

The Disparity in Economic Development between Haiti and the Dominican Republic (D.R.)



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*Hispaniola

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A brief comparison

We discussed the disparity of the Korean Peninsula in class. The quick takeaway is that political systems and institutions matter



One island, two tales

 REPUBLIC OF HAITI vs. DOMINICAN REPUBLIC 

URBAN POPULATION



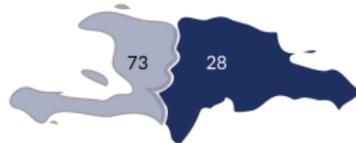
INTERNET USERS



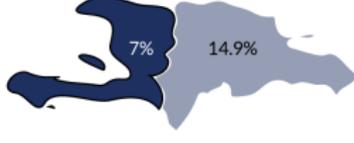
GDP PER CAPITA (US \$)



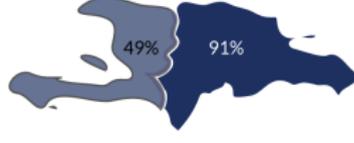
INFANT MORTALITY RATE (PER 1,000)



UNEMPLOYMENT



ADULT LITERACY RATE



- In year 2013

Haiti: Barren, Dominican Republic: Lush



What is behind this divergence?

- Conversely, what seems unlikely to be?

Population Density based upon Arable Land

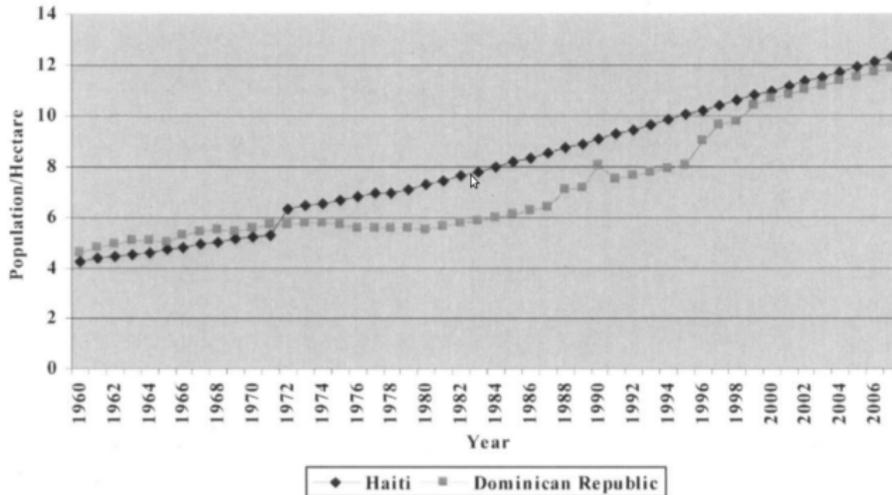
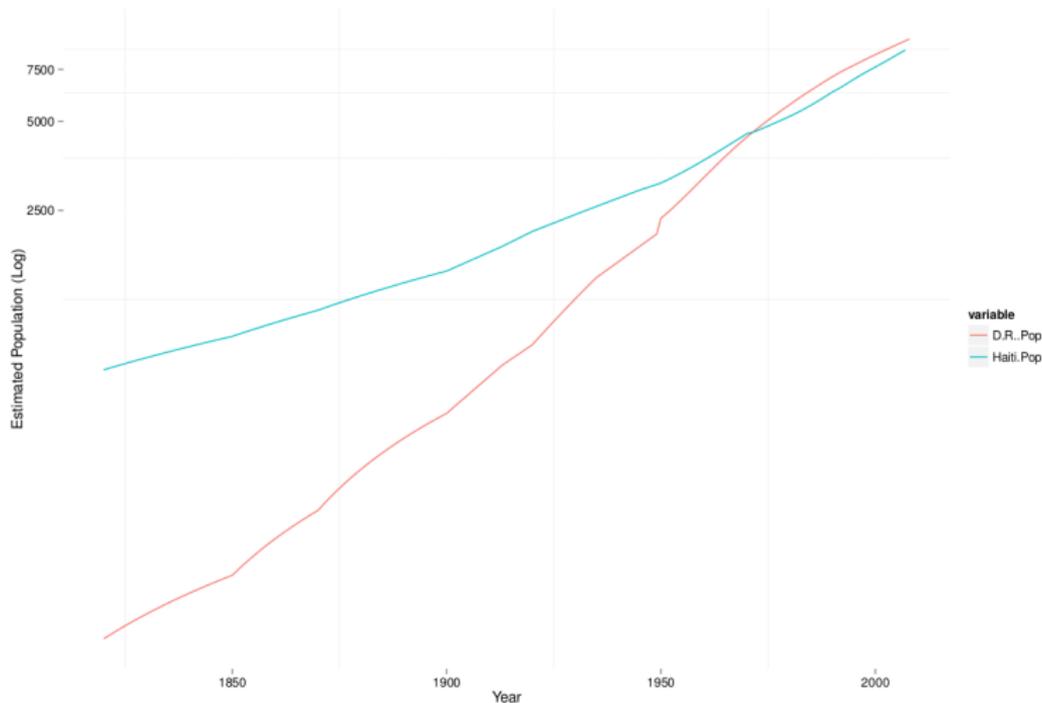


Figure 1. Population per Hectare of Arable Land in Haiti and the Dominican Republic. Source: Based on calculations derived from data found in Angus Maddison, *The World Economy: A Millennial Perspective* (Paris: OECD, 2001) 281 and The World Bank, *World Development Indicators Database* (Washington, DC: The World Bank, 2009).

Estimated Population (Log), Haiti is Blue



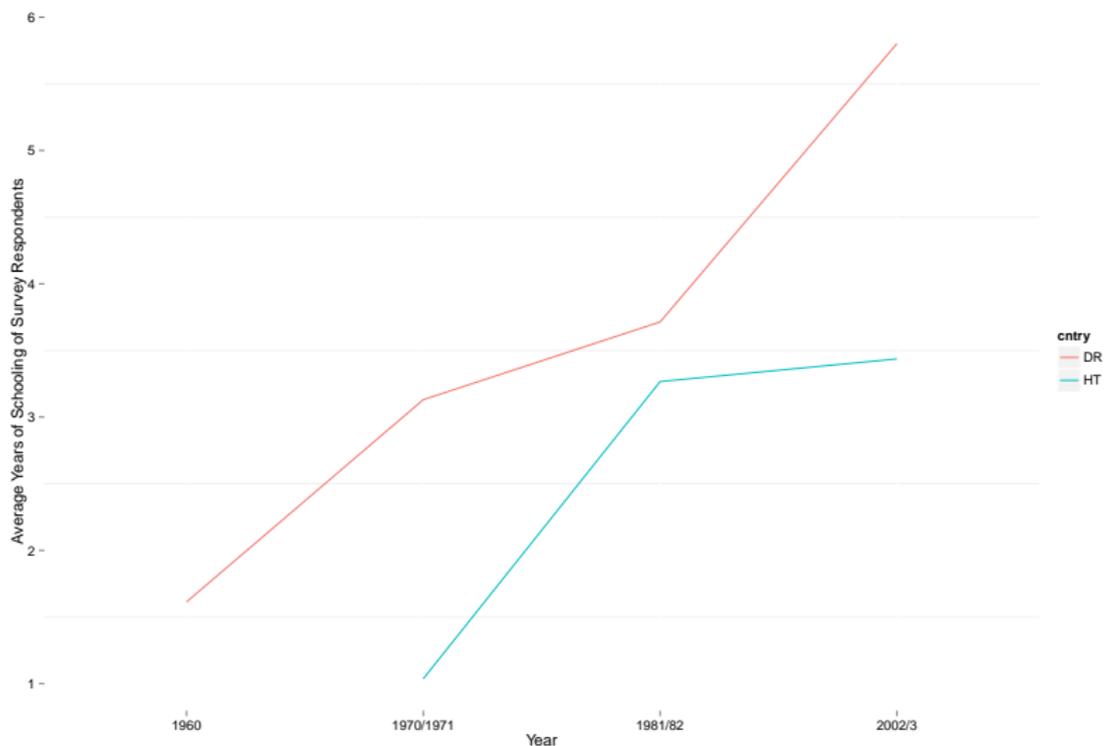
Source: Bolt, J. & van Zanden, J. L.. The First Update of the Maddison Project; Re-Estimating Growth Before 1820.
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Geographic Explanations

Variable of Interest	Haiti	D.R.	Difference
Altitude (Meters)	351.6717	354.4037	2.7325 (28.89)
Avg. Temperature (Celsius)	24.2696	24.25095	-0.01865 (.1890534)
Avg. Precipitation (Millimeters)	123.7963	113.1711	-10.6252 (2.146714)***
Ann. Precipitation (Total for Year)	1485.556	1358.053	-127.503 (25.76056)***
Nightlights in 1992	0.305979	1.779192	1.473213 (.3358133)***
Nightlights in 2012	1.063613	4.851328	3.787715 (.5049406)***
Nightlight Growth (1992-2012)	37.97994	48.24575	10.26581 (13.15699)
<i>N</i>	321	500	821

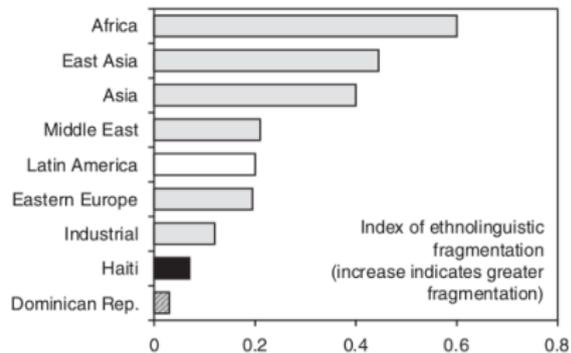
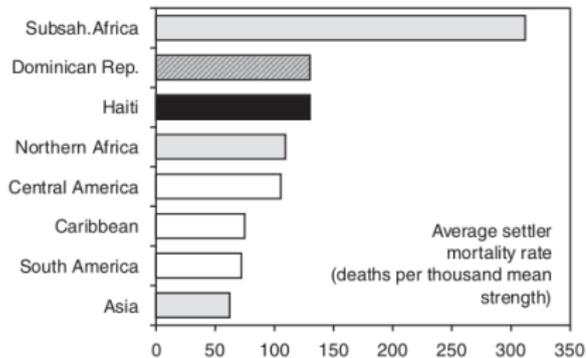
Notes: Observations are .1 degree grid cells constructed in ArcGIS (approximately 100 square km), clipped to fit the size of Hispaniola, so cells differ in size. Results are weighted by cell size. Climatic variables are generated through interpolation of monthly averages from 1950-2000. Nightlights are measured from 0-63, and computed by taking the average measurement in a grid cell. Nightlight growth is the average yearly percentage growth in light output over the 1992-2012 period. Source: WorldClim, SRTM, NOAA DMSP-OLS v4, Hijmans et al. (2005), Jarvis et al. (2008)

Education



Prevalent Explanations

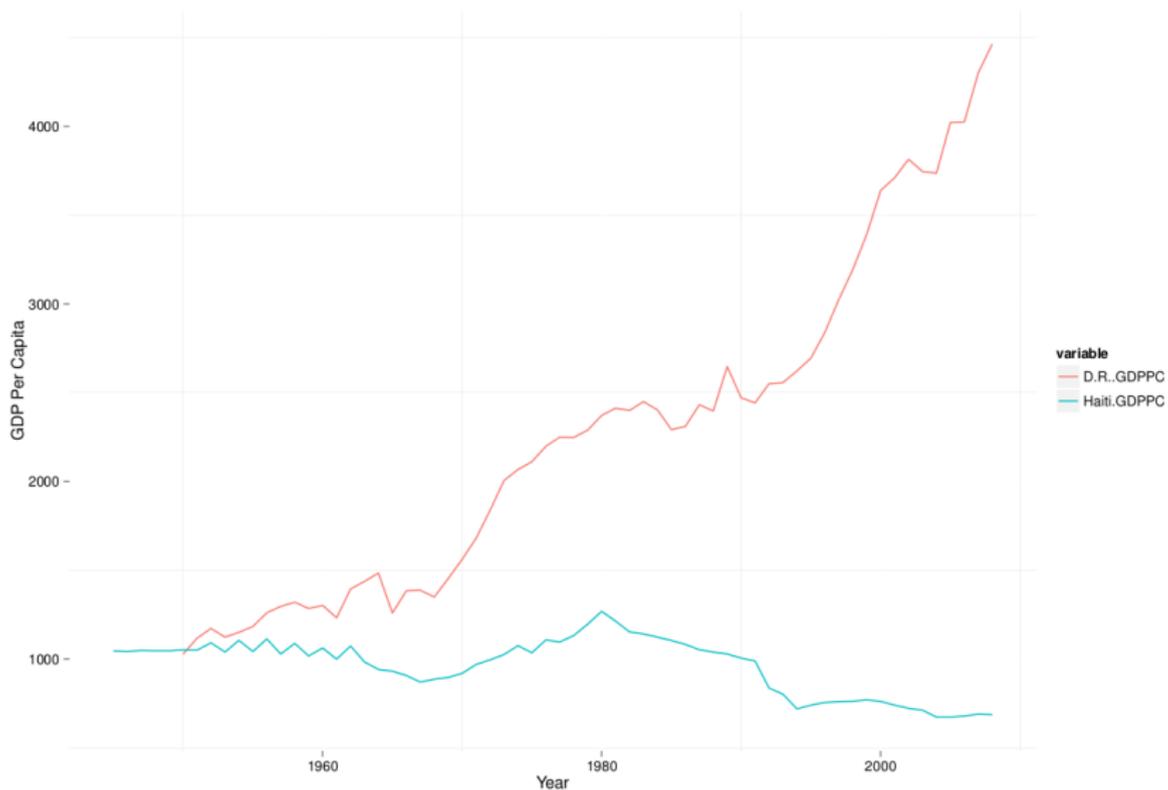
Settler Mortality and Ethnolinguistic Fragmentation



Sources: First panel: Acemoglu, Johnson, and Robinson (2001). Second panel: Gallup, Sachs, and Mellinger (1998).

Divergence is recent - GDP per Capita, Haiti is Blue

Source: Bolt, J. & van Zanden, J. L.. The First Update of the Maddison Project; Re-Estimating Growth Before 1820.

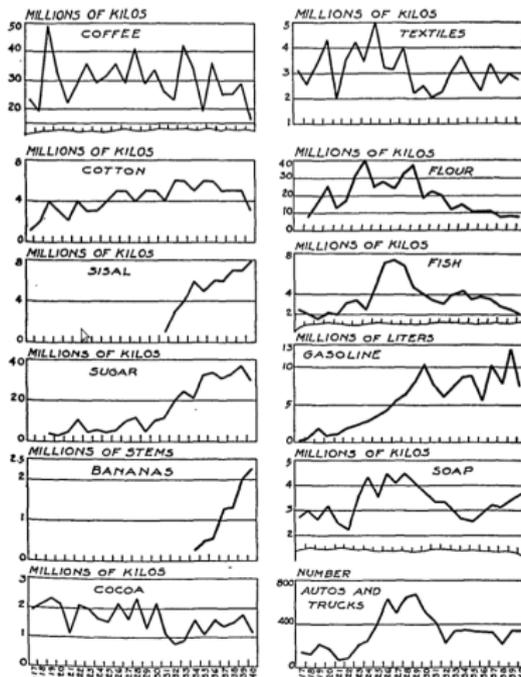


Trade

FISCAL YEARS 1916-17 TO 1929-30

EXPORTS

IMPORTS



Trade

- Both countries produced similar goods
- In 1925, primary exports of both: Coffee, Cacao, Cotton, Wood, Sugar, Molasses, Goatskins
- Total export value of Haiti in 1925: \$100,920,025 (Gourdes), D.R. in 1925: \$ 26,770,611 (USD)
- Fixed exchange rate: 1 USD to 5 Gourdes

Source: 1925 Annual Report of United States Financial Adviser to Haiti, General Receiver of Dominican Customs Report to the United States, 1925

Trade and History

- How do we know this?
- The United States occupied the Dominican Republic from 1916-1924, and took control of customs receivership, as well as the national budget
- Similarly, the U.S. occupied Haiti from 1915-1934, and strictly controlled trade until 1940

Where does this leave us?

- This basic evidence suggests the prevailing explanations for divergence are not sufficient
- Theory: actions of respective national leaders matters, and can (partially) explain divergence

Another Theory

- Jones and Olken (*Quarterly Journal of Economics*, 2005)
- Demonstrate that “leaders have a large causative influence on the economic outcomes of their nations”, particularly in autocratic settings, and less so in democracies

Another Theory

- Khan (*Journal of Haitian Studies*, 2010)
- Differences in rent-seeking behavior of leaders in Haiti and Dominican Republic can explain their economic growth

A brief overview of history - Dominican Republic

- 1924: Americans end occupation
1924-30:
- President Horacio Vasquez creates a progressive government
- Builds roads, schools, irrigation and sanitation services

A brief overview of history - Dominican Republic

- Rafael Leonidas Trujillo forces Vasquez to resign
- Trujillo rules the D.R. from 1930 to 1947
- Rules indirectly until assassination in 1961
- Establishes family monopolies, grows wealthy
- Carries out public works and construction
- Opens factories, improves agricultural production \Rightarrow economy flourishes

A brief overview of history - Dominican Republic

1962-66

- Trujillo's assassination, Balaguer is in "office"
- Elections organized
- 1962: Juan Bosch Gavino elected, quickly toppled in 1963 military coup
- Bosch and supporters, called Constitutionals, take to the streets and seize National Palace
- 24,000 U.S. soldiers are ordered to the Dominican Republic to restate order until new elections in 1966.

A brief overview of history - Dominican Republic

1966-1978

- Balaguer defeats Bosch in national elections
- Economy expands rapidly, benefiting from favorable world prices for sugar
- By late 1970s, plunging sugar prices and rising oil costs bring the Dominican economy to a halt

1978-1986

- Silvestre Antonio Guzman defeats Balaguer in elections, leads a corrupt government
- Public works programs are brought to a halt, government borrows heavily
- Guzman's popularity diminishes rapidly
- Salvador Jorge Blanco is elected in 1982

A brief overview of history - Haiti

1934-1956

- Americans leave in 1934
- Political instability resumes, numerous regime changes and military coups
- 1937: Thousands of Haitians living near the border of the Dominican Republic are massacred by Dominican soldiers under the orders of President Trujillo
- Part of efforts of Trujillo encourage *Antihaitianismo*, prejudice and discrimination against Haitians, mostly black Haitians

A brief overview of history - Haiti

1957-1971

- Francois Duvalier (Papa Doc) is elected president in the country's first universal suffrage election
 - Declares himself president for life in 1964
- 1971-1986

- Jean-Claude Duvalier (Baby Doc) becomes the new president for life after his father's death in 1971
- Haiti has relatively favorable economic performance in the 1970s
- Macroeconomic situation deteriorates sharply in the early 1980s, affected by the recession in the United States and economic mismanagement
- Duvalier flees to France in 1986.

Leaders



Rafael Trujillo (the DR 1930-1961)



Old and young Duvalier (Haiti
1957-1986)

- Similarities: both rent seekers
- D.R.: Trujillo turned nation it into his personal fiefdom
- Fortune of potentially more than 300 million dollars
- With family and allies, controlled 60% of the country's assets
- Approximately 60% of the Dominican labor force worked for Trujillo, either directly or indirectly
- Haiti: Duvalier family controlled the national wealth
- Siphoned international aid money given to Haiti for themselves
- Estimated that they stole 800 million for themselves and their cronies

- Differences: According to Khan, Trujillo felt more secure in his position as a dictator
- Used this to establish longer term rent seeking strategies.
- Helped the Dominican Republic regain control over trade policy
- Economic reform: stimulate exportation, develop industry, etc.
- Created a two-tier society based on racial prejudice

- Duvaliers ruled Haiti slightly differently
- Khan: they felt much less secure in their tenure
- In the power vacuum created after the end of the U.S. occupation, consolidated military power quickly
- Took aid money \Rightarrow soured relationship between U.S. and Haiti
- U.S. stopped aid to Haiti during Duvalier's term

- We have discussed the negative impact of corruption on economy in class
- Fukuyama: three reasons why corruption could harm economy
- Distorts economic incentives by channeling resources not into their most productive uses but rather into the pockets of officials with the political power to extract bribes
- Acts as a highly regressive tax
- Time consuming and diverts the energies of the smartest and most ambitious people who could be creating wealth-generating private firms

- In conclusion, we argue that these differences in governance between the two countries affected many outcomes
- Less corruption
- Better international relationships, larger trade volume
- ⇒ More economic growth
- ⇒ Better present day outcomes

Difficulties in Analysis

- If we wish to compare cross-sectional outcomes at the national level $\Rightarrow N = 2$
- Impossible to ascribe performance to respective leaders
- If we are clever, could compare subnational outcomes or examine time-series
- Problem: Historical, disaggregated data for both countries non-existent

Modeling Institutions

- We cannot resolve this problem
- Instead, we develop a formal model aimed at explaining some of the divergence
- This model can help illuminate economic processes behind a leader's decisions and the consequences of their actions

Model - Introduction

- Develop a model that can be applied individually to both Haiti and the Dominican Republic
- Model does not consider any interactions between the two countries
- Both countries are originally similar in terms of institutions, economic performance, etc., so consider them to be in the same initial production equilibrium

Model - Introduction

- Countries are similar in every way except for one factor
- α_C , the country specific risk of a dictator being overthrown
- $\alpha_C \sim N(0, \sigma_\alpha^2)$, can be positive or negative
- Exogenously determined at the beginning of an autocrat's time in power
- Known by both citizens and the dictator.

Model - Timing

First Stage

- Dictator, who has recently assumed power, surveys the institutional climate, learns value of α_C
- Chooses the amount of rent extraction (τ) from citizens
- The rate of rent extraction comes at a cost – decreasing the length of their expected tenure

Second Stage

- Citizens then respond to the choices of the dictator
 - Choose optimal level of production
 - Choose whether or not to stage a coup against autocrat
- After** both periods lapse, then rents are extracted and citizens go to work (essentially, both decisions are made at almost the same time)

Model - Players

- Dictator
- N number of citizens

Model - Strategies

- In the first period, dictator chooses $\tau \in [0, 1)$, rate of rent extraction from citizens
- In the second period, each citizen chooses the amount of personal production of a good (say sugar), call it q_i
- Each citizen also chooses whether or not to attempt to oust the dictator

Model - Payoffs

- Given by the respective utility functions of the dictator and the citizens
- Dictator : $U_D = \sum_{i=1}^N \tau q_i$, if citizens identical, $U_D = N\tau q$
- Citizen: $U_i = (1 - \tau)\sqrt{q_i} - cq_i$
- q_i is the quantity of output produced by citizen i , where the price of output is normalized to one. Notice that the citizen's utility function has decreasing returns to scale and a constant marginal cost

Model - First Pass

- Let's start with the most basic version of the model to analyze
- Assume the dictator chooses a level of rent extraction based upon their fixed level of altruism, determined exogenously
- Their choice of $\tau \sim \text{Uni}[0, 1 - \epsilon]$

Model - First Pass

- Second period: citizens observe and respond to actions of dictator, only action is whether or not to stage uprising
- Notice from before that citizens' utility is decreasing in τ , prefer lower amount of rent extraction
- Citizens will stage coup if: $\tau > E[\tau] + \alpha_C = 1/2 + \alpha_C$
- Therefore, risk of revolt provides an upper bound for rent extraction: $\bar{\tau} = 1/2 + \alpha_C$

Model - Second Pass

- Following from this, let's try something more complicated
- First period: Dictator chooses a level of τ
- Second period: N citizens with equal preferences choose level of production and if to revolt

Model - Second Pass

- Payoffs: Dictator – $U_D = \begin{cases} qN\tau & \text{if no coup} \\ 0 & \text{if coup} \end{cases}$
- Citizen: Same as before, but chooses to oust dictator if $\tau > \bar{\tau}$
- Can analyze optimal choices using backwards induction

Model - Second Pass

- Starting with some arbitrary $\tau \in [0, 1)$, look at citizen's optimal production
- Take FOC of $U_i = (1 - \tau)\sqrt{q_i} - cq_i$ w.r.t. to q_i
- $\frac{\partial U_i}{\partial q_i} = \frac{(1 - \tau)}{2\sqrt{q_i}} - c$, set this equal to zero and solve
- Obtain: $q_i^* = \frac{(1 - \tau)^2}{4c^2}$. Note that production is decreasing in τ .
- Interior solution to maximization problem assured since $U_i'' = -(1 - \tau)/4q^{-3/2} < 0 \Rightarrow U_i$ is concave

Model - Second Pass

- Using citizen's best response function, analyze optimal choices for dictator
- Maximization problem:

$$\max_{\tau} U_D = N\tau q^* = \frac{(1-\tau)^2}{4c^2} N\tau \quad \text{such that } \tau \leq \bar{\tau}.$$

- Notice: $U_D'' = \frac{N}{4c^2}(6\tau - 4) < 0$ for $\tau < 2/3$, can be solved using FOCs

Model - Second Pass

- Consider unconstrained problem, take FOC with respect to τ and set equal to zero
- $$\frac{\partial U_D}{\partial \tau} = \frac{N}{4c^2}(3\tau^2 - 4\tau + 1) = 0$$
- Obtain: $\tau^* = 1/3$ (Other root is $\tau = 1$, notice that this doesn't work!)
- Then, dictator will choose $\tau^* = 1/3$ if $\bar{\tau} \geq 1/3$.

Model - Second Pass

- If $\bar{\tau} < 1/3$, need to show that “leadership constraint” will bind, or $\tau = \bar{\tau}$
- Proof: Notice U_D increasing in τ , since
$$U'_D = \frac{N}{4c^2}(3\tau^2 - 4\tau + 1) > 0 \text{ for } \tau < 1/3$$
- Therefore, if $\tau < \bar{\tau}$, dictator could increase rent extraction by a small ϵ and increase their utility, without being overthrown
- $\therefore \tau^* = \bar{\tau}$ if $\bar{\tau} < 1/3$

Model - Extension

- Consider a variant where there are two groups in society: G_0 and G_1
- G_0 is the majority group in society, G_1 is a subjugated minority
- Since G_0 is the majority group, they have political power in the nation
- Only members of G_0 can stage coups, G_1 cannot (unless choice coincides with G_1)
- Within groups, individuals are still identical

Model - Extension

- Dictator now sets different rates of extraction for different groups, $G_0 : \tau_0$ & $G_1 : \tau_1$
- Within group citizen best response function:

$$q_i^* = \frac{(1 - \tau_g)^2}{4c^2} \quad (\text{same as before})$$

- Dictator chooses optimal rent extraction given best response functions and given that there are N_0 members of G_0 and N_1 members of G_1 , where

$$N_0 + N_1 = N$$

Dictator's Utility Maximization Problem

$$\max_{\tau_0, \tau_1} U_D = \sum_{i \in G_0} \sqrt{\tau_0} q_{i0} + \sum_{i \in G_1} \tau_1^{3/2} q_{i1} = N_0 \sqrt{\tau_0} q_0 + N_1 \tau_1^{3/2} q_1$$

- Subject to the constraint $\tau_0 \leq \bar{\tau}$ (no constraint for minority group)
- Exponent of τ_G represents relative bias of dictator to one group
- Can now take FOCs and verify that SOC's guarantee interior solution

Model - Extension

- Notice: $\frac{\partial^2 U_D}{\partial \tau_0^2} < 0$ for $\tau < 1/2$ & $\frac{\partial^2 U_D}{\partial \tau_1^2} < 0$ for $1/8 < \tau < 3/4$ *

*Approximation

- Solving FOCs (steps omitted), obtain:

$$\tau_0^* = 1/5 \quad \text{and} \quad \tau_1^* = 3/7$$

- Note that in the previous problem, $\tau^* = 1/3$

Edit: Can't compare two different utility functions!

- Is dictator better off?
- Assume $\bar{\tau} \geq 1/3$. Then in the original problem, utility is

$$U_D^O = q^* N \tau^* = N \frac{(1 - 1/3)^2}{4c^2} (1/3) = \frac{N}{27c^2}$$

- In the extended problem,

$$U_D^E = N_0 \sqrt{1/5} q_0^* + N_1 (3/7)^{3/2} q_1^* = N_0 \frac{4}{25\sqrt{5}c^2} + N_1 \frac{12\sqrt{3/7}}{343c^2}$$

- $U_D^E > U_D^O$ if (approximating) $N_0 > (15/14)N_1$.
- If G_0 (majority group) is larger, dictator is better off!

Model - Extension

- What about total output of a nation?

- Original problem:
$$\sum_{i=1}^N q_i = N \frac{(1 - \tau^*)^2}{4c^2} = \frac{N}{9c^2} = \frac{N_0 + N_1}{9c^2}.$$

- Extended problem:

$$\sum_{i \in G_0} q_i + \sum_{i \in G_1} q_i = N_0 q_0^* + N_1 q_1^* = \frac{4N_0}{25c^2} + \frac{4N_1}{49c^2}$$

- Output is larger if

$$\frac{4N_0}{25c^2} + \frac{4N_1}{49c^2} > \frac{N_0}{9c^2} + \frac{N_1}{9c^2} \Rightarrow N_0 > \frac{325}{529} N_1$$

- Again, if majority group is larger, GDP of nation will be higher

Conclusions

- Even in dictatorships, citizens have some control over rent extraction, risk of revolt provides upper bound
- Citizens choose to produce less output if rent extraction is higher
- Implies that a rational dictator will choose a relatively low rate of extraction to maximize wealth
- If society is split into a minority and majority, dictator can subjugate minority and enrich themselves more than if they extracted higher rent from everyone
- In a majority-minority society, economic output may be larger, even if one group is significantly worse off

- Model is a work in progress

Extensions

- Thinking about game as a infinite period model, where in each stage the game is similar to as presented – but at the end of the round α_c is updated based upon total output of society
- This particular extension will help explain difference in short versus long term rent seeking strategy
- Multi-period Analogues of Utility Functions:

$$\sum_{j=0}^T \delta^j \sum_{i=1}^N q_{ij} \tau_j, \quad \sum_{j=0}^T \delta^j (1 - \tau_j) \sqrt{q_{ij}} - cq_{ij}$$

Sources & Questions - Your feedback is encouraged/much appreciated!

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