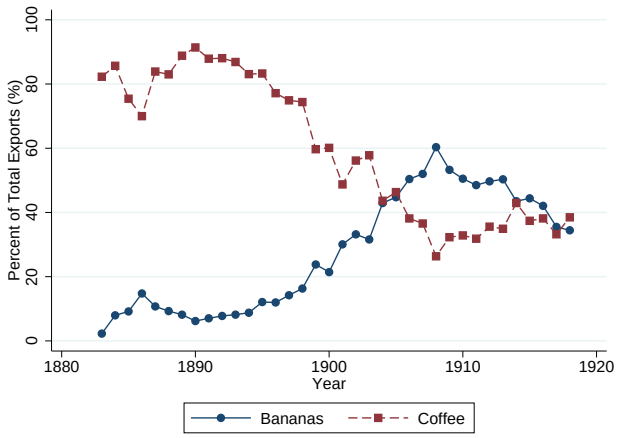
A Historical Details

A.1 The UFCo in Costa Rica

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

Figure A.1 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).

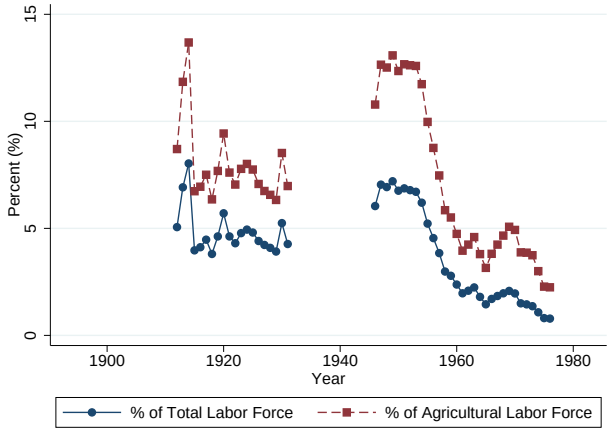
Figure A.1: Banana and Coffee (Percentage of Total Costa Rican Exports), 1883-1918



Source: Authors' calculations based on the "Statistical Summary, years 1883 to 1910: trade, agriculture, industry" (*"Resúmenes estadísticos, años 1883 a 1910: comercio, agricultura, industria"*), and 1911 to 1918 Costa Rican Statistic Yearbooks.

Figure A.2 illustrates the evolution of UFCo employment in Costa Rica. On average, between 1912 and 1931 the UFCo 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. However, due to a series of hurricanes that destroyed the plantations in several countries along with expropriations and scandals of corruption that lowered the price of the UFCo's stock (none of these natural disasters or scandals in Costa Rica, but in other Latin American countries), the company went bankrupt. Further, as its successor, today known as Chiquita, followed a corporate strategy that divested in the production process to focus on marketing, the UFCo abandoned banana production in Costa Rica in 1984.

Figure A.2: UFCo 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 Population Censuses.

B Unsatisfied Basic Needs (UBN) Index

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, who constructed the index based on information from the 2000 Population Census and household surveys that included data on income. 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 maintain the 2000 structure and use only the subset of the components for which similar variables are available in all four censuses.[50] Table B shows which census variables constitute each basic need, and describes the standards under which the need is considered unsatisfied.

Appendix L shows that the main results of the paper are preserved if we use the index only for the 2000 and 2011 censuses, including all its original components.

Table B.1: 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.
		Continued on next page

[50]For earlier years, surveys with income and household data do not exist, however, we ensure that questions from the census remain perfectly comparable across time.

Table B.1 – continued from previous page

Dimension	Component	Variable from Census
	Overcrowding	Household with more than two persons per room.
Health		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 School Achievement	Household with at least one member from 7 to 17 years old not attending school. Household with at least one member from 7 to 17 years old attending school regularly, but with a school backwardness higher than 2 years.
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

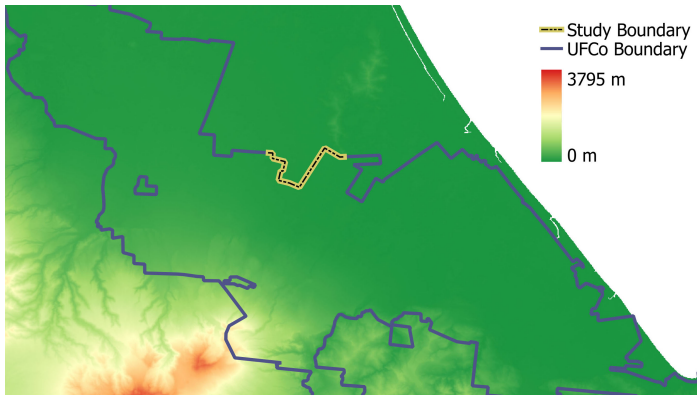
Table B.1 – continued from previous page

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.

C Additional Figures

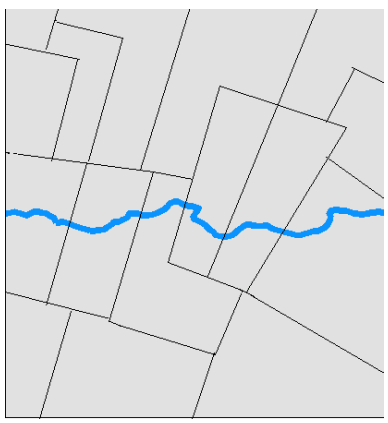
Figure C.4 shows an example of how the study boundary follows a natural landmark (the river) closely, but not exactly, as it was jointly determined by the river and preexisting plots. In 1904 the government forbid, by law, to sell the plots in orange back to the company (or any foreigner), therefore this boundary was kept constant during the company's tenure.

Figure C.3: Study Boundary

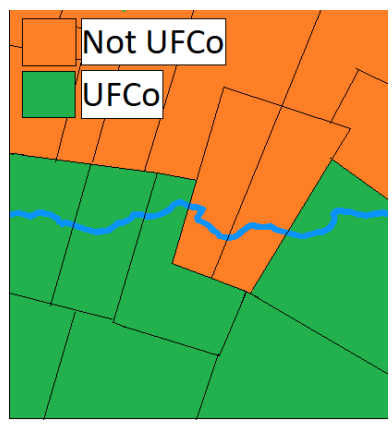


Notes: Elevation is shown in the background. The figure shows the boundary segment along which (i) there is evidence of a quasi-random land assignment, and (ii) geographic characteristics balance. Further details are discussed in Section 2.2.

Figure C.4: The UFCo 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.

Figure C.5: One of the Original Maps from the Costa Rican National Archive

Notes: The figure provides an example of one of the original maps from the Costa Rican National Archive (*Archivo Nacional de Costa Rica*) that we collected, scanned, and digitized. (*Source:* Fondo: Mapa. Signatura: 17849).

D Additional Results

Table D.2: Segments along All the Border where Geographic Characteristics Balance

	Sample falls within					
	<4 km of UFCo boundary			<10 km of UFCo boundary		
	Inside	Outside	s.e	Inside	Outside	s.e
Elevation	31.273	45.636	(10.144)	33.107	58.949	(9.173)***
			[13.317]			[22.869]**
Slope	0.097	0.434	(0.249)	0.339	0.511	(0.158)
			[0.264]			[0.251]
Temperature	26.001	26.061	(0.050)	25.865	25.991	(0.046)***
			[0.063]			[0.115]**
Observations	101	104		190	234	

Notes: The table corresponds to areas along the entire border where features balance. The unit of observation is 1x1 km grid cells. Robust standard errors for the difference in means between UFCo and non-UFCo observations are in parentheses, and Conley standard errors in brackets. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D.3: Balance on Geographic Characteristics for Redrawn Border

	Sample falls within					
	<5 km of UFCo boundary			<10 km of UFCo 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]**
Observations	96	85		168	141	

Notes: The table corresponds to areas along the exogenously redrawn border segment.The unit of observation is 1x1 km grid cells. Robust standard errors for the difference in means between UFCo and non-UFCo observations are in parentheses. Conley standard errors for the difference in means are in brackets. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D.4: Average UFCo Effect Along All Border Segments where Characteristics Balance

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFCo	-0.052	-0.009	-0.030	-0.065	-0.103	-0.157
	(0.016)***	(0.011)	(0.013)**	(0.015)***	(0.020)***	(0.035)***
	[0.017]***	[0.007]	[0.013]**	[0.015]***	[0.017]***	[0.032]***
Adjusted R^2	0.082	0.093	0.261	0.017	0.113	0.170
Observations	13,850	13,850	13,850	13,850	13,850	13,850
Clusters	348	348	348	348	348	348
Mean	0.152	0.048	0.221	0.179	0.449	0.599

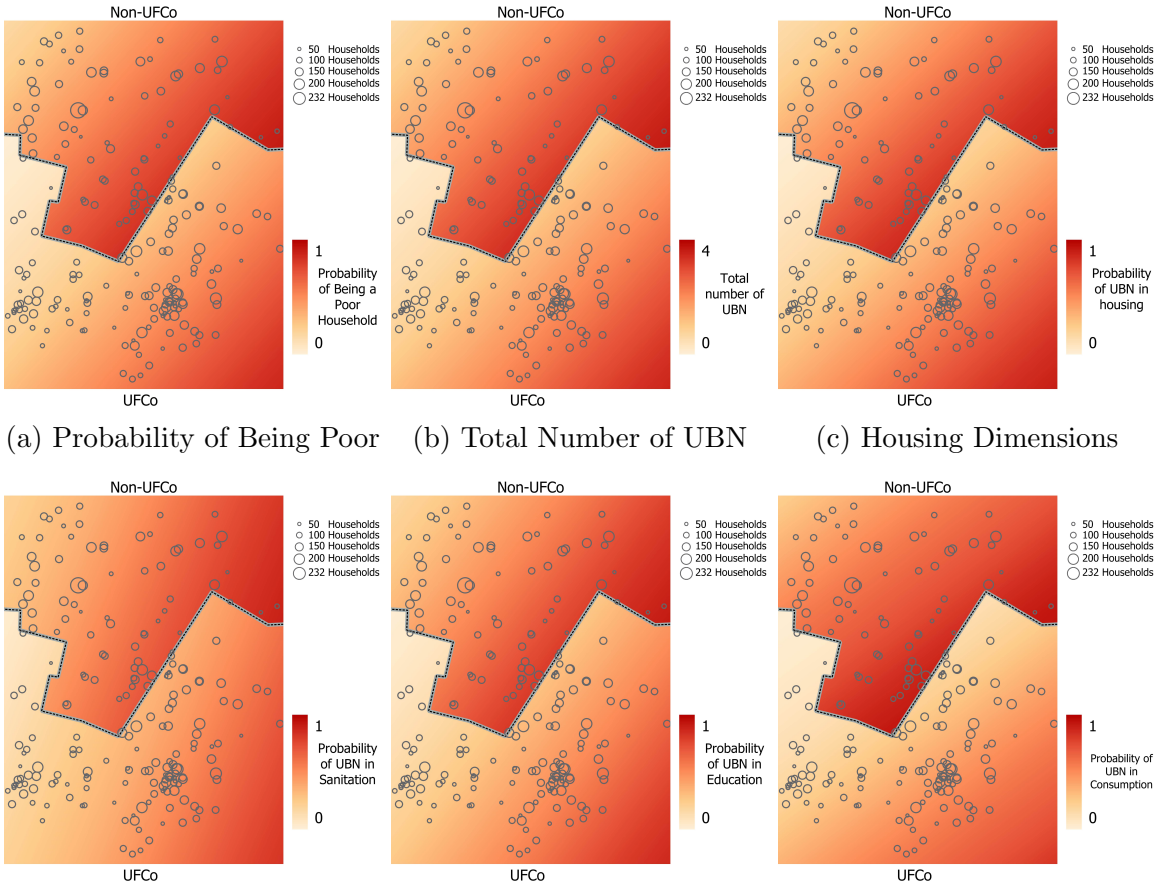
Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic controls (slope, elevation, temperature); demographic controls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

Table D.5: UFCo-Effect Across Years Along All Border Segments where Characteristics Balance

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
$UFCo_{1973}$	-0.057	-0.010	-0.056	-0.069	-0.102	-0.171
	(0.055)	(0.077)	(0.028)**	(0.039)*	(0.045)**	(0.154)
	[0.048]***	[0.083]	[0.020]***	[0.042]	[0.060]***	[0.154]
$UFCo_{1984}$	-0.052	-0.003	-0.041	-0.067	-0.091	-0.163
	(0.032)	(0.018)	(0.021)*	(0.025)***	(0.031)***	(0.060)***
	[0.028]**	[0.016]	[0.022]*	[0.023]***	[0.027]***	[0.048]***
$UFCo_{2000}$	-0.053	0.016	-0.047	-0.073	-0.122	-0.189
	(0.021)**	(0.012)	(0.018)**	(0.019)***	(0.027)***	(0.043)***
	[0.023]***	[0.012]	[0.013]***	[0.019]***	[0.023]***	[0.036]***
$UFCo_{2011}$	-0.049	0.012	-0.008	-0.058	-0.095	-0.127
	(0.019)***	(0.008)	(0.016)	(0.021)***	(0.026)***	(0.038)***
	[0.018]***	[0.008]	[0.021]	[0.034]*	[0.031]***	[0.050]***
Adjusted R^2	0.081	0.093	0.262	0.016	0.113	0.170
Observations	13,850	13,850	13,850	13,850	13,850	13,850
Clusters	348	348	348	348	348	348
$Mean_{1973}$	0.393	0.234	0.399	0.154	0.453	1.179
$Mean_{1984}$	0.176	0.058	0.370	0.173	0.495	0.776
$Mean_{2000}$	0.140	0.036	0.218	0.159	0.495	0.551
$Mean_{2011}$	0.100	0.014	0.124	0.202	0.480	0.440

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic controls (slope, elevation, 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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure D.6: Plots of the UFCo Effect on Contemporary Household Outcomes

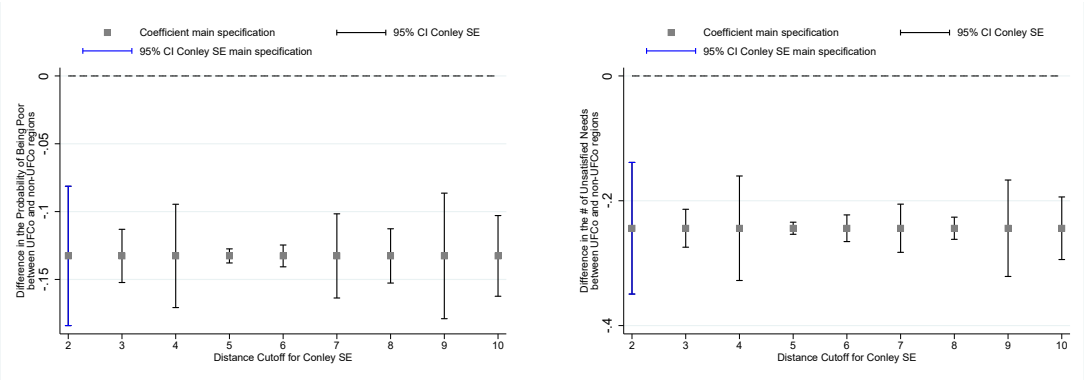


(a) Probability of Being Poor (b) Total Number of UBN (c) Housing Dimensions

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

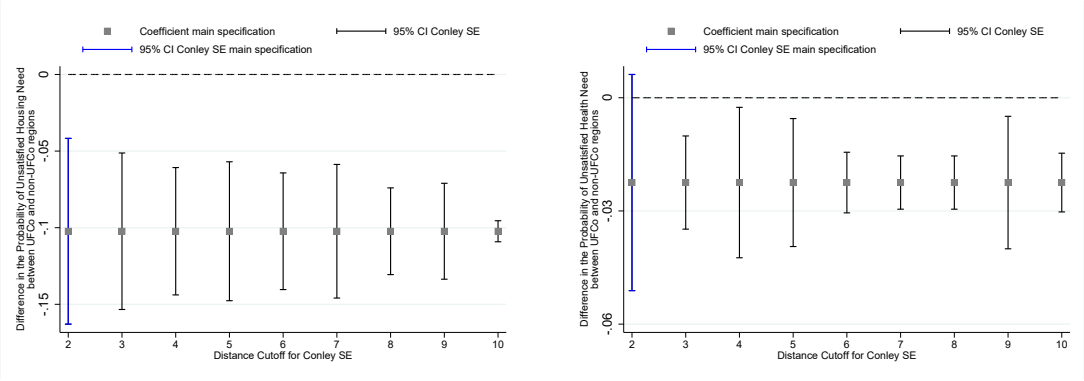
Notes: The figure shows the study boundary, with UFCo territories being south. Each dot represents a census-block's centroid. Dot-size represents the number of households in each census-block. The background in each subfigure shows predicted values, for a finely spaced grid of longitude-latitude coordinates, from a regression of the outcome variable under consideration on the UFCo dummy and a linear polynomial in latitude and longitude. The predicted jump across the UFCo boundary is clear in all the subfigures, and lighter areas (better outcomes) coincide with former UFCo regions.

Figure D.7: Alternative Cutoffs for Conley Standard Errors and Main Results



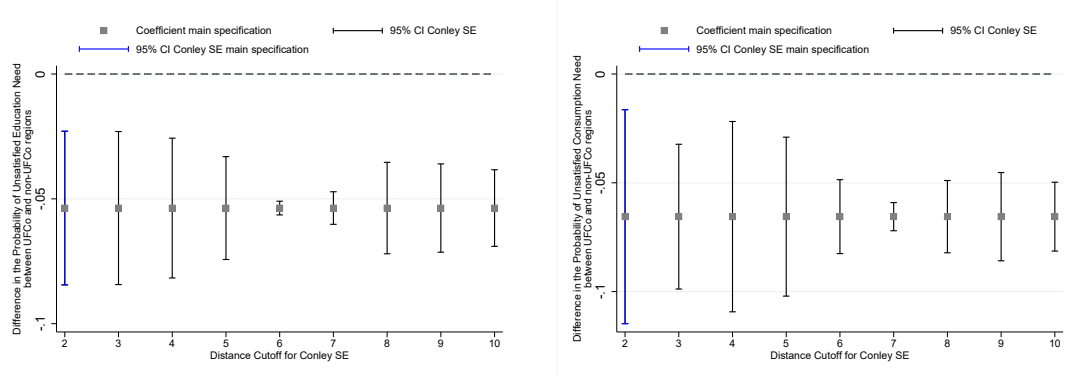
(a) Probability of Being Poor

(b) Total Number of Unsatisfied Needs



(c) Housing Dimension

(d) Health Dimension

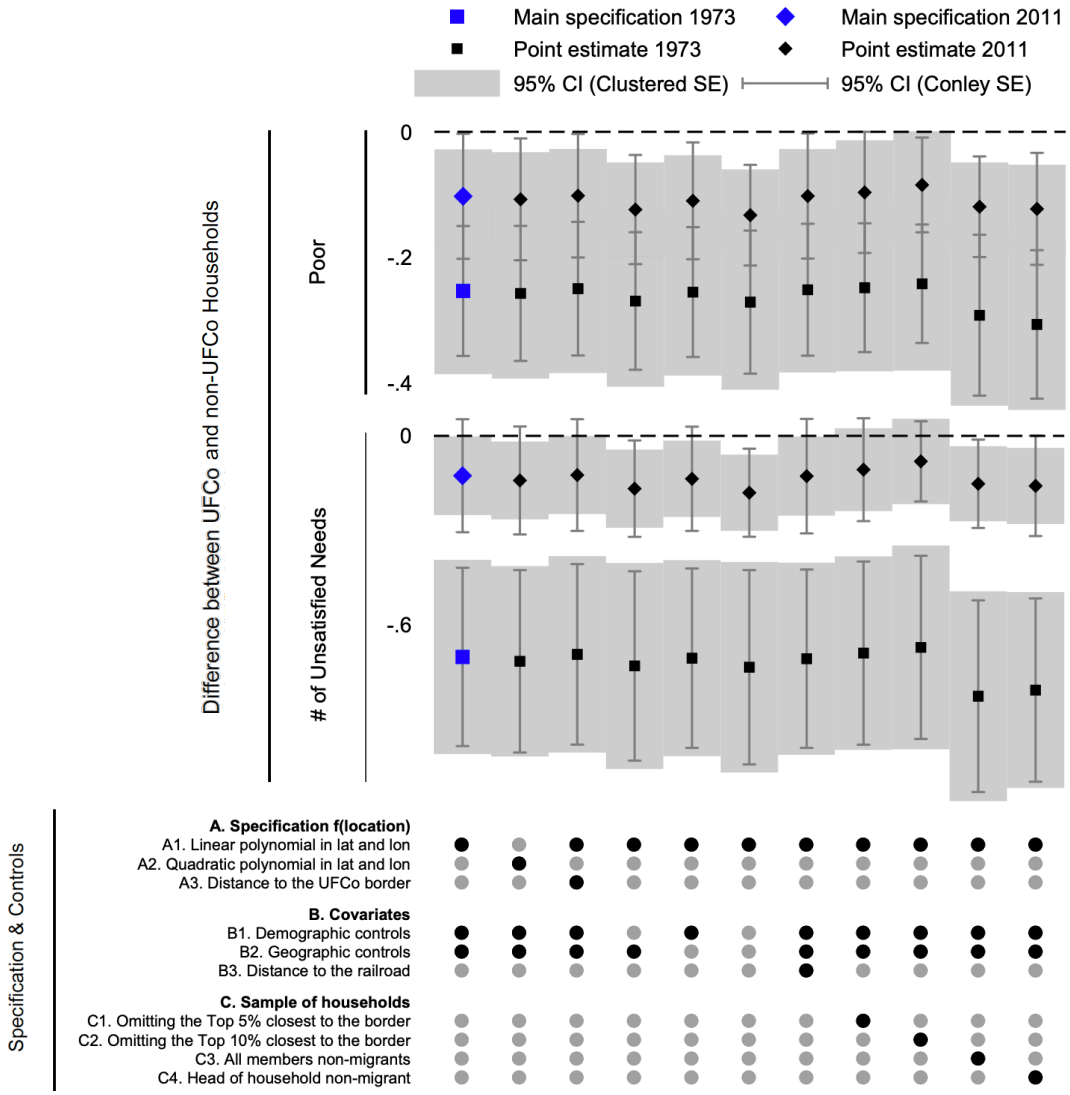


(e) Education Dimension

(f) Consumption Dimension

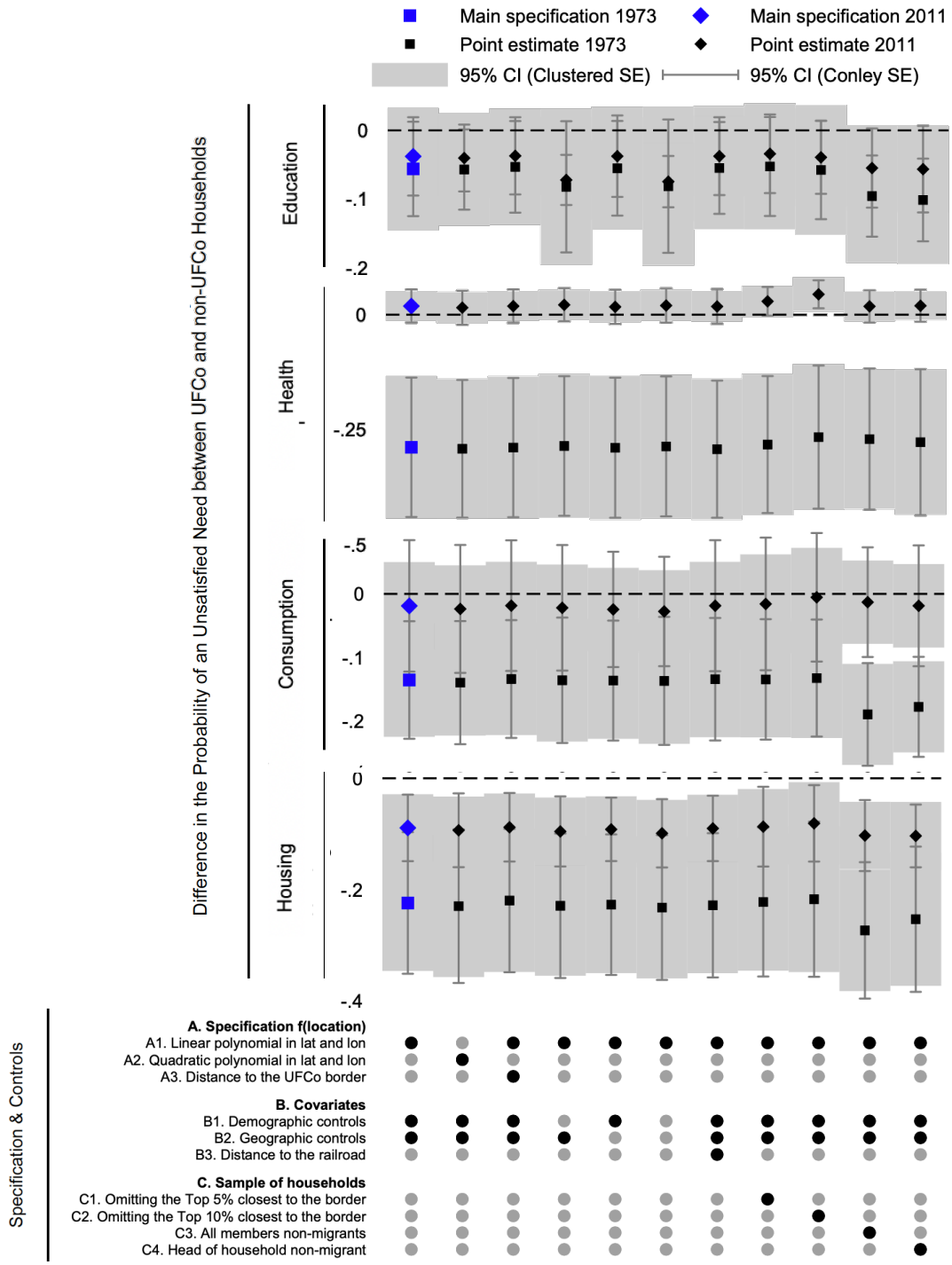
Notes: We compute Conley standard errors at alternative cutoff distances. For our main results, we choose 2 km as the cutoff because it is the distance that *maximizes* standard errors for all outcomes, as shown in this figure. In general, all results are robust to alternative cutoffs ranging from 2 to 10 km (the maximum allowed by the plantation's size), and to the placebo tests reported in Table E.6.

Figure D.8: Robustness checks, Main Specification, Dynamic UFCo Effect (Part 1/2)



Notes: For each outcome, we plot two series corresponding with 1973 and 2011 differences between UFCo and non-UFCo regions. In the bottom panel, black dots indicate the controls added in each regression that is vertically aligned with these dots. Figure 5 shows similar checks for UFCo's average effect. Individual tables with these regressions are reported in the supplementary Online Appendix for the authors' websites.

Figure D.9: Robustness checks, Main Specification, Dynamic UFCo Effect (Part 2/2)



Notes: For each outcome, we plot two series corresponding with 1973 and 2011 differences between UFCo and non-UFCo regions. In the bottom panel, black dots indicate the controls added in each regression that is vertically aligned with these dots. Figure 5 shows similar checks for UFCo's average effect. Individual tables with these regressions are reported in the supplementary Online Appendix for the authors' websites.

E Falsification Tests

Table E.6: Average UFCo Effect: Placebo Tests 2 km and 4 km

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Placebo at +2 km			
UFCo	0.013	-0.011	0.023	-0.010	0.002	0.014
	(0.035)	(0.019)	(0.017)	(0.030)	(0.038)	(0.064)
	[0.041]	[0.017]	[0.019]	[0.022]	[0.030]	[0.065]
Adjusted R^2	0.097	0.168	0.237	0.013	0.111	0.193
			Panel B: Placebo at -2 km			
UFCo	-0.040	0.003	-0.003	0.002	-0.016	-0.042
	(0.026)	(0.019)	(0.020)	(0.024)	(0.029)	(0.055)
	[0.031]	[0.019]	[0.019]	[0.029]	[0.029]	[0.055]
Adjusted R^2	0.098	0.168	0.237	0.013	0.111	0.193
			Panel C: Placebo at +4 km			
UFCo	0.007	-0.011	0.003	-0.010	0.019	0.017
	(0.033)	(0.028)	(0.017)	(0.025)	(0.032)	(0.060)
	[0.041]	[0.017]	[0.011]	[0.021]	[0.027]	[0.053]
Adjusted R^2	0.097	0.168	0.237	0.013	0.111	0.193
			Panel D: Placebo at -4 km			
UFCo	-0.017	0.006	-0.011	0.009	-0.006	-0.025
	(0.020)	(0.016)	(0.016)	(0.021)	(0.023)	(0.045)
	[0.017]	[0.008]	[0.010]	[0.019]	[0.020]	[0.038]
Adjusted R^2	0.097	0.168	0.237	0.013	0.111	0.193

Notes: All regressions include 9,179 observations and 206 clusters. +2 km and +4 km refer to shifting the boundary 2 km and 4 km North, respectively; while -2 km and -4 km refer to shifting the boundary 2 km and 4 km South. UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic controls (slope, elevation, 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: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E.7: Human Capital Accumulation: Non-Migrants 1973-2011

	Years of schooling	Primary	Secondary
	(1)	(2)	(3)
UFCo	0.223	0.048	0.001
	(0.124)*	(0.017)***	(0.008)
	[0.146]	[0.018]***	[0.006]
Adjusted R^2	0.244	0.210	0.043
Mean	4.587	0.461	0.056

Notes: Observations: 26,179; clusters: 206. The unit of observation is the individual. Robust standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic and individual controls, census fixed effects, and a linear polynomial in latitude and longitude.

Table E.8: Human Capital Accumulation: 1973 Migrants

	Years of schooling	Primary	Secondary
	(1)	(2)	(3)
UFCo	-0.117	0.017	-0.015
	(1.103)	(0.175)	(0.021)
	[0.655]	[0.114]	[0.016]
Adjusted R^2	0.099	0.063	0.015
Mean	2.928	0.195	0.016

Notes: Observations: 1,551; clusters: 14. We follow Cameron and Miller (2015) using the bias-adjusted cluster-robust standard errors, and the degrees of freedom adjustment in Imbens and Kolesár (2016). The unit of observation is the individual. Robust standard errors, adjusted for clustering by census block, are in parentheses. Conley standard errors are in brackets. All regressions include geographic and individual controls; census fixed effects, and a linear polynomial in latitude and longitude.

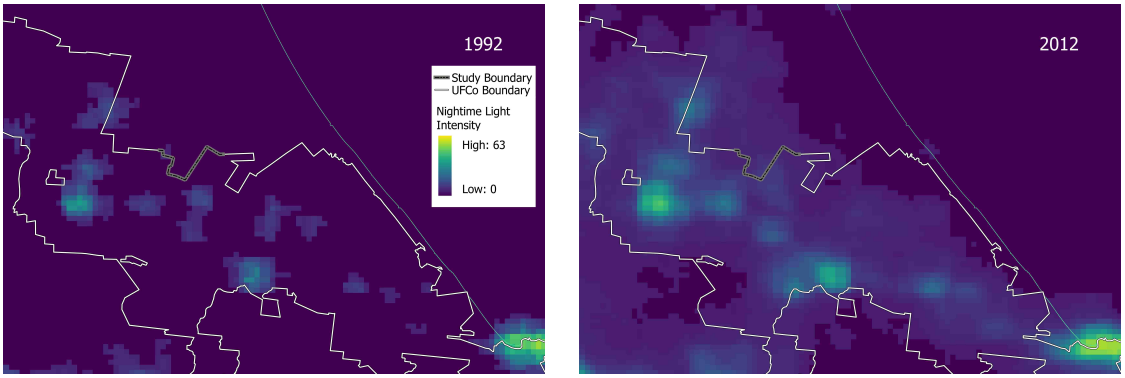
F Luminosity Data

We use satellite-recorded data on nighttime lights as a proxy for income and economic activity (e.g., Henderson et al., 2012; Hodler and Raschky, 2014; Chen and Nordhaus, 2011; Michalopoulos and Papaioannou, 2014).[51] The data spans 1992 to 2013 at a spatial resolution of 30 arc-seconds. For each grid cell, an integer between 0 (no light) and 63 represents its light intensity. Figure F.10 shows the satellite image near the study boundary in 1992 and 2012, and suggests higher luminosity in areas inside the

[51]The data on nighttime light is collected by the US Air Force Defense Meteorological Satellite Program's Operational Linescan System, and is processed by the National Geophysical Data Center.

former UFCo area. Column (1) in Table F.9 confirms this difference in luminosity: nighttime light intensity is 21% (exp(0.193)-1=0.212) higher in the former UFCo. If we assume an elasticity between nighttime light intensity and GDP of 0.3 (Henderson et al. 2012, Hodler and Raschky 2014), the 21% difference implies that output in the former UFCo areas is about 6.37% higher. Column (2) shows that luminosity per capita is 18% (exp(0.165)-1=0.18) higher in the former UFCo plantations. Column (3) shows that the annual growth rate of luminosity per capita is 2.064 percentage points higher in former UFCo areas. In Columns (4) and (5) we account for 9.2% of observations that are zero by adding 0.01 to the luminosity data (or luminosity per capita) before taking the logarithm. In general, the results are consistent with our main estimates, providing evidence that suggests significantly higher levels of income and economic activity in the former UFCo areas.

Figure F.10: Nighttime Lights and the Study Boundary



Notes: The figure shows the UFCo's concession's boundary and how satellite nighttime lights data shows a much higher luminosity inside the former UFCo, both in 1992 and 2012.

Table F.9: UFCo Effect using Luminosity Data

	ln Light	ln Light/Pop	Gr. Rate Light/Pop	ln(.01+Light)	ln (.01+Light/Pop)
	(1)	(2)	(3)	(4)	(5)
UFCo	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: The unit of observation is 1x1 km grid cells located within 5 km of UFCo boundary. Robust standard errors are in parentheses. Conley standard errors are in brackets. Regressions include year fixed effects.

G Migrant Comparison, 1927 Population Census

We use the 1927 Population Census microdata to analyze early waves of migration to the UFCo. The microdata is available for a representative sample. The cantons are the strata, and households are the primary sample unit. Within a household, the data record all members. We estimate a variant of equation (1). Considering that the extension of a canton might be relatively large compared to the UFCo's concession in that canton, we proxy the company's presence as the fraction of canton's land that was part of the UFCo. As outcome variables, we consider the probability of owning private property (real state), of having any primary education, of having any secondary education, and of being able to read and write.

Table G.10: Negatively Selected Migrants to UFCo Regions: 1927 Population Census

	Probability of				Probability of			
	Owning property	Primary education	Secondary education	Literacy	Owning property	Primary education	Secondary education	Literacy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Migrants to UFCo cantons compared with migrants to							
	non-UFCo cantons				neighboring non-UFCo cantons			
UFCo	-0.381	-0.253	-0.061	-0.174	-0.489	-0.252	0.008	-0.119
	(0.033)***	(0.044)***	(0.022)***	(0.047)***	(0.026)***	(0.048)***	(0.027)	(0.052)**
Adj-R^2	0.30	0.08	0.02	0.06	0.36	0.13	0.01	0.08
Obs.	6,431	18,851	18,851	26,048	2,939	6,087	6,087	9,762
Mean	0.369	0.946	0.074	0.682	0.251	0.936	0.057	0.706

Notes: The unit of observation is the individual. Regressions are weighted using sample weights. Robust standard errors, adjusted for clustering by PSUs and stratification at the canton level, in parentheses. UFCo corresponds to the fraction of canton's area that belonged to the UFCo landholdings. All regressions include individual controls (age, age squared, gender), and a linear polynomial in latitude and longitude. We denote: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table G.10 shows that migrants to the UFCo were negatively selected in education and property ownership, as compared with migrants to other Costa Rican regions. The left panel of Table G.10 shows the difference in outcomes for migrants to UFCo cantons compared to migrants in all the remaining Costa Rican cantons. To gauge their magnitude, consider the average UFCo landholding fraction in a canton where the company was present (0.27). The migrants in the UFCo regions were on average 10.3 percentage points (pp) less likely to own real state, 6.8 pp less likely of having any primary education, 1.6 pp less likely of having any secondary education, and 4.7 pp less likely of being able to read and write. All the estimates are significant at the 1% level. The right panel of Table G.10 shows that the results are robust after comparing outcomes of migrants to UFCo cantons with outcomes of migrants

to cantons neighboring UFCo locations (meaning they share at least one boundary).

H Control Region vs. Other Rural Regions

In this section, we study the control region outside the UFCo in 2 ways, asking: i) was there a negative spillover from the company to this region?, and related, ii) were migrants to the control ex-ante better in some dimension than migrants to the UFCo? First, we compare the control group with other non-UFCO regions on a belt around it in 1973, while the company was still operating, considering households that are beyond 20 km from the UFCo's border.[52] We consider:

$$y_{ig1973} = \gamma control_g + f(\text{geographic location}_g) + \mathbf{X}_{ig1973}\beta + \mathbf{X}_g\Gamma + \varepsilon_{ig1973}, \quad (4)$$

where y_{ig1973} is an outcome of individual or household i in census-block g in 1973; and $control_g$ is a dummy that is equal to 1 if census-block g's centroid lies within the counterfactual region (within 5 km from the boundary shown in Figure C.3). Other variables follow a the same notation as in equation (1). Table H.11 displays the results. Given concerns about having few clusters that also are unbalanced, we follow Cameron and Miller (2015) using the bias-adjusted cluster-robust standard errors, and the data determined degrees of freedom adjustment in Imbens and Kolesár (2016). The effects suggest that direct negative spillovers from the UFCo to the control group are unlikely.

Table H.11: Main Outcomes: Control Region Outside UFCo vs. Other Rural Regions

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
Control Region	-0.514	-0.612	0.124	-0.221	-0.420	-1.222
	(0.136)**	(0.188)**	(0.041)*	(0.197)	(0.010)***	(0.165)***
	[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
Observations	494	494	494	494	494	494
Clusters	7	7	7	7	7	7
Mean	0.672	0.656	0.437	0.235	0.923	2.00

Notes: UBN= Unsatisfied Basic Need. The unit of observation is the household. Robust standard errors, adjusted for clustering by census block, are in parentheses. Due to number of unbalanced clusters, we follow Cameron and Miller (2015) using the bias-adjusted cluster-robust standard errors, and the data determined degrees of freedom adjustment in **Imbens and Kolesár (2016)**. Conley standard errors in brackets. All regressions include geographic controls (slope, elevation, 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.

[52] Results using larger distances are also robust and available upon request.

Comparing Migrants' Human Capital Accumulation in Control Region vs. in Other Non-UFCo Rural Regions We compare the human capital accumulation of migrants to our control region with the migrants to other nearby rural regions. We estimate equation (4) using educational attainment as the outcome variable restricting the sample to migrants. The left panel of Table H.12 shows that the control group attracted relatively high skilled migrants, compared with migrants to other nearby regions. Considering the entire population in the control region vs all other non-UFCo rural regions (right panel of Table H.12), we find households within the control group have more years of schooling and a higher probability of completing primary and secondary education.

Table H.12: Human Capital: Control Region Outside UFCo vs. Other Non-UFCo Rural Regions

	Migrants			All population		
	Years of schooling	Primary	Secondary	Years of schooling	Primary	Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
Control Region	1.208	0.171	0.016	1.453	0.259	0.029
	(0.024)***	(0.003)***	(0.001)***	(0.206)*	(0.014)**	(0.002)**
	[0.033]***	[0.003]**	[0.000]***	[0.033]***	[0.003]**	[0.000]***
Adjusted R^2	0.081	0.013	0.012	0.083	0.033	0.012
Observations	1,091	1,091	1,091	2,067	2,067	2,067
Clusters	7	7	7	7	7	7
Mean	2.448	0.111	0.007	2.425	0.107	0.006

Notes: The unit of observation is the individual. Robust standard errors clustered by census block, are in parentheses. Due to number of unbalanced clusters, we follow Cameron and Miller (2015) using the bias-adjusted cluster-robust standard errors, and the data determined degrees of freedom adjustment in **Imbens and Kolesár (2016)**. Conley standard errors in brackets. All regressions include geographic and individual controls, census fixed effects, and a linear polynomial in latitude and longitude.

I Details on Government Expenditures

This section discusses how government spending in regions around the UFCo was not different from the spending in the rest of the country. We gathered data on government spending per municipality from annual reports from the Comptroller General of the Republic of Costa Rica (*Contraloría General de la República de Costa*

Rica) published between 1955 and 1984,[53] and estimate spending per capita. Table I.13 compares government spending per capita between UFCo municipalities and all other rural municipalities in the country, and do not find significant differences.

Table I.13: Comparison of Government Spending per Capita across Municipalities

	ln Government Spending per Capita	
	(1)	(2)
UFCo	0.007	-0.008
	(0.078)	(0.082)
Year FE	No	Yes
Adjusted R^2	-0.001	0.316

Notes: Observations: 690. Clusters: 50. The unit of observation is the municipality. Robust standard errors clustered by municipality, in parentheses.

J Model's Framework and Estimation

J.1 Theoretical Framework

There are $j \in \{1, ..., N\}$ locations, and time is discrete. Throughout, we use a prime to denote next-period values. Each individual lives for one period. First, each agent is born in the location where her parent lives. Then, she chooses whether to live and work in this location, or to move to a different location. Once the location is chosen, the individual supplies a unit of labor inelastically to produce a differentiated variety in the location she lives, and she consumes. The period ends with the agent having one offspring.[54] The total number of workers is normalized in each period and the initial population is exogenous.

Household Preferences and Consumption After endogenously choosing their location, agents consume and derive utility. In particular, workers living in region j have constant elasticity of substitution (CES) preference with elasticity σ across differentiated domestic goods (c). Additionally, they derive utility from the per capita local amenities of the region where they live. The deterministic component

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

[54] This OLG structure, which follows Allen and Donaldson (2018), will allow us to compute steady states which are independent of the initial allocation of individuals across space. This will matter for our counterfactual analysis.

of welfare—defined as welfare up to an idiosyncratic shock that we will introduce below—of a worker residing in location j is given by $\mathcal{U}(c_{jk},\ \tilde{a}_j) = \tilde{a}_j[\sum_{k=1}^{N} c_{jk}^{\frac{\sigma-1}{\sigma}}]^{\frac{\alpha\sigma}{\sigma-1}}$, where $\tilde{a}_j = (A_j/L_j)^{1-\alpha}$ captures the utility derived from per capita local amenities.[55] Each worker supplies one unit of labor inelastically and earns a nominal wage (w_j). Let P_j be the CES price index.[56] The *equilibrium* deterministic utility of a worker in location j can be expressed as $W_j = \tilde{a}_j \left(\frac{w_j}{P_j}\right)^{\alpha}$.

Migration, Shocks and Location Choice As previously stated, the utility of a worker in region j has a deterministic component given by W_j in equilibrium. Further, we allow for bilateral moving costs $\lambda_{jk} \geq 1$, where any value larger than one implies there are migration frictions. Thus, the deterministic utility of a worker who migrates from location j to location k is given by $\frac{W_k}{\lambda_{jk}}$.

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 j who is *not moving* will depend on the idiosyncratic shock ω_k, and is given by $W_j\omega_j$, while the utility of a resident of location j *moving* to location k is denoted as $W_{jk}(\vec{\omega}) = \frac{W_k\omega_k}{\lambda_{jk}}$. Thus, each period, a worker in location j chooses his location solving $\max_k \left\{W_{jk}(\vec{\omega})\right\} = \max_k \left\{\frac{W_k\omega_k}{\lambda_{jk}}\right\}$.

We further assume that the idiosyncratic utility shifter, $\vec{\omega}$, follows a Frechet extreme value distribution with shape parameter θ. Letting L_j denote the number of workers who live in location j at time t, it follows that the outflow of individuals born in region j who will choose to work in region k (L'_{jk}) can be described as $\frac{L'_{jk}}{L_j} = \frac{\left(\frac{W'_k}{\lambda'_{jk}}\right)^{\theta}}{\sum_{n=1}^{N}\left(\frac{W'_n}{\lambda'_{jn}}\right)^{\theta}}$. Finally, we can derive the gravity equation describing bilateral migration flows from location j as a function of its current population, expected utility in j and utility in other locations, as follows:

$$L'_{jk} = (\lambda'_{jk}\Omega'_j)^{-\theta}(W'_k)^{\theta}L_j, \tag{5}$$

[55] We assume there is perfect congestion in local amenities (i.e., $\tilde{a}_i = \bar{a}_j(A_j/L_j^{\rho})^{1-\alpha}$ 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 UFCo (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.

[56] As is standard, the CES price index is given by $P_j = \left(\sum_{n=1}^{N-1}(\tau_{nj}p_n)^{1-\sigma}\right)^{1/(1+\sigma)}$, where p_n denotes the price of the variety produced in region $n \neq U$ and τ_{nj} represents bilateral iceberg trade costs (as described below).

where $\Omega'_j = \left[\sum_{n=1}^{N}\left(\frac{W'_n}{\lambda'_{jn}}\right)^{\theta}\right]^{\frac{1}{\theta}}$ denotes the expected utility of an individual born in location j.

Trade Local bilateral trade flows from region j to region k incur an iceberg trade cost, $\tau_{jk} \geq 1$, where $\tau_{jk} = 1$ corresponds to frictionless trade. Thus, the bilateral trade flows of domestic goods are governed by a standard gravity equation: $X_{jk} = \tau_{jk}^{1-\sigma}\left(\frac{w_j}{A_j^{\chi}}\right)^{1-\sigma}\frac{w_k L_k}{P_k^{1-\sigma}}$.

Producers The country has N regions: one producing "bananas," where only the UFCo operates (denoted 'U'), and other $N-1$ locations ($j \in \{1, 2, ..., N-1\}$) which produce a domestic homogeneous good. We assume bananas are a pure export good, while domestic goods are consumed locally. We proceed by describing these regions and their production schemes.

The UFCo's Region (U) The UFCo is a profit maximizer and the sole employer within its location, departing from standard spatial models where firms are price-takers. Besides wage, the firm may also provide local amenities as part of the worker's compensation bundle, and solves the following problem

$$\max_{\{A_U, L_U\}} \Pi_U = \max_{\{A_U, L_U\}} P_U \left(\frac{A_U}{L_U}\right)^{\chi} L_U^{\phi} - w_U(L_U)L_U - P_A A_U$$

such that

$$L_U = L_{U,-1} - \sum_{j=1}^{N-1} L_{Uj} + \sum_{j=1}^{N-1} L_{jU} \tag{6}$$

where L_{Uj} and L_{jU} satisfy equation (5), and χ measures the strength with which the level of amenities (like hospitals or schools) increases productivity.[57]

This means that the firm will provide workers with utility as compared with their "outside option" to attract enough people to meet their optimal labor demand, 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 would

[57] Costa Rican banana production represented, on average, less than two 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.

have to provide workers with a higher utility level, either through higher wages or more local amenities. Conversely, in a hypothetic case where workers are immobile ($L' = L = L_{-1}$) would lead to a perfectly inelastic labor supply and a case of pure monopsony within this region.[58]

Firms in the Rest of the Country Each of the $N-1$ regions in the rest of the country produce domestic tradable goods.[59] Producers in location $j \in \{1, ..., N-1\}$ maximize profits in a competitive market and pay taxes to the government, solving

$$\max_{\{L_j\}} \Pi_j(L_j) = \max_{\{L_j\}} p_j \left(\frac{A_j}{L_j}\right)^{\chi} L_j^{\gamma} - w_j L_j - T_j.$$

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

Government The government collects taxes T from firms in the "Rest of the Country," and provides local amenities to this region so that $P_A A_j = \frac{L_j}{\bar{L}-L_U} \sum_{j=1}^{N-1} T_j = \frac{L_j}{\bar{L}-L_U} \sum_{j=1}^{N-1} t P_j (A_j)^{\chi} L_j^{\gamma}$, 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 $\sum_{j=1}^{N-1} T_j$, where each T_j is a fixed proportion t of the sales in region j, which is consistent with severe historical borrowing constraints. We also assume that revenue is spent on local amenities according to the labor share in each region, which is consistent with the observed public spending shares in our data: From 1955 to 1984, public spending on local amenities per capita across cantons was very similar, so much so that the dispersion index of this data is only 0.008.[60]

[58] The curvature of workers' utility function, which is concave in amenities and consumption will guarantee that the compensation bundle chosen by the company will be a combination of both amenities and wages. A previous version of the model was dynamic, in that amenities did not fully depreciating from one period to the next. This more complicated version, available upon request, delivered qualitatively similar results, but could explain why there is persistence after UFCo's exit. In particular, a depreciation rate of amenities of 3% allowed us to match the observed rate of convergence across UFCo and non-UFCo regions.

[59] Note that these goods are homogeneous in the sense that they have the same production function, however, they will be traded given the CES structure of the utility function.

[60] The dispersion index is a normalized measure of the dispersion of a probability distribution, and it is defined as the ratio of the variance to the mean. A constant random variable would have a dispersion index of zero. An under-dispersed random variable would have dispersion between zero and 1 (for example, points spread uniformly), while if the dispersion index is larger than 1, a dataset is considered over-dispersed.

Equilibrium A competitive equilibrium in this economy consists of prices $\{w_j, p_j\}_{j=1}^N$, and $\{P_A\}$; company decisions $\{A_U, L_U\}$; and labor supply $\{L_j\}_{j=1}^N$ such that: All firms and households optimize; trade is balanced; labor flows are consistent across regions $L'_j = \sum_k L'_{kj}$ and $L_j = \sum_k L'_{jk}$; and the labor, domestic good, and UFCo 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).

J.2 Estimation

We calibrate the model to the historical reference equilibrium corresponding to the observed annual levels of economic activity at the canton-level, with 59 locations in total, for years 1950-1973, in which all the data required for the estimation is available. Our strategy to recover the parameters in the model has several steps. Our first step assumes migration costs of the standard form $\ln(\lambda_{jk}) = \mu \ln(dist_{jk})$.[61] We substitute these into equation (5), and obtain

$$\ln(L_{jkt}) = -\theta\mu \ln(dist_{jk}) + \theta\alpha \ln(w_{jt}) + \theta(1-\alpha) \ln\left(\frac{A_{jt}}{L_{jt}}\right) + \rho_j + \pi_k + \varepsilon_{jkt}, \tag{7}$$

where $j \in R$, $k \in U$ and ρ_j, π_k are origin and destination fixed-effects. We can then estimate θ, μ, and α using data on distances and migration of individuals working in the agricultural sector across locations. As endogeneity is a concern, we use an IV strategy, where we focus on agricultural workers who migrate from any region to a non-UFCo location. For them, their main outside option at the time was working in coffee plantations. Thus, as in Section 5.1.4, we use the suitability to grow coffee in a location to instrument for wages. For amenities, while still focusing on migration to non-UFCo locations only, we use a "Bartik"-type instrument (Bartik, 1991). Along the lines of Nakamura and Steinsson (2014), the instrument is constructed using national changes in population interacted with the population share in each location according to the 1927 Population Census (more than two decades before the data to calibrate our model begins).[62] Table J.14 shows both stages of this estimation.

We find that $\{\mu, \alpha, \theta\} = \{0.23, 0.75, 5.96\}$. These values are reassuring. While

[61] We approximate intra-unit trade costs based on the average distance traveled to the center of a circular unit of the same area from evenly-distributed points within it (e.g., Redding and Venables (2004)).

[62] Note that, given the historical setting, both of these instruments only make sense when the destination of a migrant is *outside* the UFCo.

μ is in line with standard elasticities found in the literature (Redding and Rossi-Hansberg, 2017), α aligns with values of the income share spent on consumption goods obtained after collecting data from household income and expenditure surveys conducted in Costa Rica between 1949 and 1961, which imply a value of $\alpha = 0.8$.[63] Finally, our migration elasticity for agricultural workers of mid-20th century Costa Rica, θ, is in line with findings from Allen and Donaldson (2018), who estimate a migration elasticity of 8.45 for the United States in 1850, which decreased consistently over time (5.58 in 1950) until reaching a value of 4.5 in 2000.[64] Given the importance of this key elasticity, in the next section, we show how our results change for a wide range of values of θ.

Based on data we collected from the Annual Report of the Ministry of Economy and Finance (*Memoria Anual del Ministerio de Economía y Hacienda*), we set the share of tax revenues over non-UFCo-related GDP, T, equal to 0.1318. We assume costless trade and set $\sigma = 5$ as in Allen and Donaldson (2018), while conducting a sensitivity analysis. We recover other parameters using a simulated method of moments (SMM). The targets for the SMM mainly exploit variation between the UFCo region and the rest of the country. Table J.15 reports the results of our SMM and its targets. We proceed by explaining these targets and data sources in more detail.

We hand-collected data on the number of employees hired by the UFCo from company reports. The number of workers in coffee production comes from the 1950 and 1963 Agricultural Censuses. We digitized data on coffee and banana prices from Costa Rican Statistic Yearbooks, while data on spending per capita on amenities by the UFCo and the government corresponds with the one described in Section 5.1.3. Finally, we create a model-based version of the RD design we conducted empirically. To obtain the RD estimate, we first construct a projection of the probability of

[63] These are the "Family Income and Expenditure for San José. Survey 1949" (*"Ingresos y gastos de las familias de la ciudad de San José. Encuesta 1949"*) and the "Survey of Family Income and Expenditures 1961" (*"Encuesta de ingresos y gastos familiares 1961"*). The surveys asked a representative sample of Costa Rican households about the share of their income spent on different goods and services, including food, clothes, housing, education, and healthcare. The data record the goods and services with a high level of detail, consisting of 144 categories in 1949 and 153 in 1961. We classify each good and service as an amenity if, according to the company's reports, the UFCo provided them to its workers at no extra cost. With this, we can calculate the share of income spent on amenities and "consumption" and found that the share of income spent in non-UFCo provided goods and services had a value of 0.80.

[64] This elasticity might have been larger for agricultural workers in Costa Rica, as compared with modern-day estimates, due to the aggressive expansion of the agricultural frontier at the time.

Table J.14: Estimation of Model Elasticities

First Stage		
	ln Wages (1)	ln Amenities per Capita (2)
Coffee Intensity	0.227	
	(0.089)**	
ln Population share		1.114
		(0.104)***
Adjusted R^2	0.580	0.600
F-statistic (excluded instruments)	21.197	113.777
Second Stage (Dependent variable: L_{kj})		
	Coefficient	Standard Error
ln Distance between Locations k and j	-1.378	(0.104)***
ln Wages in Location j	4.466	(0.714)***
ln Amenities per Capita in Location j	1.490	(0.363)***
Adjusted R^2	0.632	

Notes: First Stage: the unit of observation is the individual in column (1) and the canton in column (2). Robust standard errors, adjusted for clustering by canton, are in parentheses. Second Stage: the unit of observation is the migration flow between location k (origin) and j (destiny). We consider only flows of agricultural workers from any location to agriculture-intensive locations, as our instruments are only valid for this type of flows. Robust standard errors, adjusted for clustering by each k and j pair, are in parentheses.

being poor—an index that does not have a model-equivalent—on real wages and investments in amenities per capita in each location—which are observable both in the data and in the model. To do so, we use real wages of agricultural workers from the 1973 Population Census and data we collected on government spending per municipality, while controlling for the geographic and demographic characteristics of each location.[65]

Table J.15: Jointly Calibrated Values in Steady State (SMM)

Target	Data	Model
Local effect (RD)	-0.06	-0.06
Agricultural labor share UFCo	0.09	0.09
Price per ton UFCo/RoC	0.13	0.13
Investment per cap UFCo/government	1.27	1.27

We estimate that the average fitted probability of being poor for the UFCo region (U) is $P(\widehat{poor_{UFCo}}) = 0.721$, and for the rest of the country (R) is $P(\widehat{poor_R})$=0.776.

[65]In particular, we restrict attention to households with at least one member in the agricultural sector and estimate the following specification: $\mathrm{P(poor}_j) = \beta_1 \ln(w_j) + \beta_2 \ln\left(\frac{P_A A_j}{L_j}\right) + \mathbf{X}_j\Gamma + \varepsilon_j, where \mathrm{P(poor}_j)$ is the probability of being poor in location j, $\ln(w_j)$ is the logarithm of the average wage for members in households working in the agricultural sector in location j, $\ln\left(\frac{P_A A_j}{L_n}\right)$ is the logarithm of the government spending per capita in location j. We find that β_1=-0.077, and β_2=-0.055, with standard errors of 0.033 and 0.024, respectively.

Therefore, $\gamma = P(\widehat{poor_{UFCo}}) - P(\widehat{poor_R})$=-0.056 (robust standard error adjusted for clustering by location: 0.015). We then run the SMM to minimize the difference between the empirical and model-based γ.

The SMM targeted moments from the model closely match the data. Our calibrated parameters are, first, the price of amenities (P_A) with a value of 5.91, then, we obtain a value of χ, which measures the effect of amenities in productivity, of 0.06. In general, it is extremely difficult to measure the effect that amenities like schools have on productivity, as the decision to provide them is disconnected from the decisions of firms. In our case, the UFCo was, in some sense, a "profit-maximizing public goods producer," which internalized the effect of amenities on productivity. Thus, the setting provides a rare opportunity to estimate a value of χ from the levels of investment that the company chose. The SMM results in a value of 0.18 and 0.07 for the labor share of output in the UFCo (ϕ) and the rest of the country (γ), respectively.[66]

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[66]Historically, the coffee plantations suffered from low productivity (León Sáenz, 2012).

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