Multinationals, Monopsony and Local Development:

Evidence from the United Fruit Company

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Large Foreign Firms, Monopsony and Local Development

- The effect of large-scale multinational investments in developing countries remains an important open question.

Market power & low wages, exploitation, underdevelopment.	**vs**	Job creation, investment, growth.

  - Mixed empirical evidence on the effects of FDI & identification challenges.

- Particular type of FDI, land concessions, has been pervasive in the last 20 years.
  - Over 64 million acres of land have been assigned as land concessions to foreigners in developing countries (Cotula et al, 2009)

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- This paper studies the effects of large foreign investment projects on development.
- Evidence from the *United Fruit Company* (UFC).
  - One of the largest multinationals of the 20th Century.
  - In Costa Rica, the firm had a large land concession, where it was the only employer from 1889 to 1984.

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Outline of the Paper

- Identify firm's local effect using a geographic regression discontinuity design
  - Collect census data geo-referenced at the census-block level between 1973-2011
  - Identify a segment of the concession's border that was re-drawn
  - Estimate the causal effect of the UFC along the border (positive, persistent)
- Understand mechanism using quantitative and qualitative evidence
  - Large investments in amenities to attract workers to the region (hospitals, schools)
  - Not due to selective migration or negative spillovers from the UFC to its neighbors
- Propose a model that incorporates this mechanism
  - Disciplined by reduced form results and historical data
  - Estimate aggregate effect of the company
  - Run counterfactual exercises that inform policy recommendations

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Related Literature

FDI's effects on development Caves 1974,Blomstrom Wolf 1994, Kokko 1994, Alfaro et al 2010,Lipsey 2002

- Natural experiment to establish causality,
- Analysis decades after investment.

Labor market power & labor compensation Gutierrez Phillipon 2017,Autor et al 2017,Berger et al 2018

- Study impact of the spatial labor market structure on investment choices & composition of compensation bundle,
- Long-run effects.

Political economy & public goods provision Tiebout 1956; Chattopadhyay & Duflo 2004.

- Experiment where the public goods provider is a profit maximizer.

Effects of extractive firms & institutions Nunn 2008; Dell 2010; Lowes Montero 2016; Dell Olken 2017.

- Focus on coercive forms of labor vs importance of labor mobility.

Historical Background

The UFC in Costa Rica

- Received a land concession (9% national land) in exchange for building a railroad and started production in 1899.
  - Land was unpopulated when concession started.
  - Government did not invest in this land during the concession.
  - Workers required to live within the concession.
- Employed up to 20% of agricultural labor force (11% of total).
- Produced 42% of exports on average.
- Operated in 12 countries in Latin America.
- HQ in Boston; ranked within top 40 companies in the NYSE.
- Went bankrupt in 1984 after financial difficulties (expropriations, hurricanes), leaving the area of our study.

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Data: *Collected and digitized*

- **Location**: *Collected and digitized* maps of UFC's plantations from original copies in the Costa Rican National Archive.

- **Historical Data:** *Collected and digitized*:
  - 1914-1984 on public expenditures per municipality by type,
  - 1900-1984 UFC's Annual Reports and expenditures by type.

- **Census data:** 1973, 1984, 2000, and 2011 w/census-block geo-code.
  - Define ECLAC's 4 dimensions of Unsatisfied Basic Needs (UBN):
    - **Housing**: Quality of dwelling's materials and overcrowding.
    - **Health**: Type of sewage, access to clinic.
    - **Education**: School attendance & achievement (7 -17 yrs old).
    - **Consumption**: Number of income recipients, schooling, and dependents.
  - A household is considered poor if it has at least one UBN.
  - The total number of UBN defines the severity of poverty.

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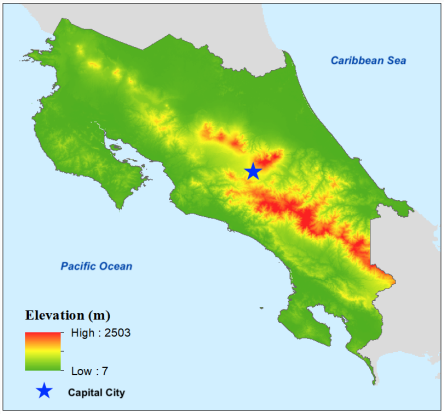
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Local Effects on Development

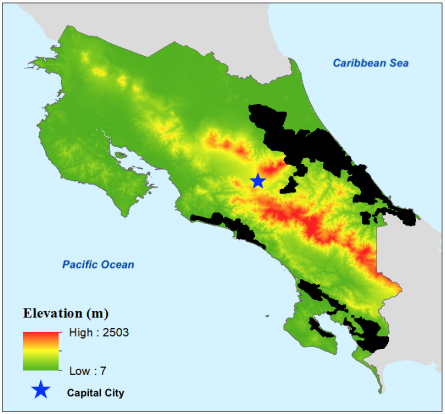
Identification Strategy

- Strategy: Compare outcomes of census-blocks just across UFC's boundary.
- Issue: Land assigned to the UFC (in black) is not random, in general.



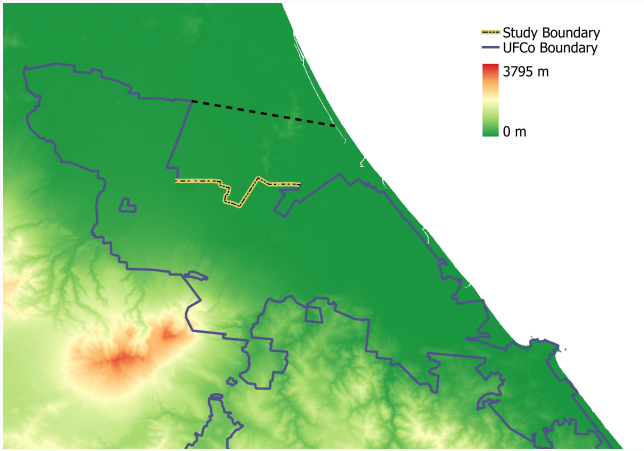
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Land Assignment: Area of our Study

Solution: Identify a quasi-random land assignment.



Land Assignment: History

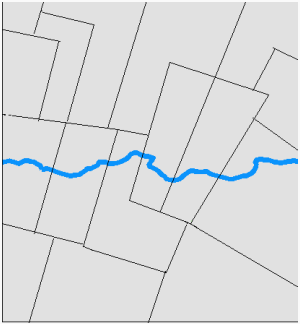
- Initially, concession's contract was not precise about its northern boundary (Soley, 1941).
- In 1904, after a legal dispute, concessions were subjected to revision.

  $\rightarrow$ Border was redrawn to "roughly" south from Reventazon River.

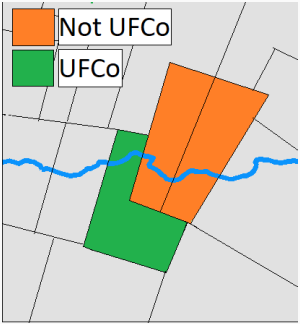
- By law, land "outside" could not be resold to the UFC (Viales, 2001).

Border Design

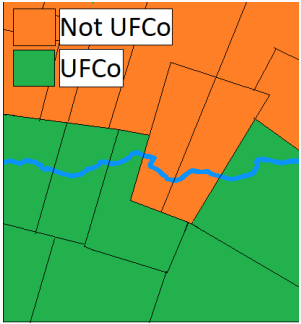
Example: UFC Boundary Follows the River Closely but not Exactly



(a) River & pre-existing plots



(b) Expropriation costly & plots did not follow river



(c) Final boundary & river do not coincide

Balance of Geographic Characteristics

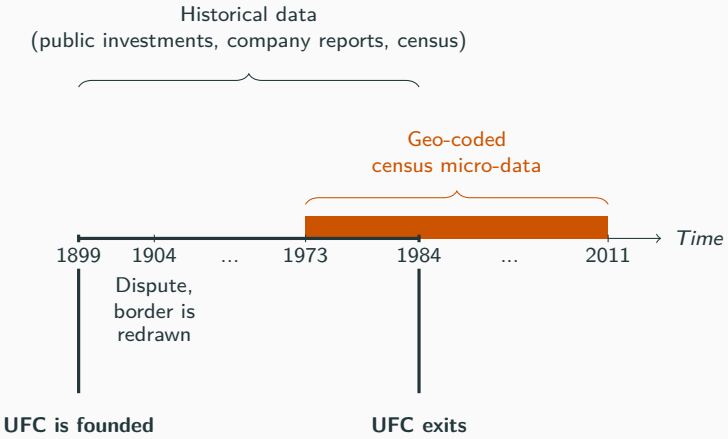
- Consistent w/nature of the assignment, geographic characteristics vary smoothly at the boundary (<10km across the border).

Balance on Geographic Characteristics

	Inside	Outside	s.e
Elevation	28.524	28.115	(1.330)
			[3.530]
Slope	0.211	0.241	(0.072)
			[0.140]
Temperature	26.087	26.097	(0.006)
			[0.014]

Robust SE in parentheses; Conley SE in brackets.

Timeline: UFC and Data



Geographic RD: Average Effect Pooling Across Years

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

- $y_{igt} \rightarrow$ outcome of household i in census block g in year t.
- $UFC_g \rightarrow$ dummy=1 if g's centroid was inside the UFC.
  $\rightarrow \gamma$ **captures the difference between outcomes in former UFC areas and the control region.**
- $f(\text{location}_g) \rightarrow$ RD polynomial; controls for g's geo-location.

Results: Better Outcomes Inside Former UFC

Average Effect Across Years

	Probability of Unsatisfied Basic Need in				Probability	Total #
	Housing	Health	Education	Consumption	of being poor	of UBN
UFC	**-0.095**	**-0.026**	**-0.057**	**-0.059**	**-0.124**	**-0.228**
	(0.026)***	(0.012)**	(0.022)**	(0.025)**	(0.031)***	(0.057)***
	[0.029]***	[0.011]**	[0.019]***	[0.025]**	[0.026]***	[0.051]***
Adj.R^2	0.102	0.173	0.241	0.015	0.115	0.200
Mean	0.176	0.060	0.235	0.200	0.481	0.670
% Variation w.r.t. Mean	**-54%**	**-15%**	**-24%**	**-30%**	**-23%**	**-34%**

UBN = Unsatisfied Basic Need. N = 8,786 and 200 Clusters. Robust SE, adjusted for clustering by census block in parentheses. Conley SE in brackets.

River

Placebo Test

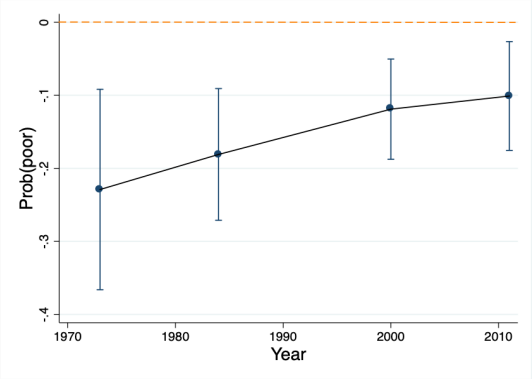
Geographic RD: Time-Varying Effect

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

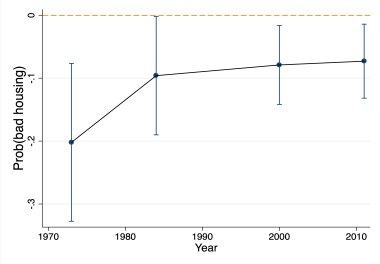
- $UFC_g = 1$ if census-block g was within the UFC.
- γ_{1973} captures the difference between regions while UFC was producing.
- $\gamma_{1984}, \gamma_{2000}, \gamma_{2011}$ captures the difference between regions post-UFC.

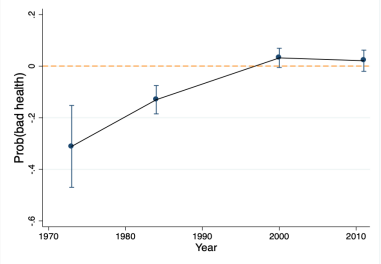
Persistent Difference and Slow Convergence

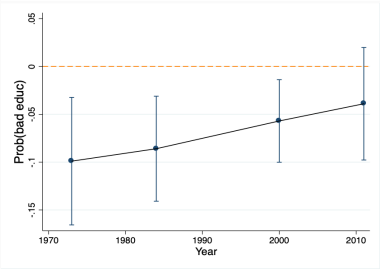
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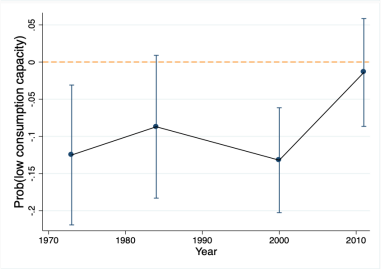


Persistent Difference and Slow Convergence









Robustness Checks

- Across a variety of specifications, coefficients are always statistically negative – magnitudes range between 11-58% variation with respect to the sample mean.
  - Alternative specifications of the RD polynomial. Details
  - Different sets of controls: No Demographic Controls, No Geographic Controls, No Demographic or Geographic Controls. Details
  - Alternative distances from boundary: 5 km and 1 km from the boundary. Details
  - Alternative placebo test: 1 km from the boundary. Details
  - Regression using the entire boundary Details
  - Estimations with only non-migrants: All household members are non-migrants. head of household is non-migrant. Details
  - Alternative outcome variables: Trejos Index, nighttime lights. Details

Role of Labor Market Competition

Mechanism: Role of Competition in the Labor Market

1. Qualitative Evidence from Archival Research

- Concern with attracting and maintaining a sizable workforce. Statement
- Investment in local amenities as a solution. Statement
- Strategy was successful. Statement

Outside option & high turnover → Need to attract and maintain workers
→ Investments in "welfare"→ Better living standards.

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Mechanism: Role of Competition in the Labor Market

2. Empirical Evidence from Archival Research

- Positive relation: UFC workers' outside options (real wages) & current outcomes. IV
- Investments within UFC were higher than govt expenditures in control region:
  - UFC's spending per patient was 61% higher, on average. Details
  - UFC's spending per student was 33% higher, on average. Details
  - Housing provision for workers' families only. Details
- Access to amenities restricted to UFC workers → might explain sharp discontinuity right at the boundary.

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Alternative Hypothesis

Ruling-Out Alternative Hypothesis

Alternative Hypothesis:

1. Selective migration to the UFC during UFC's tenure:
   - **Migrants** to UFC were negatively selected compared w/control
     - 1927-1973: lower average yrs of schooling, literacy, real estate
     - No evidence of better agricultural abilities
     - Stronger results in subsample of UFC-born individuals
   - **Migrants** to control vs other regions have statistically equal observables 1927-1973
2. Negative spillovers from the UFC to the control region.
   - Statistically equal govt spending in control vs other rural regions
   - Re-running RD as *control vs other rural regions* $\rightarrow$ statistically equal Details

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Model

The Model: Preview

- Empirical estimates measure local effects.

- Build a GE spatial model to asses the aggregate effects of the UFC
  - Key channel based on empirical evidence: monopsonistic firm invests to attract workers into the region.
  - Key trade-off: market power versus investments
  - Run counterfactuals → how firm's welfare effect depends on labor mobility & market power.

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  - Run counterfactuals $\rightarrow$ how firm's welfare effect depends on labor mobility & market power.

The Model: Preview

- **Structure**
  - Households:
    - Mobile workers choose where to live to maximize utility s.t. mobility frictions.
  - Company's region:
    - Local monopsonist chooses wages & amenities to maximize profits, internalizing effect on labor supply.
    - Local amenities increase local productivity.
    - Company has access to a technology that locals do not have.
  - Rest of the country:
    - Many regions where producers behave competitively.
    - Government collects taxes and invests in local amenities s.t. budget constraint.

Framework: Households

- $i \in \{1, ..., N\}$ locations
- Each agent lives for 1 period:
  - Born in location of parent $\rightarrow$ chooses where to live and work $\rightarrow$ has 1 offspring
- Workers consume w/CES preferences across bundles of domestic and foreign goods , and enjoy per capita local amenities ($\tilde{a}_i = \bar{a}_i (A_i/L_i)^{\alpha_A}$).
- Letting P_i be the CES price index, the *equilibrium* deterministic utility is

$$\mathcal{U}_i = \tilde{a}_i \left(\frac{w_i}{P_i} \right)^{\alpha}. \tag{3}$$

- W/bilateral moving costs λ_{ij} and idiosyncratic taste differences $\sim$Frechet w/shape θ:

$$L_{ij} = (\lambda_{ij} \Omega_i)^{-\theta} (\mathcal{U}_j)^{\theta} L_{i,-1}, \tag{4}$$

where $\Omega_i = \left[\sum_{n=1}^{N} \left(\frac{\mathcal{U}_n}{\lambda_{in}} \right)^{\theta} \right]^{\frac{1}{\theta}}$.

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The UFC Region

Firm type UFC: Only firm in its location. Solves:

$$V(A_U, \vec{L}_{-1}) = \max_{\{A'_U, L_U\}} \{P_U A_U^{\chi} L_U^{\phi} - w_U(L_U)L_U - P_A[A'_U - (1-\delta)A_U]\} + \beta V(A'_U, \vec{L})$$

subject to

$$L_U = L_{U,-1} - \sum_{i=1}^{N-1} L_{Ui} + \sum_{i=1}^{N-1} L_{iU} \tag{5}$$

where labor flows satisfy the gravity equation $L_{ij} = \left(\frac{\mathcal{U}_j}{\lambda_{ij}\Omega_i}\right)^{\theta} L_{i,-1}$, and χ measures the strength of the amenity-induced productivity increase.

Timing details

Rest of the Country

Domestic Producers in the Rest of the Country:

- behave competitively,
- their productivity is increasing in local amenities (A_i^X), and
- pay lump-sum taxes (T_i) to the government.

Government:

- collects lump-sum taxes $T_i = \tau P_i Q_i$, and
- provides amenities A_i according to each location's share of labor supply $\frac{L_i}{L}$.

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Quantitative Analysis

Calibration

- 71 locations
- Period: 1956-1973
- Use SMM:
  - Exploit variation in labor shares, production, prices and levels of investment in UFC and non-UFC regions.
  - Replicate RD in the model to match observed differences in probability of being poor between UFC and non-UFC regions.

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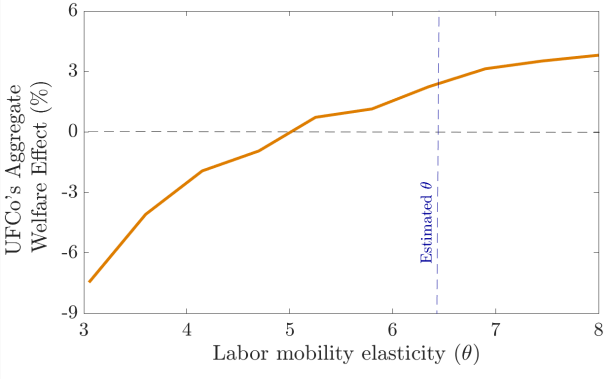
Results

Estimated Parameters					
θ	Labor mobility elasticity	6.46			
σ	Elasticity of substitution	4.63			
α_A	Per-capita amenities utility weight	0.09			
Preset Parameters					
Parameter	Definition	Value	Target	Data	Model
ϕ	UFC share of L in factor payments	0.62	Company reports		
τ	Share of taxes over GDP	0.13	National accounts		
Jointly Calibrated Values at SS (SMM)					
γ	RoC share of L in factor payments	0.40	Mean $L_U / \sum_i L_i$	0.14	0.18
α	Consumption's share in $\mathcal{U}$	0.87	% spent amenities UFC	.031	.038
P_W	P of imports	0.85	Mean terms of trade	1.32	1.44
P_U	P of banana exports	1.22	Share UFC/total X	1.40	1.55
P_A	P of local amenity	0.98	Share inv Gov/UFC	0.30	0.24
χ	Amenity productivity share	.061	Local RD	0.29	0.26

Notes: GDP does not include UFC's production. Data 1964-1984.

Local RD - Details | Non-Targeted Moments

Labor Mobility and UFC's Welfare Effect



- As ↓ labor mobility, UFC's effect on welfare becomes negative.
  - ↓ welfare by 6% if workers were half as mobile.

Data Additional exercises

Conclusions

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- Large-scale multinational investments can lead to positive and persistent effects on long-run growth.
- Key role of workers' outside options and govt's constraints in determining the effect of these projects on development.
- These results have important policy implications for developing countries today.

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Thank you!

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Results

- Households on the "wrong side" of the river.

Table 1: Contemporary Household Outcomes (N=1,937 and 44 Clusters)

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consump.	of being poor	of UBN
UFC	**-0.100**	**-0.014**	**-0.085**	**-0.084**	**-0.149**	**-0.284**
	(0.034)***	(0.030)	(0.030)***	(0.024)***	(0.046)***	(0.074)***
	[0.025]***	[0.011]	[0.018]***	[0.019]***	[0.024]***	[0.027]***
Adj. R^2	0.144	0.224	0.274	0.031	0.157	0.269
Mean	0.176	0.060	0.235	0.200	0.481	0.670
p-value (difference)	0.93	0.41	0.38	0.88	0.97	0.89

Notes: UBN= Unsatisfied Basic Need. N=8,786 and 200 Clusters. Robust SE, adjusted for clustering by census block in parentheses. Conley SE in brackets.

Back

Results

- To account for selective migration:

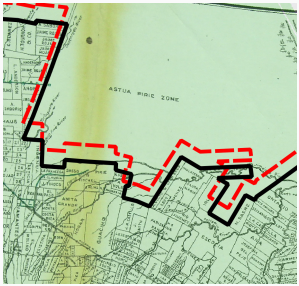
Table 2: Contemporary Household Outcomes

	Probability of UBN in				Probability	Total number
	Housing	Health	Education	Consumption	of being poor	of UBN
UFC	**-0.104**	**-0.004**	**-0.062**	**-0.055**	**-0.135**	**-0.225**
	(0.027)***	(0.015)	(0.025)**	(0.025)**	(0.030)***	(0.052)***
	[0.031]***	[0.015]	[0.023]***	[0.028]**	[0.027]***	[0.049]***
Adj. R^2	0.077	0.145	0.226	0.012	0.102	0.165
Mean	0.158	0.050	0.220	0.205	0.466	0.632

UBN= Unsatisfied Basic Need. N=8,786 and 200 Clusters. Robust SE, adjusted for clustering by census block in parentheses. Conley SE in brackets. We include geographic controls, demographic controls for the number of workers, children and infants, census FE, and a linear polynomial in latitude and longitude. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Back

Placebo Tests: A Fake Boundary



- Shift the entire boundary 2km.
- Re-run the analysis within 2km of the "fake" boundary.
  - All units are on the same side of the boundary.
  - There should be no significant differences.

Placebo Test: No Significant UFC Effect

	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 +2km						
UFC	0.022	-0.009	0.027	-0.010	0.008	0.031
	(0.034)	(0.019)	(0.018)	(0.030)	(0.040)	(0.066)
	[0.039]	[0.017]	[0.021]	[0.020]	[0.031]	[0.067]
Adj. R^2	0.098	0.173	0.240	0.014	0.111	0.195
Panel B: Placebo at -2km						
UFC	-0.030	0.008	-0.006	0.005	-0.008	-0.023
	(0.025)	(0.019)	(0.019)	(0.024)	(0.030)	(0.056)
	[0.031]	[0.019]	[0.019]	[0.027]	[0.029]	[0.054]
Adj. R^2	0.098	0.173	0.239	0.014	0.111	0.195

Notes: Observations: N =2,861; Clusters=100 for both panels. UBN= Unsatisfied Basic Need. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Back

High Turnover 1900-1924

Extracts from Annual Reports to Shareholders (1922-1924):

- Average worker turnover was 3 months.
- "...there is constant overturn of labor and we are periodically importing new laborers...these migratory habits do not permit them to remain in the plantation from one year to the next, and as soon as they become physically efficient in our methods and acquire money they return to their families and must be replaced".
- Why was turnover so high?

Back

A need to increase investments in "welfare"

Extracts from Annual Report to Shareholders (1925):

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

Back

Reductions in Turnover

Extracts from Annual Report to Shareholders (1927-1940):

- Strong investments started in 1927-1930, stopped during the depression, and continued in the late 1930s-early 1940s. ("we have *poured* resources into following the recommendations [to decrease turnover]"; 1928).

- Later reports (1937, 1940) state "family housing served as an incentive for long service", "schools formed the cornerstone of childrearing", and lower turnover helped in fighting the spread of diseases.

Back

Santa Marta, Colombia: Worse Outside Options & Outcomes

Under UFC's control: Strikes against working conditions opposed by the Colombian army, even resulting in massacres. Telegrams:

"I have the honor to report that the legal advisor of the UFC here in Bogota stated yesterday that the number of ***strikers killed by the Colombian military authorities*** *during the disturbance reached between 500 and 600"(1928).*

"We also report that the total number of ***strikers killed by the Colombian military*** *exceeded 1000" (1929).*

Today: 5th poorest city in Colombia. 30% less cumulative growth since 1985 than average rural city in Colombia & 42.8% of population w/o primary school – 10% less than average rural city.

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Other Details on Identification

Commuting

- Another concern for the identifying assumption could be that people who lived outside the UFC plantations commuted and worked for the company.
- We find evidence that people in the surrounding areas did not enjoy the services provided by the company. For example, in terms of payroll.

Back

Other Details on Identification

- **Rates of migration during the treatment.**
  - We interpret this migration, which is common whenever a large company/ multinational increases demand drastically, as part of the UFC effect.
  - In our case, migrants are negatively selected in terms of human capital, as growing banana requires low-skilled labor. This is documented with historical data.
  - This suggests that our positive UFC effect might be a **lower bound** of the impact a multinational may have on development as compared, for instance, with a company inducing migration from high-skilled labor.

Other Details on Identification

Rates of migration at the time of each census.

- Differences between migration rates in UFC and non-UFC regions are not statistically significant.
- Results are robust to considering only non-migrants.

Back

Are We Just Capturing Persistence in Innate Agricultural Skills?

		Probability of UBN in				Probability	Total number
		Housing	Health	Education	Consumption	of being poor	of UBN
		(1)	(2)	(3)	(4)	(5)	(6)
Agricultural Sector	UFC	**-0.097**	**-0.022**	**-0.052**	**-0.055**	**-0.123**	**-0.225**
		(0.028)***	(0.018)	(0.024)**	(0.027)**	(0.033)***	(0.059)***
		[0.027]***	[0.004]*	[0.023]**	[0.025]**	[0.024]***	[0.048]***
N=6,190; clusters=200	Mean	0.185	0.070	0.267	0.187	0.495	0.709
Non-Agricultural Sector	UFC	**-0.094**	**-0.002**	**-0.076**	**-0.065**	**-0.122**	**-0.233**
		(0.037)**	(0.024)	(0.031)**	(0.049)	(0.052)**	(0.091)**
		[0.044]**	[0.016]*	[0.023]***	[0.018]***	[0.034]***	[0.072]***
N=2,596; clusters=193	Mean	0.153	0.037	0.159	0.229	0.449	0.578
p-value for difference		0.94	0.32	0.48	0.85	0.98	0.93

Notes: The p values in the last row are for the test of the hypothesis that the UFC coefficient is the same between the two groups. The p values are clustered at the census block level.

→No Statistical difference between the results in both subsamples.

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Government Spending in Nearby Areas

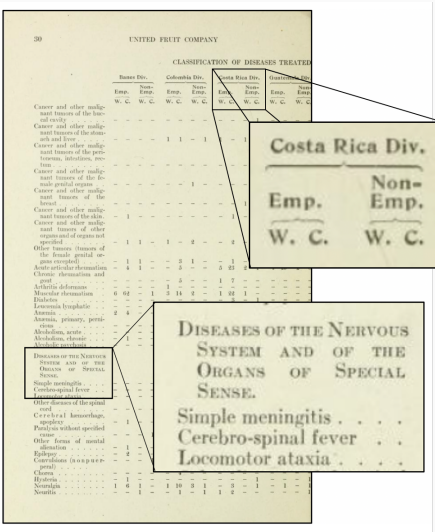
Government spending in the "outside"/counterfactual region was:

- Statistically larger than in the average rural region in Costa Rica 1900-1970 (23%).
- Statistically equal to spending in the average Costa Rican rural region from 1970-2000.

$\rightarrow$ Results are not driven by relatively low public spending in the counterfactual region.

Back

Level of Detail in Annual Reports to Shareholders

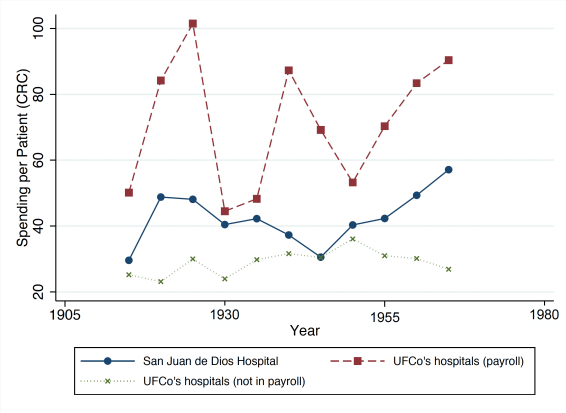


Highly detailed reports: illness, employee, worker or family(kids, wife).

Mechanisms: Health

To improve Health and sustain its workforce → network of hospitals and Medical Department. Limited to payroll; higher than gov. spending.

Spending per Patient (CRC)



Back

Mechanisms: Only Workers Could Use Housing Infrastructure

- **Housing**: the UFC provided to its workers free housing. Dwellings included electricity, a water tap, and its private bath and toilet.

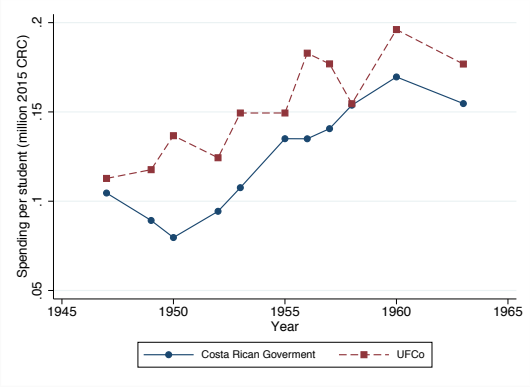


- Work for the UFC $\iff$ live in UFC's land.

Back

Mechanisms: UFC vs Government Investments in Education

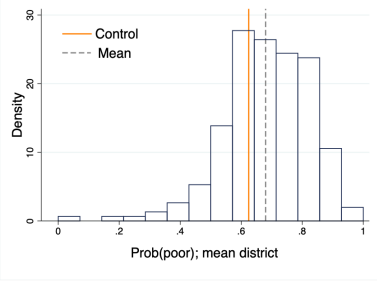
Spending per Student (CRC)

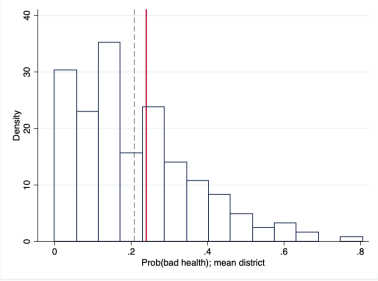


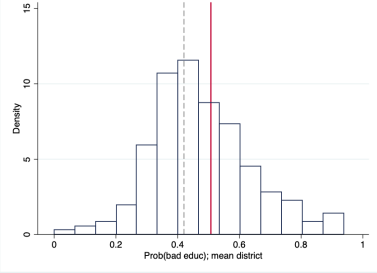
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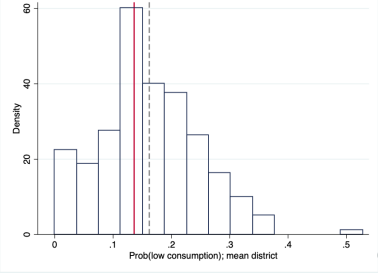
Spending per student by the UFC is persistently higher than the government's.

Counterfactual Region is not on the Left Tail for any Outcome









Back

Tight Financial Constraints in Costa Rica during the 1900s

External Debt late 1800s-mid 1900s (Marichal, 1988)

- **1870:** $15 millions of external debt with 18% interest rate (sovereign bonds sold in England and France). External debt service represented between 50 and 20% of value of exports.
- **1874:** default on payments. Debt is restructured with longer maturity and higher interest rate.
- **1901:** default on payments. Debt is restructured with longer maturity and higher interest rate.
- **1933:** $21 millions of external debt (new debt emitted to cover delayed interest payments).
- **1935-1946:** default on payments (moratorium).

Back

Measuring the Degree of Monopsony

We measure the degree of monopsony of the UFC using

- the variation in the company's employment (1912-1984), and
- the variation in world banana prices (as shocks to the UFC's MPL in Costa Rica).

$$ln(employment) = \alpha + \beta ln(P^{world}_{banana}) + \varepsilon_{jit}$$

Dependent variable: Log employment

Coefficient	Value
β	0.397^{***}
	(0.089)

$\beta < 1 \rightarrow$ Monopsony in the local labor market.

Back

No Population-Related Pre-Trends

- Area was lightly inhabited before the UFC's arrival.

Total Population on the Caribbean Coast

Year	1883	1892	1927
Population	545	1858	32278
% Total Population	0.09	0.29	6.08

Source: Population censuses.

Back

RD Using the Entire Boundary

Average UFC Effect: Entire Boundary

	P(Unsatisfied Basic Need) in				Prob. of	Total #
	Housing	Health	Education	Cons.	being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.080	-0.026	-0.037	-0.047	-0.095	-0.190
	(0.017)***	(0.011)**	(0.016)**	(0.014)***	(0.023)***	(0.044)***
	[0.029]***	[0.015]	[0.019]***	[0.025]**	[0.026]***	[0.051]***
% Variation wrt Mean	**41.5**	**35.6**	**17.7**	**34.9**	**29.3**	**41.4**
Adjusted R^2	0.097	0.109	0.248	0.017	0.116	0.193
Mean	0.193	0.073	0.209	0.135	0.324	0.459

Notes: UBN = Unsatisfied Basic Need. **N = 672,102**.

Ruling-Out Other Mechanisms: Not a Selection Story

At the time of the Census...

- Differences between migration rates in UFC and non-UFC regions are not statistically significant.
- Results are robust to considering only non-migrants.

During UFC's tenure...

- Were the "best workers" selected into the UFC?
  - Migrants to the UFC have lower average years of schooling than to the counterfactual region (3 months).
  - Same results in subsamples in/out of agricultural sector. Details

Back

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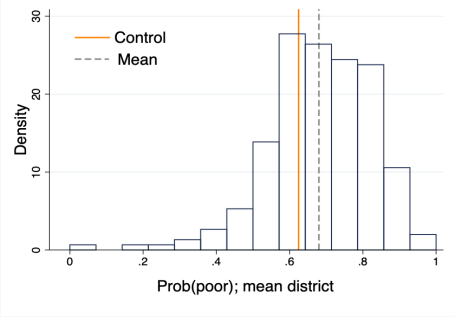
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Ruling-Out Other Mechanisms: Weak Control Group?

Was the region used as a control particularly bad?

- Migrants w/stat. equal yrs of schooling to other rural regions:
- Comparison of outcome variables in this region w/other districts →not a weak control group.



Other Outcomes

Back

Model Fit: Non-Targeted Moments

Non-Targeted Moments

Moment	Data	Model
UFC inv/sales	0.045	0.061
GDP/UFC sales	0.11	0.23
Corr(inv, outside option)	.021	.043

Notes: GDP does not include UFC's sales (both model and data). Outside option is proxied by real wages in the neighboring location (both model and data).

Back

Replicating the RD in the Model

- We calibrate the model to district-level data. To replicate our RD, we:
  1. Estimate a projection of the probability of being poor on wages and investments

$$P(poor_{in}) = \beta_1 w_{in} + \beta_2 \frac{P_A A_n}{L_n} + \Gamma_{in} + \Gamma_n + \epsilon_{in},$$

     while controlling for geographic and demographic characteristics of each location.

  2. For districts on both sides of the border segment where we ran our RD, calculate $\gamma = \widehat{P(poor_{UFC})} - \widehat{P(poor_{Non\ UFC})}$, **in the data and in the model**.

  3. Minimizes the difference between the empirical and model-based γ.

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RDD Using the Entire (Unbalanced) Border

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
UFC	-0.080	-0.026	-0.037	-0.047	-0.095	-0.190
	(0.017)***	(0.011)**	(0.016)**	(0.014)***	(0.023)***	(0.044)***
	[0.029]***	[0.015]	[0.019]***	[0.025]**	[0.026]***	[0.051]***
% Variation	**41.5**	**35.6**	**17.7**	**34.9**	**29.3**	**41.4**
Adjusted R^2	0.097	0.109	0.248	0.017	0.116	0.193
N	672,102	672,102	672,102	672,102	672,102	672,102
Clusters	398	398	398	398	398	398
Mean	0.193	0.073	0.209	0.135	0.324	0.459

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Outside Options during UFC Times vs Current Outcomes

- Test relation between outcomes **today** & workers' outside options in UFC times:

$$y^i_{j,t} = \beta \sum_k \frac{wage_{k,1973}}{price_{k,1973}} \frac{(dist_{jk})^{-1}}{\sum_n (dist_{jn})^{-1}} + \varepsilon^i_{j,t},$$

where real wages outside UFC (k) weighted by inv of distance are a proxy of the "outside option" of UFC household i in UFC district j. $t \in 2000, 2011$.

- Potential endogeneity concern $\rightarrow$ IV strategy:
  - Instrument for real wages: Suitability to grow coffee in region i based on its geographic characteristics.
  - Idea: Regions more suitable to grow coffee –which grows in a different climate and altitude than banana and was the main outside option– offered higher wages for agricultural workers.

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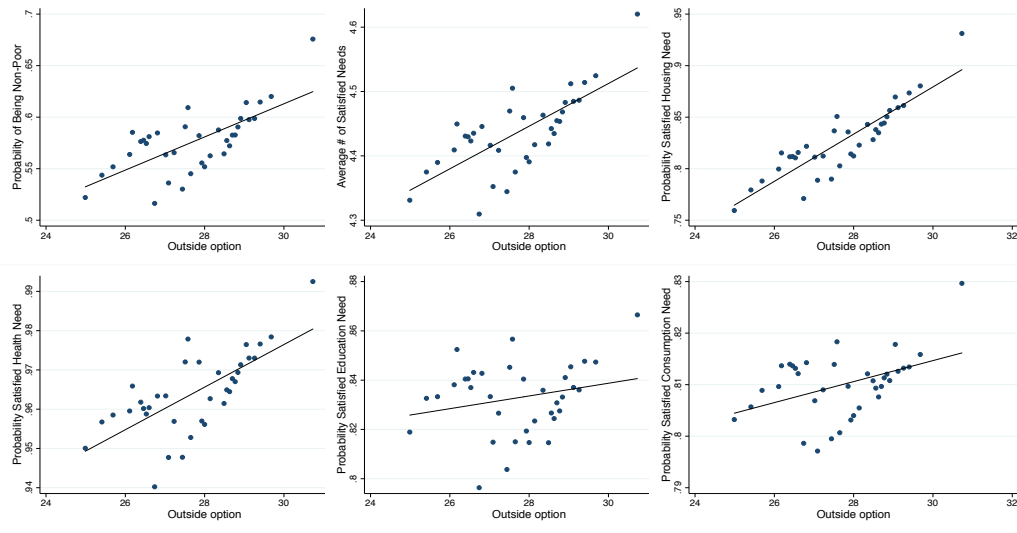
Outside Options during UFC Times vs Current Outcomes (cont'd)

Second Stage: Outside Option in 1973 and Outcomes within the UFC in 2000 and 2011

	Probability of UBN in				Probability	Total number
	Housing	Sanitation	Education	Consumption	of being poor	of UBN
	(1)	(2)	(3)	(4)	(5)	(6)
Outside option	-0.028	-0.009	-0.011	-0.005	-0.028	-0.053
in 1973	(0.006)***	(0.003)***	(0.006)**	(0.006)	(0.012)**	(0.018)***
Mean	0.152	0.034	0.153	0.178	0.391	0.518
% Variation w.r.t. Mean	**-18.5**	**-26.4**	**-7.2**	**-2.9**	**-7.2**	**-10.3**

Notes: UBN = Unsatisfied Basic Need. N = 341,665. The unit of observation is the household. Robust SE, clustered by district-year, in parentheses (114 clusters). All regressions include demographic controls (adults, children, infants per household), year FE, and a linear polynomial in latitude and longitude.

Living Standards Today vs Outside Options in UFC Times



Back to mechanism Back to counterfactuals

Estimated Elasticities

Following Allen and Donaldson (2018),

- **Step 1:** Assuming $\ln(\lambda_{ij}) = \mu \ln(dist_{ij})$ and substituting this into the gravity equation:

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

  where ρ_{it}, π_{jt} are fixed-effects, $i \in R$, and $j \in U \rightarrow$ estimate $\{\theta\mu\}$ jointly.

- **Step 2:** (Theorem) given observed data on $\{Y_{it}, L_{it}, L_{it-1}\}$ and identified values of $\{\lambda_{ij}^{-\theta}\} = \{dist_{ij}^{-\theta\mu}\}$,

$$\exists \text{ unique values of } \left\{\mathcal{U}_{it}^{\theta}, P_{it}^{1-\sigma}\right\}.$$

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$$ln(\mathcal{U}_{it}^{\theta}) = \theta \ln w_{it} + (1-\sigma)^{-1} \ln(P_{it}^{1-\sigma}) + \theta \bar{a}_{it} \tag{6}$$

Endogeneity $\rightarrow$ IVs from model-simulation for $X = \left\{w_{it}, P_{it}^{1-\sigma}\right\}$

1. Guess elasticities & get proxies for $\bar{a}_{it}$ (geographic characteristics);
2. Use SMM to get estimates of other parameters in the model.
3. Start model simulation at $L_{i0} = 1964$ pop. shares $\rightarrow$ generate X.
4. Estimate (6) using IV, controlling for geo-characteristics and L_{i0}.

   $\rightarrow$ exclusion restriction: unobservables not correlated w/1964 pop shares or geo-characteristics of other locations, conditional on own attributes.
5. With estimated elasticities, re-do (2-4) and iterate until convergence.

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Counterfactual: Perfectly Competitive Labor Markets

Effect of the UFC:

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

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

→ Very different effects on stock of amenities and wages.

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Estimated Elasticities

- Ideally: Use utility equation to infer, via market clearing conditions, the elasticity of labor mobility θ, of substitution σ, and α_A.

$$ln(\mathcal{U}_{it}^{\theta}) = \theta \ln w_{it}^{\alpha} + (1-\sigma)^{-1} \ln(P_{it}^{\alpha(1-\sigma)}) + \theta\alpha_A ln\left(\frac{A_{it}}{L_{it}}\right) + \theta\bar{a}_i + \varepsilon_{it}. \tag{7}$$

- Problem? Endogeneity $\rightarrow$ Follow Allen and Donaldson (2018), use model-based IV. IV

- Use SMM to get estimates of other parameters in the model.

The UFC's Region: Timing

Firm UFC (U)

Takes $\{A_U,\ \vec{L}_{-1}\}$ as given
& chooses $\{A'_U,\ L_U,\ w(L_U)\}$ to max profits.



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Internal Trade

- Local bilateral trade flows from region i to region j incur an iceberg trade cost, $\tau_{ij} \geq 1$, where $\tau_{ij} = 1$ corresponds to frictionless trade.

- Thus, bilateral trade flows are governed by a standard gravity equation:

$$X_{ij} = \tau_{ij}^{1-\sigma} \left(\frac{w_i}{A_i^{\chi}} \right)^{1-\sigma} \frac{w_j L_j}{P_j^{1-\sigma}}.$$

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Model-Based IV

- Initialize $\{\theta, \sigma, \alpha_A\}$ & get proxies for $\bar{a}_i$ (geographic characteristics).
- Start model simulation at $L_{i0} =$ 1964 pop. shares and run (7), controlling for L_{i0} and geographic characteristics $\rightarrow$ new $\{\theta, \sigma, \alpha_A\}$.

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- With the new elasticities, iterate until convergence.

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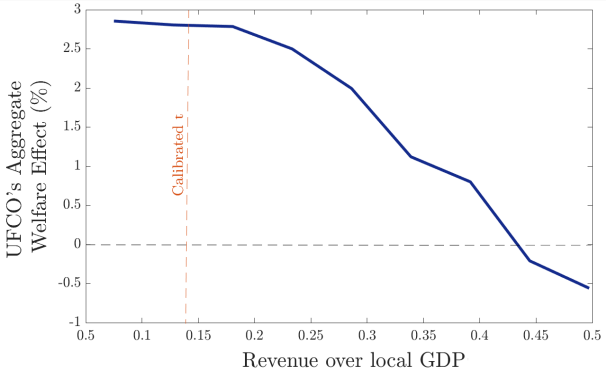
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Govt's Budget Constraint and Welfare Effect



- As ↑ govt's funds, UFC's effect on welfare becomes negative.

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