

Development II

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Week 2: Why isn't the whole world developed?

- Technology and other assumptions
- Neo-classical benchmarks
 - Efficient allocation and convergence
 - Solow Growth
 - Trade
 - Factor movement
- Misallocation
 - Lewis, dualism and its critics
 - enduring puzzles
 - modern takes

Lucas, Robert E. 1990. "Why Doesn't Capital Flow from Rich to Poor Countries?" *American Economic Review* 80 (2): 92–96. [link](#)

Gollin, Douglas. 2014. "The Lewis Model: A 60-Year Retrospective." *Journal of Economic Perspectives* 28 (3): 71–88. [link](#)

Gollin, Douglas, David Lagakos, and Michael E. Waugh. 2013. "The Agricultural Productivity Gap." *The Quarterly Journal of Economics* 129 (2): 939–993. ([link](#))

Also useful: [jupyter notebooks](#) on Specific Factors, Edgeworth Boxes and Lucas 1990.

Homogeneous and Homothetic Production Functions

A function is homogenous of degree k if:

$$F(\tau K, \tau L) = \tau^k F(K, L)$$

Linear-homogeneous or constant returns ($k=1$):

$$F(\tau K, \tau L) = \tau F(K, L)$$

Production in intensive form.

If $k=1$, set $\tau = \frac{1}{L} : F\left(\frac{K}{L}, 1\right) = \frac{F(K,L)}{L} = f(k)$

where $k = \frac{K}{L}$

Euler's Theorem

Recall

$$F(\tau K, \tau L) = \tau^k F(K, L)$$

Take derivative wrt to τ

$$k \cdot \tau^{k-1} F(K, L) = F_K \cdot K + F_L \cdot L$$

When $k = 1$ (CRS)

$$F(K, L) = F_K \cdot K + F_L \cdot L$$

On competitive markets $r = p \cdot F_K$ and $w = p \cdot F_L$ so we get

$$F(K, L) = F_K \cdot K + F_L \cdot L$$

$$p \cdot F(K, L) = p \cdot F_K \cdot K + p \cdot F_L \cdot L$$

$$p \cdot F(K, L) = r \cdot K + w \cdot L$$

Factor payments exhaust total product

When $k = 1$ Euler's theorem in intensive form means marginal product of capital will be $f'(k)$ and marginal product of labor (wage in competitive model):

$$f(k) - f'(k) \cdot k$$

output per worker hour minus payments to capital per worker hour equal wage per worker hour.

If F is homog. of degree k , marginal products are homog. of degree $k - 1$.

Take derivative of each side of $F(\tau K, \tau L) = \tau^k F(K, L)$ wrt to K and L respectively:

$$F_K(\tau K, \tau L) = \tau^{k-1} F_K(K, L)$$

$$F_L(\tau K, \tau L) = \tau^{k-1} F_L(K, L)$$

Implies that the rate of technical substitution (RTS) or the slope of any isoquant along any ray from the origin is the same:

$$\frac{F_L(\tau K, \tau L)}{F_K(\tau K, \tau L)} = \frac{F_L(K, L)}{F_K(K, L)}$$

With Constant Returns to Scale ($k = 1$)

$$F_L(\tau K, \tau L) = F_L(K, L) \text{ and } F_K(\tau K, \tau L) = F_K(K, L)$$

In a competitive market all firms hire K and L to equalize factor prices. Means can determine only $\frac{K}{L}$ ratio and not scale of K and L . Any two firms with same have the same $\frac{K}{L}$ have same marginal products F_K and F_L .

Hence with CRS the size distribution of firms is *indeterminate*

Firms could be all the same size, some large other smalls. We can't tell, nor does it really matter.

Another way to see this: under CRS marginal and $MC(Q)$ and $AC(Q)$ of production are same across firms. So cannot determine firm's optimal scale Q .

Cobb-Douglas production

$$F(K, L) = A \cdot K^\alpha L^\beta$$

A interpreted as total factor productivity parameter

Degree of homogeneity $k = \alpha + \beta$

If $k = 1$ then $\beta = 1 - \alpha$, then

$$F_L = (1 - \alpha)A \cdot K^\alpha L^{-\alpha} = (1 - \alpha)A \cdot \frac{K^\alpha L^{1-\alpha}}{L}$$

$$F_L = \frac{(1 - \alpha) \cdot F(K, L)}{L}$$

and

$$F_K = \frac{\alpha \cdot F(K, L)}{L}$$

Marginal products are a multiple of average products

Aggregate Production Function Models

- Solow Growth Model
- Convergence in any model with diminishing returns to the accumulated factor (guaranteed with CRS)

Solow Growth Model

$$y = k^\alpha$$

$$\frac{dk}{dt} = s \cdot k^\alpha - (n + g + \delta)k$$

Steady state:

$$k^* = \left(\frac{s}{n + g + \delta} \right)^{\frac{1}{1-\alpha}}$$

Convergence regardless of starting point.

Countries further away from steady state grow faster (catch up or converge)

Capital mobility

Diminishing marginal product of capital implies that countries that if there are two countries with the same production technology

- country with less accumulated capital per worker has higher $r = f'(k)$
- capital should flow from rich to poor countries, accelerating convergence.

See Lucas (1990) [jupyter notebook](#)

Ricardo-Viner or Specific Factors Model

Variations of the model (see [jupyter notebook](#))

- Two-sector trade model (short-run version of Heckscher-Ohlin-Samuelson or HOS model)
 - Income distribution and Political economy
- Migration across countries, sectors
 - dualism, Lewis, Harris Todaro
- (mis)allocation across and within sectors.

“Institutions as a Fundamental Cause of Long-run Growth” [link](#)

A few key readings:

Sokoloff, K. and S. Engerman, 2000, Institutions, Factor Endowments, and Paths of Development in the New World. *Journal of Economic Perspectives* 14.([link](#))

Acemoglu, D., S. Johnson and J. Robinson, 2001, The Colonial Origins of Comparative Development: An Empirical Investigation. *The American Economic Review* 91, 1369-1401. ([link](#))

Banerjee, Abhijit, and Lakshmi Iyer. 2005. History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India. *American Economic Review* 95, no. 4: 1190. ([link](#))

* Dell, Melissa. 2010. “The Persistent Effects of Peru’s Mining ‘Mita.’” *Econometrica* 78 (6): 1863–1903.

North, Douglass . 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge ; New York: Cambridge University Press.

Long run growth trends

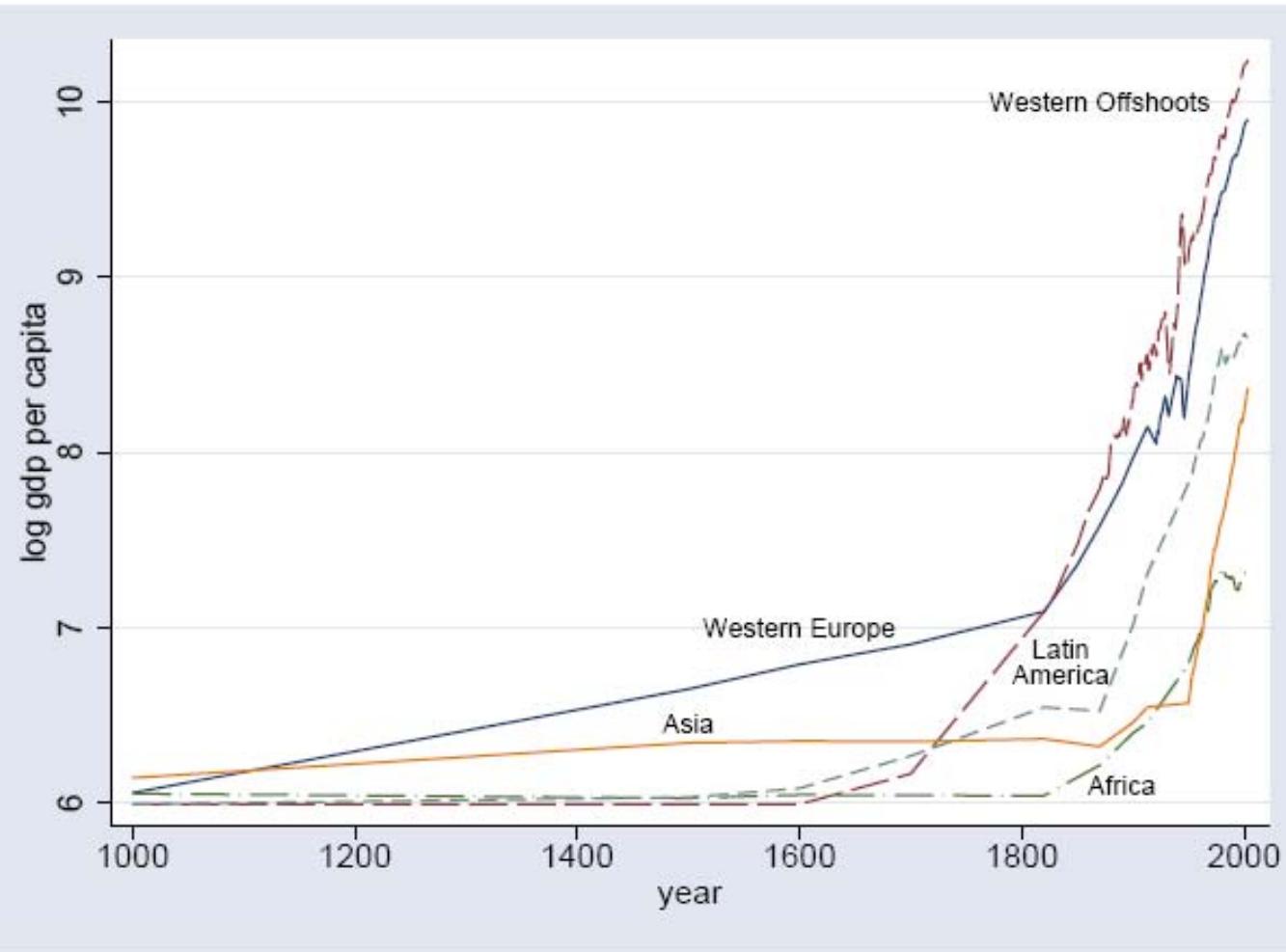


FIGURE 1.11. The evolution of average GDP per capita in Western Offshoots, Western Europe, Latin America, Asia and Africa, 1000-2000.

This and following graphs from: Acemoglu (2007 draft) [Introduction to Modern Economic Growth](#)

Testing for Convergence

- Barro style regression:

$$g_{t,t-1} = \beta \ln y_{t-1} + X_{t-1}' \alpha + \varepsilon_t$$

$g_{t,t-1}$ = annual growth rate between t-1 and t

y_t = income per capita or output per worker

\mathbf{X}_{t-1} = vector of conditioning variables

Convergence evidence in OECD

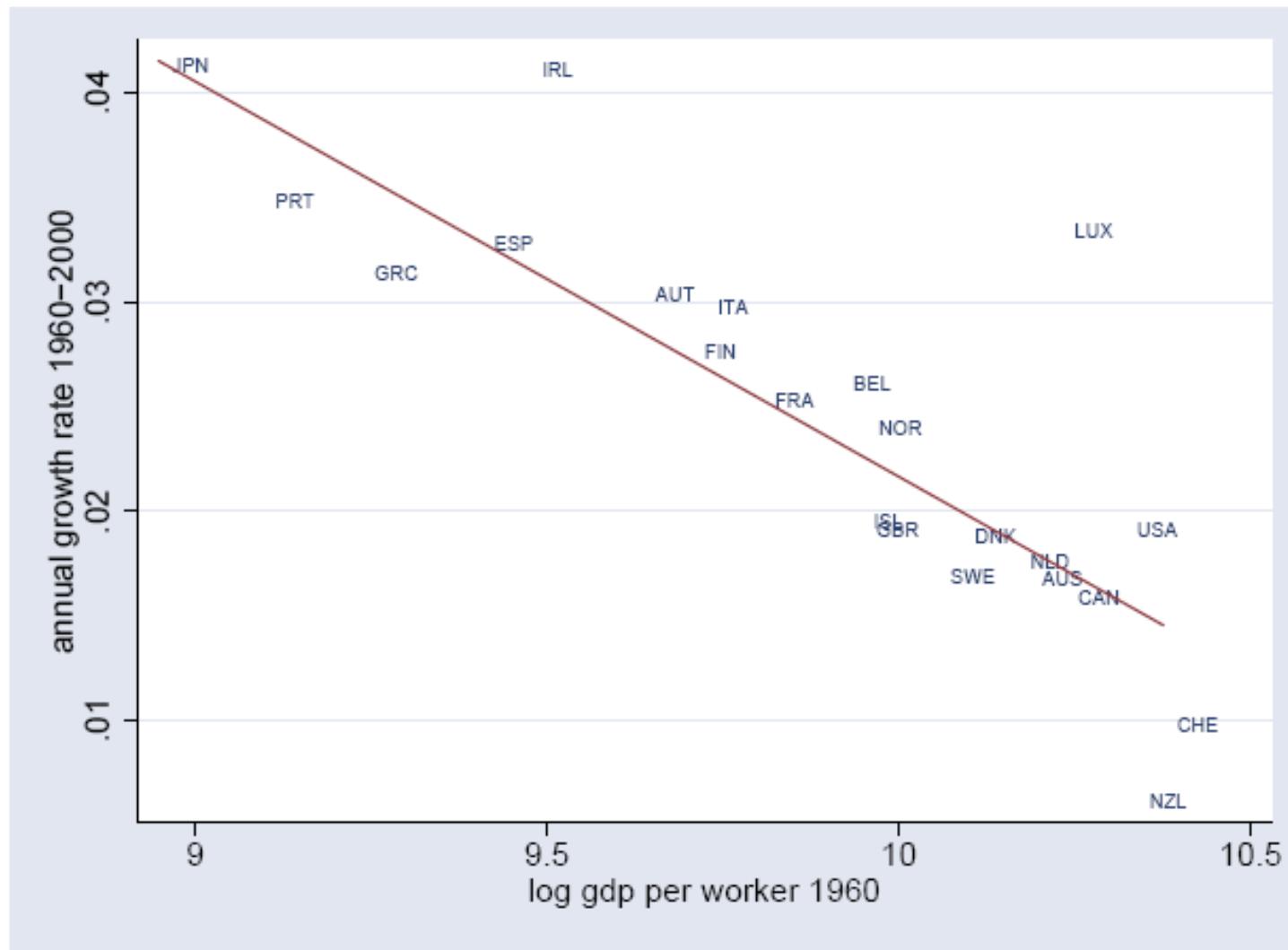


FIGURE 1.14. Annual growth rate of GDP per worker between 1960 and 2000 versus log GDP per worker in 1960 for core OECD countries.

The entire world

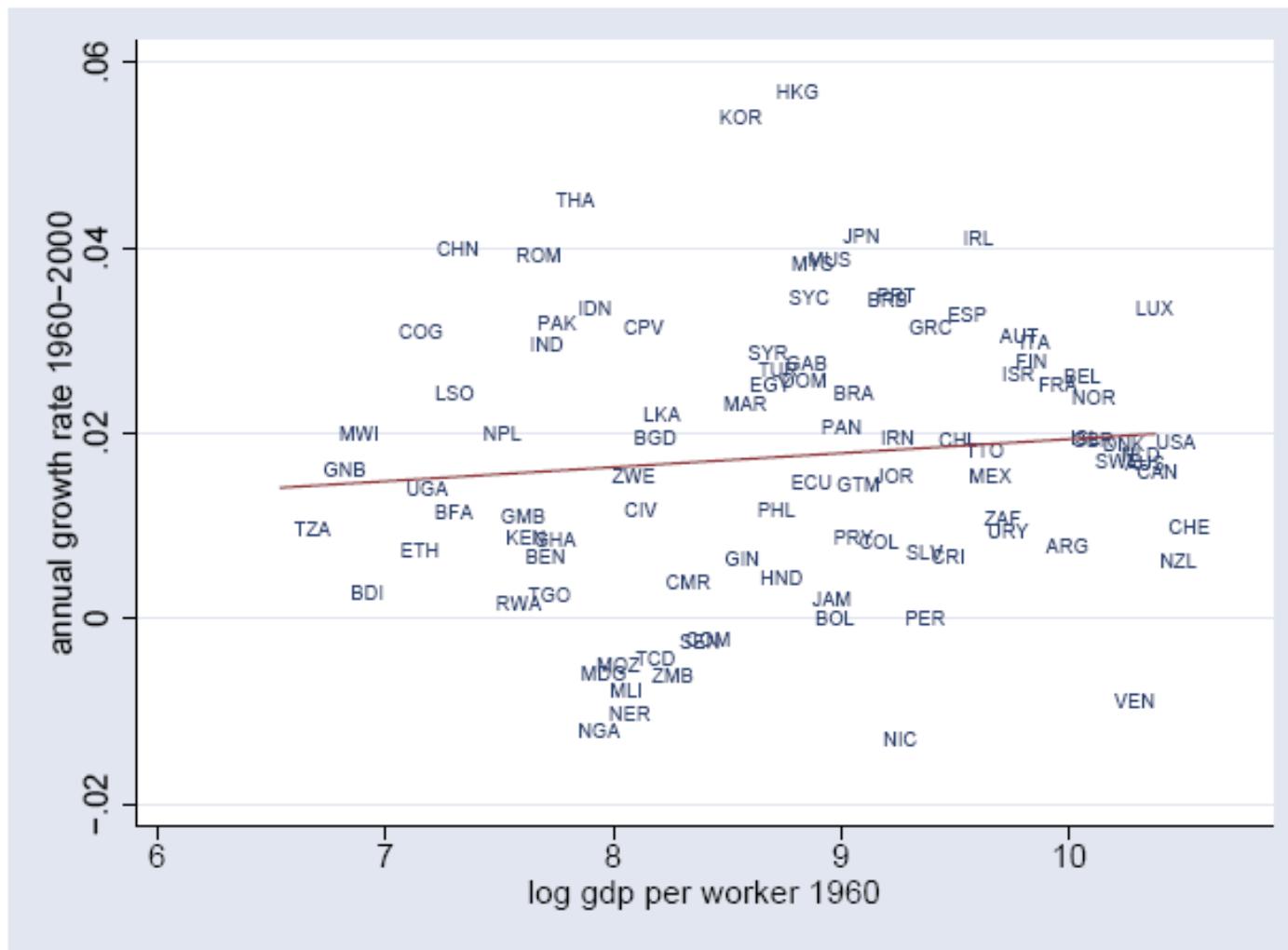


FIGURE 1.13. Annual growth rate of GDP per worker between 1960 and 2000 versus log GDP per worker in 1960 for the entire world.

Questions

- Why have some countries invested more in physical and human capital accumulation?
- Why have some countries been faster to adopt new technologies and organize production more efficiently?
- Do government policies matter? Why do some countries adopt good policies? Why don't the poorer countries imitate the 'good institutions'?
- Hypothesized determinants of long run growth?
 - Geography
 - Culture
 - Institutions (colonial history)

- Cross-country regressions
and determinants of growth
- Solow growth accounting:

$$y_t = A_t k_t^{\beta_1} h_t^{\beta_2}$$

$$\ln y_t = \ln A_t + \beta_1 \ln k_t + \beta_2 \ln h_t + \varepsilon_t$$
- Need an explanation of what drives A_t
- A, k and h endogenous
- More generally:

$$\ln y_t = \mu + \mathbf{X}_t' \boldsymbol{\gamma} + \varepsilon_t$$

Growth regressions and Identification

- Variables in \mathbf{X} have included: schooling, human capital, geography, institutions, culture, etc, etc.
 - **Endogeneity problem:** some \mathbf{X} variables may be determined by other variables in the system. Then \mathbf{X} moves endogenously with \mathbf{y} but not because \mathbf{X} causes \mathbf{y} but because other exogenous factors move them both.
 - Unobservables correlated with both income and \mathbf{X} variables
 $\rightarrow E(\mathbf{X}'\varepsilon) \neq 0$ biased OLS coefficient estimates

Reverse causality and omitted variables are special cases.

Need truly exogenous variables (not related to observed or unobserved variables in the system)

Identification: Search for Instruments and/or natural experiments

Searching for exogenous determinants: Geography

- Montesquieu (1748): climate affects behavior directly. ‘people...more vigorous in cold climates’ and more likely to be ruled by despots.
- Jared Diamond (*Guns, Germs and Steel: The Fates of Human Societies*, 1997):
 - Eurasia and Mesopotamia had natural advantages for rise of agriculture and large animal domestication.
 - Agriculture → population density and specialization
 - military
 - innovations and trade
 - exposure to disease
 - Military technology + disease immunity facilitated conquest (up to 95% of native population of Americas dies of new diseases)

Geography (contd.)

- Jeff Sachs: Geographical advantages (e.g. coastline and sea), reduced crop productivity in tropics, burden of infectious diseases in tropics on human productivity.

Latitude and GDP

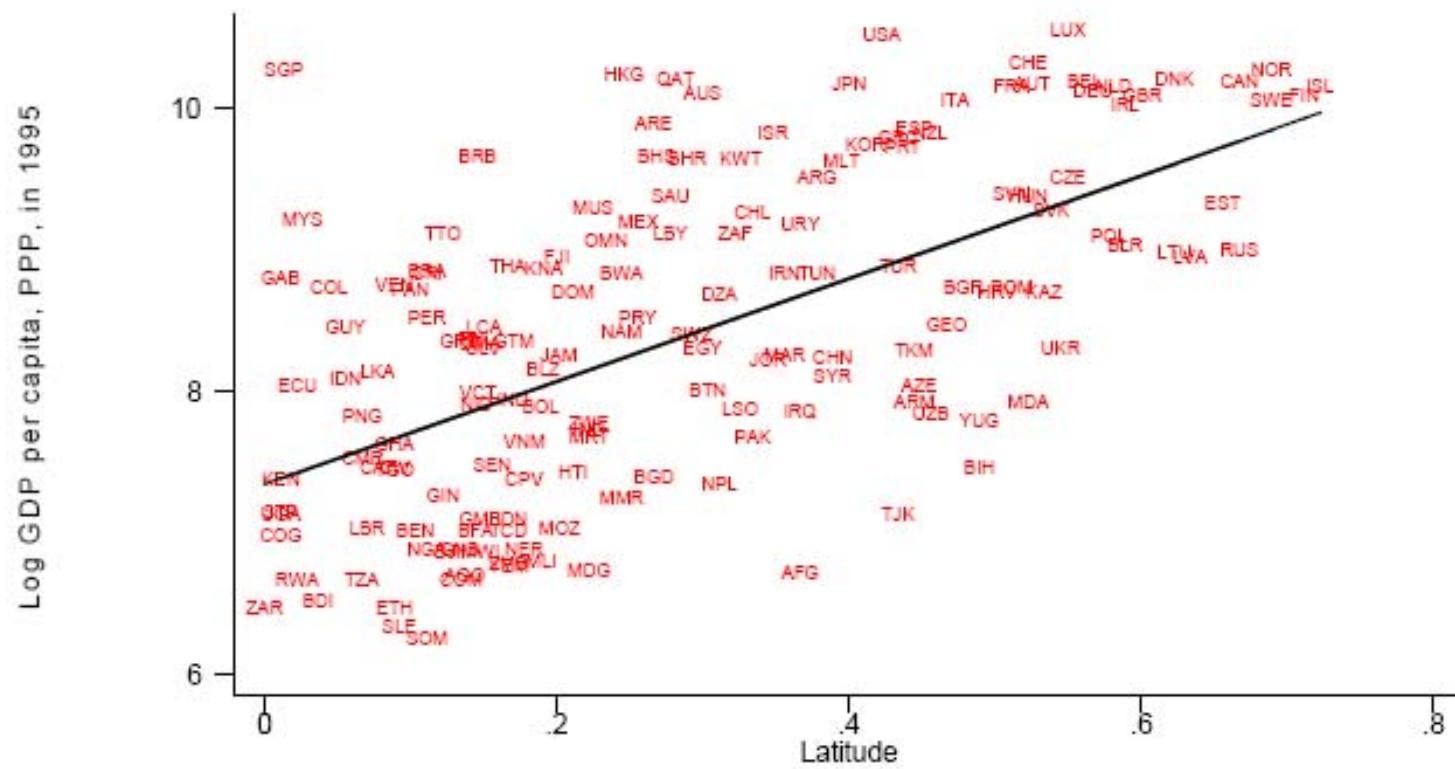
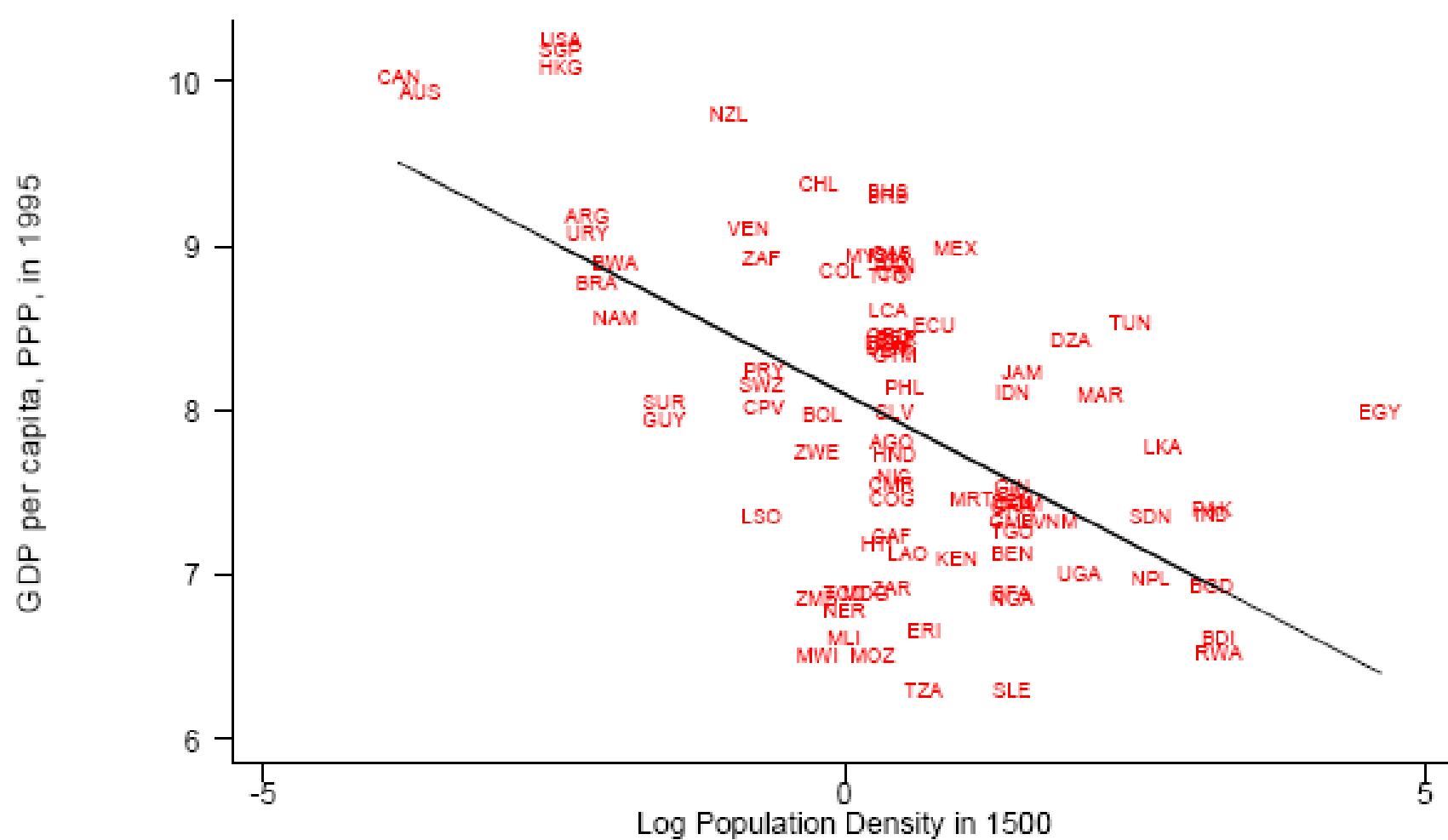


FIGURE 4.2. Relationship between latitude (distance of capital from the equator) and income per capita in 1995.

AJR: Reversal of Fortune



Reversal, controlling for current population composition

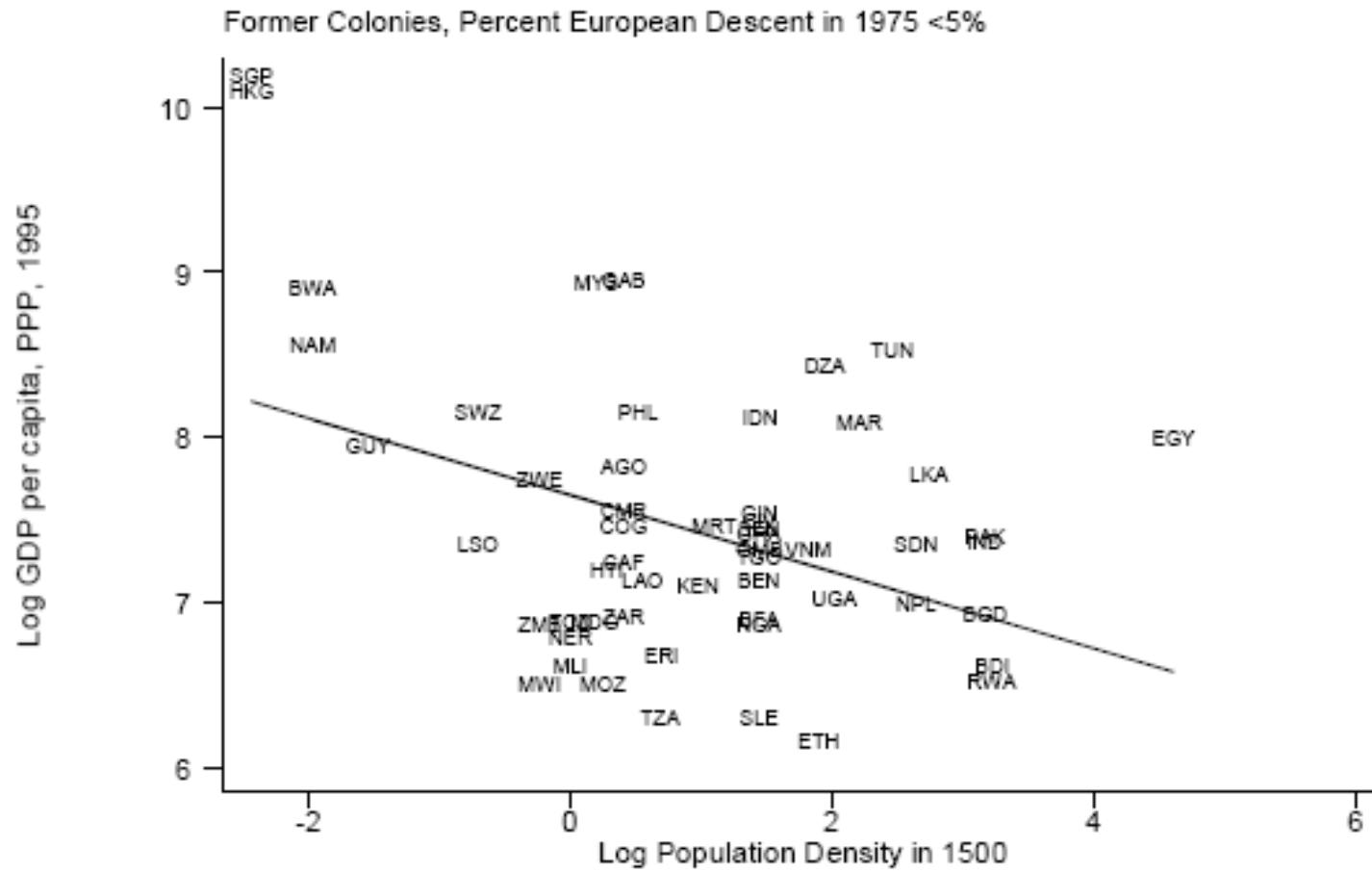


FIGURE 4.13. The Reversal of Fortune among former European colonies with two current European inhabitants.

Institutions

- North: “Institutions are the rules of the game in a society, or more formally, are the humanly devised constraints that shape human interaction.”

Institutions shape incentives to invest, take risks, and enter into trading relationships.

- Economic institutions: Property rights, contract enforcement
- Political institutions: Constraints on politicians and elites, separation of powers, etc.
- Formal versus informal
 - Formal: codified rules
 - Informal: social norms and rules of thumb; how formal rules are implemented in practice.

Acemoglu-Johnson-Robinson

Colonial Origins of Comparative Development

- Types of settlements: ‘extractive’ vs. ‘neo-Europes’ produce different types of institutions

Expropriation Risk and GDP (OLS)

$$\ln y_i = \mu + \alpha R_i + \mathbf{X}_i' \gamma + \varepsilon_i$$

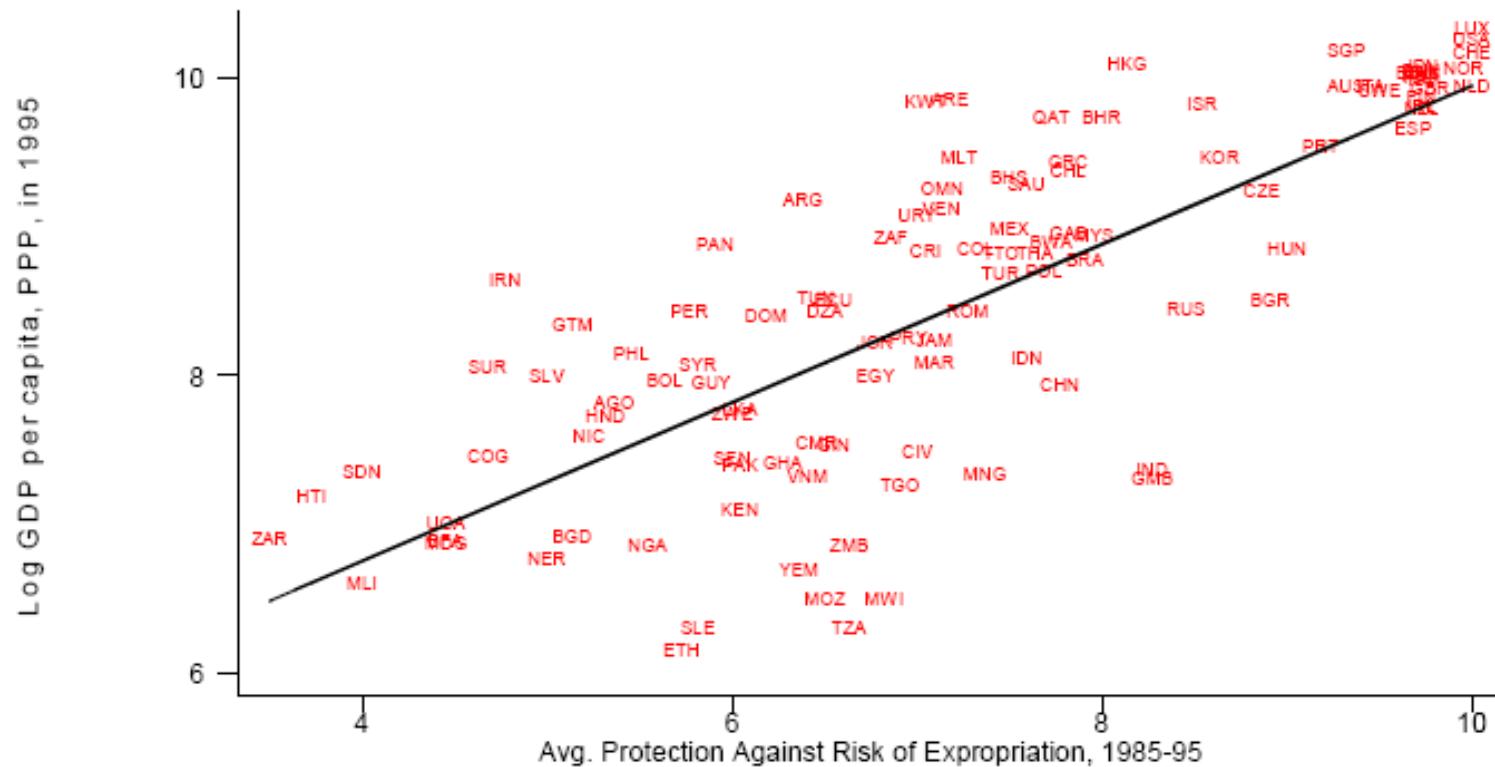


FIGURE 4.1. Relationship between economic institutions, as measured by average expropriation risk 1985-1995, and GDP per capita.

- Problem: Pattern of settlement and institutions is endogenous.
Coefficients will be biased.
- Need to find source of exogenous variation: (something that shapes institutions but only affects today's income via those institutions)
 - disease environment proxied by potential 'white settler mortality.'
- Plausible instrument?
 - Mortality rates as far back as 1500
 - Yellow fever and other diseases affected Europeans, locals had more immunity.
 - Yellow fever is mostly eradicated so less likely to have direct effect.
Control for other potential direct effect sources (e.g. latitude, malaria and life expectancy today, etc)

Potential Settler Mortality and GDP

$$\ln y_i = \mu + \alpha R_i + \mathbf{X}_i' \gamma + \varepsilon_i$$

$$R_i = \xi + \beta \log M_i + \mathbf{X}_i' \delta + \nu_i$$

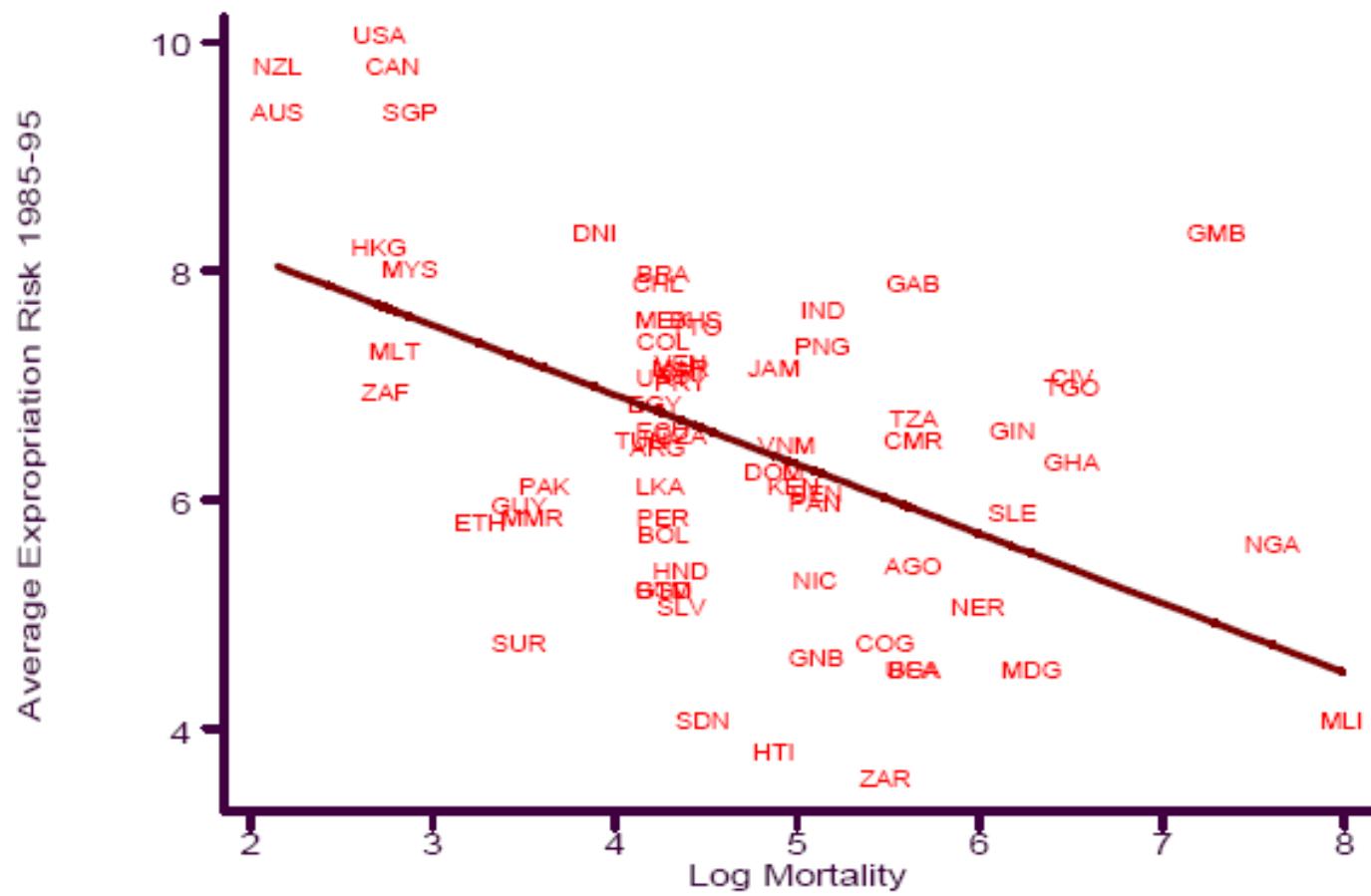
First Stage Regressions:

Dependent variable is protection against risk of expropriation

	All former colonies	All former colonies	All former colonies	Without neo-Europe
Settler Mortality	-0.61 (0.13)	-0.5 (0.15)	-0.43 (0.19)	-0.37 (0.14)
Latitude		2.34 (1.37)		
Continent Dummies (p-value)			[0.25]	
R-Squared	0.26	0.29	0.31	0.11
Number of Observations	63	63	63	59

Standard errors in parentheses

Sample limited to countries for which have GDP per capita data



Second Stage Regressions:

Dependent variable is log GDP per capita in 1995

	All former colonies	All former colonies	All former colonies	Without neo-Europe
Protection Against Risk of Expropriation, 1985-95	0.99 (0.17)	1.11 (0.26)	1.19 (0.39)	1.43 (0.45)
Latitude		-1.61 (1.57)		
Continent Dummies (p-value)			[0.09]	
Number of Observations	63	63	63	59

Robustness

	Base sample (1)	Base sample (2)	British colonies only (3)	British colonies only (4)	Base sample (5)	Base sample (6)	Base sample (7)	Base sample (8)	Base sample (9)
Panel A: Two-Stage Least Squares									
Average protection against expropriation risk, 1985–1995	1.10 (0.22)	1.16 (0.34)	1.07 (0.24)	1.00 (0.22)	1.10 (0.19)	1.20 (0.29)	0.92 (0.15)	1.00 (0.25)	1.10 (0.29)
Latitude			-0.75 (1.70)			-1.10 (1.56)		-0.94 (1.50)	-1.70 (1.6)
British colonial dummy	-0.78 (0.35)	-0.80 (0.39)							
French colonial dummy	-0.12 (0.35)	-0.06 (0.42)							0.02 (0.69)
French legal origin dummy					0.89 (0.32)	0.96 (0.39)			0.51 (0.69)
p-value for religion variables							[0.001]	[0.004]	[0.42]
Panel B: First Stage for Average Protection Against Expropriation Risk in 1985–1995									
Log European settler mortality	-0.53 (0.14)	-0.43 (0.16)	-0.59 (0.19)	-0.51 (0.14)	-0.54 (0.13)	-0.44 (0.14)	-0.58 (0.13)	-0.44 (0.15)	-0.48 (0.18)
Latitude			1.97 (1.40)			2.10 (1.30)		2.50 (1.50)	2.30 (1.60)
British colonial dummy	0.63 (0.37)	0.55 (0.37)							
French colonial dummy	0.05 (0.43)	-0.12 (0.44)							-0.25 (0.89)
French legal origin					-0.67 (0.33)	-0.7 (0.32)			-0.05 (0.91)
R ²	0.31	0.33	0.30	0.30	0.32	0.35	0.32	0.35	0.45

Engerman and Sokoloff: Institutions, Factor Endowments (Inequality), and Paths of Development

- Factor endowments (climate, soil, natural resources, availability of labor) shape type of institutions created by colonizers
- Persistence over time: narrow elite → concentrated political power
→institutions to reinforce inequality
 - land policy
 - voting rights and participation
 - schooling investments

RDD_R

February 14, 2018

1 Research Discontinuity Designs (in R)

This is a jupyter notebook with an R kernel running in the background to execute R code.

Content below draws on

- Cattaneo, Idrobo and Titiunik (2008) “A Practical Introduction to Regression Discontinuity Designs: Part I,” in Cambridge Elements: Quantitative and Computational Methods for Social Science, Cambridge University Press. See also “Part II” paper.
- Meyersson (2014): *Islamic Rule and the Empowerment of the Poor and Pious*, *Econometrica* 82(1): 229-269.

Links to these papers and data and Stata and R code for replication at [RD Software Packages site](#).

1.0.1 Sharp RD

Assignment to treatment status is a deterministic and discontinuous function of a covariate (running variable or forcing variable) X_i .

$$D_i = \begin{cases} 1 & \text{if } X_i \geq X_0 \\ 0 & \text{if } X_i < X_0 \end{cases}$$

where X_0 is a threshold or cutoff.

Example: National Merit scholarship awarded to all students with PSAT score above some threshold.

$Y_i(1)$ and $Y_i(0)$ are potential outcomes observed under treatment or control, respectively. $E[Y_i(1)|X_i]$ observed only to right of cutoff. $E[Y_i(0)|X_i]$ only to left.

Treatment effect estimated as

$$\tau_{SRD} = E[Y_i(1) - Y_i(0)|X_i = X_0]$$

Local treatment effect at/near the cutoff. In practice SRD estimate estimated as difference between weighted average of outcomes on the either side of the discontinuity.

Conditional independence:

$$E[Y_i(0)|X_i, D_i] = E[Y_i(0)|X_i]$$

once we control for confounder X_i , treatment assignment as good as random.

For observations very close to the discontinuity we effectively have an experiment.

Figure 2.1: Conditional Probability of Receiving Treatment in Sharp RD Design

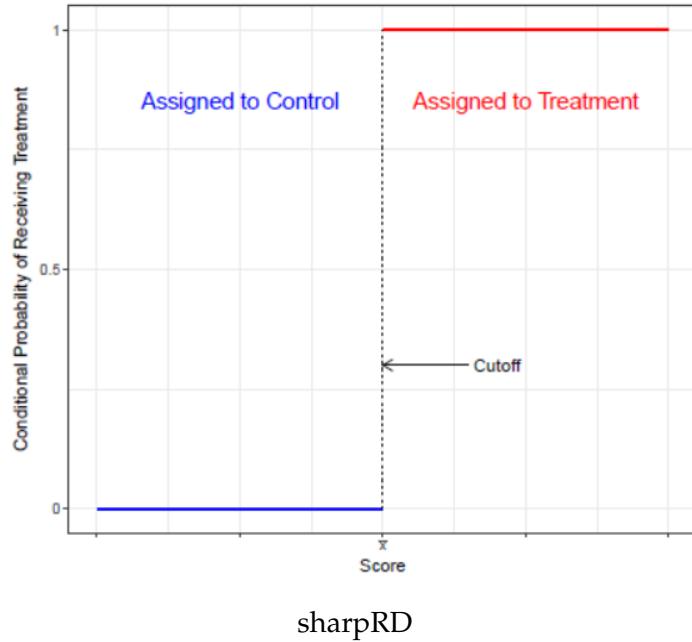
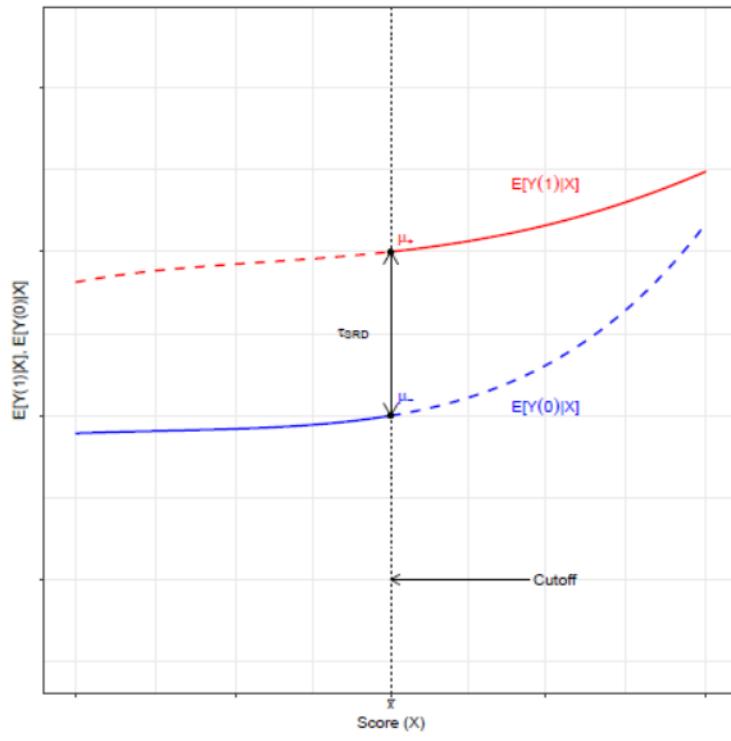
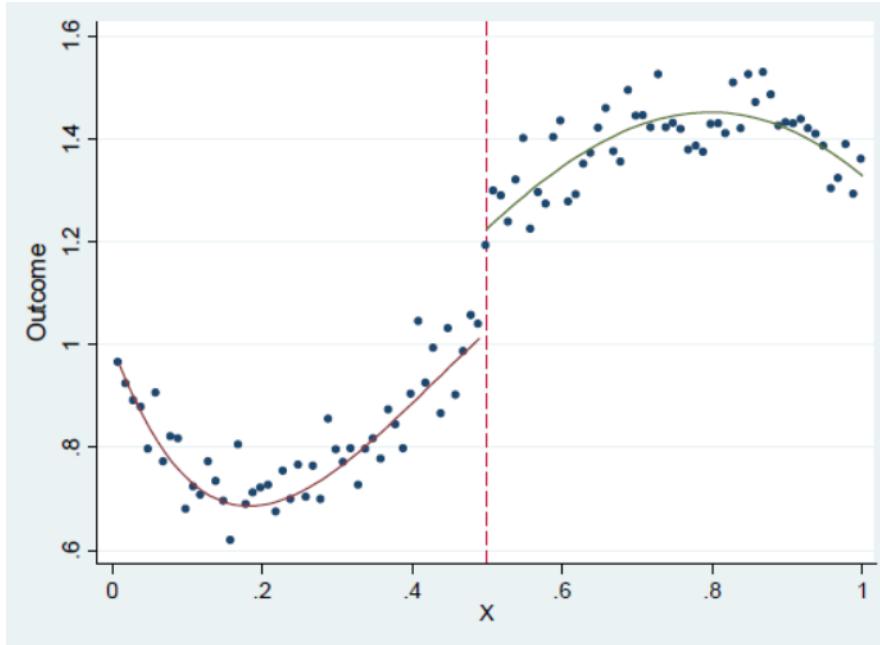


Figure 2.2: RD Treatment Effect in Sharp RD Design





rdd1

Non-linearity must not be mistaken for a discontinuity. In this example with linear fits on each side, estimate a positive ‘treatment’ effect. More likely relationship is non-linear with zero treatment effect.

1.0.2 Meyersson (2014)

1.0.3 Identifying impacts of municipal election victories by Islamic political parties on educational attainment of women

X - running variable

Y - outcome women’s high-school completion rate

T - treatment Islamic party comes to power in municipal government

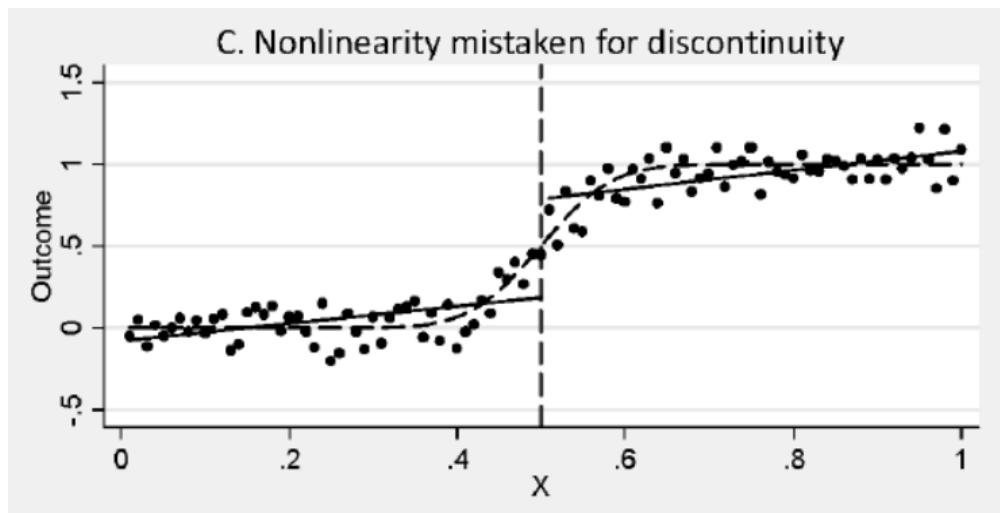
```
In [41]: #control the size of R plots in jupyter
options(repr.plot.width=5, repr.plot.height=5)
```

```
In [42]: # Load R libraries
```

```
library(foreign)
library(ggplot2)
library(lpdensity)
library(rddensity)
library(rdrobust)
library(rdlocrand)
library(TeachingDemos)
```

1.1 R Code

```
In [43]: data = read.dta("CIT_2018_Cambridge_polecon.dta")
```



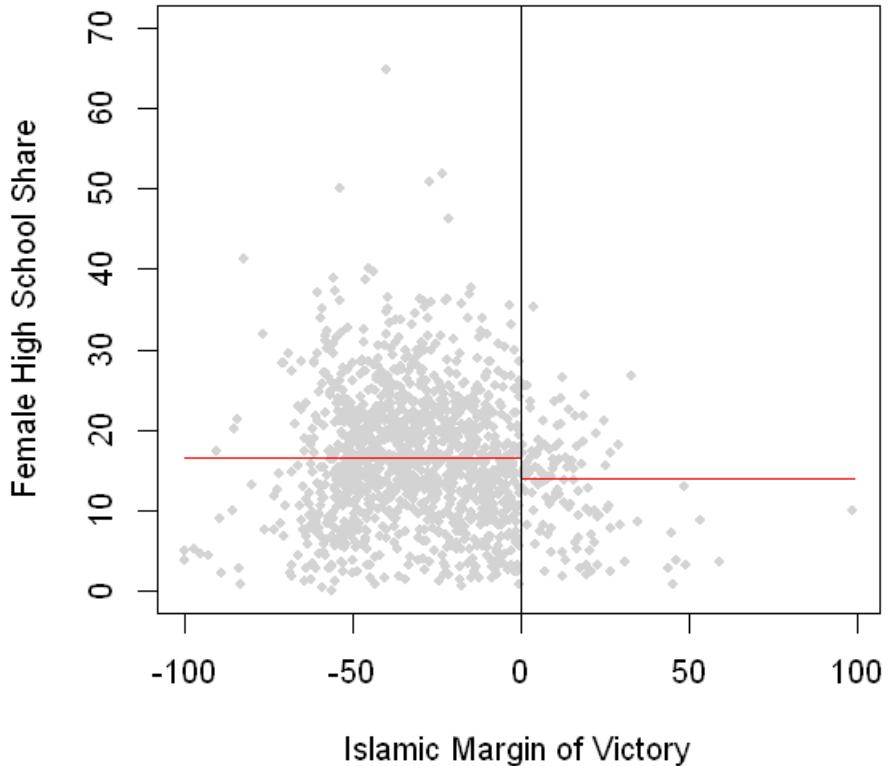
Non Linear relationship

```
In [44]: Y = data$Y
          X = data$X
          T = data$T
          T_X = T*X
```

Raw Comparison of means (Figure 2.3a)

If we simply compare outcomes in treated (Islamic major) and non-treated areas (secular major), we find lower female educational attainment in areas where Islamic parties won.

```
In [45]: rdplot(Y, X, nbins = c(2500, 500), p = 0, col.lines = "red", col.dots = "lightgray",
           x.label = "Islamic Margin of Victory", y.label = "Female High School Share", y
```

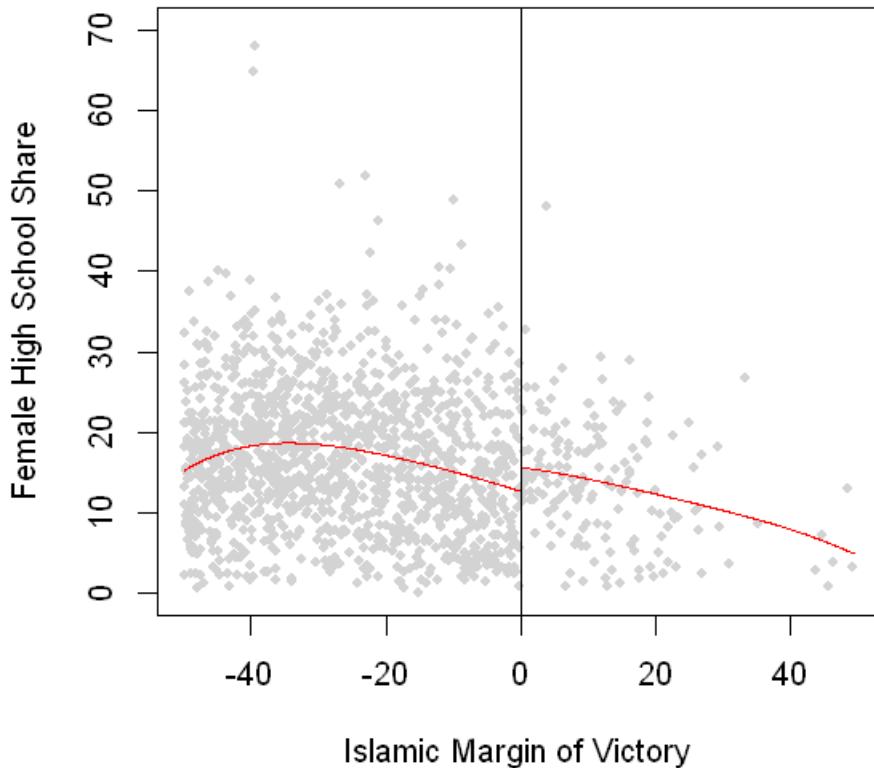


Local comparison of means: Narrowing the bandwidth In last plot we compared mean value in treated and control group. But these two groups differ considerably.

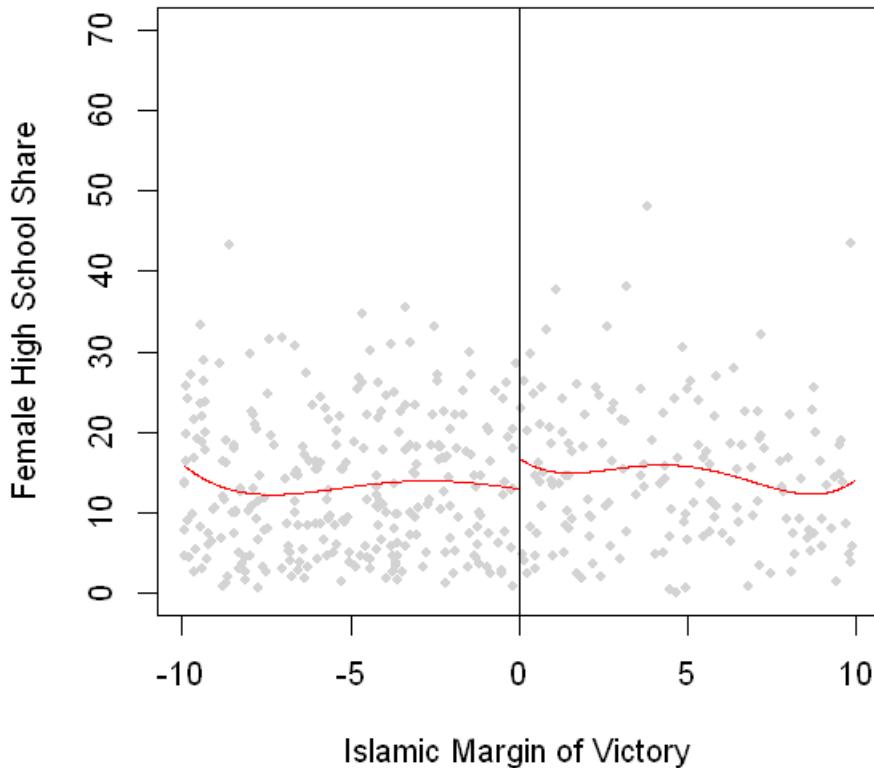
Below we focus on more ‘local’ effects (closer to just above and below the cutoff).

In next plot we fit a 4th degree polynomial on each side but now limit bandwidth to ‘closer’ contests where absolute victory margin was within 50 points.

```
In [46]: rdplot(Y[abs(X) <= 50], X[abs(X) <= 50], nbins = c(2500, 500), p = 4, col.lines = "red",
               col.dots = "lightgray", title = "", x.label = "Islamic Margin of Victory",
               y.label = "Female High School Share", y.lim = c(0,70))
```



```
In [47]: rdplot(Y[abs(X) <= 10], X[abs(X) <= 10], nbins = c(2500, 500), p = 4, col.lines = "red",
x.label = "Islamic Margin of Victory", y.label = "Female High School Share", y
```



1.2 RD plots

- scatter plots (as above) make it hard to discern ‘jumps’
- RD plots aggregate or ‘smooth’ data before plotting.
 - local sample means (from bins) represented by dots
 - polynomial (or local linear) fits

Plenty of variation in bin and bandwidth selection and curve fitting based on these concepts.

```
In [48]: rdplot(Y, X, nbins = c(20,20), binselect = 'esmv', x.label = 'Running Variable', y.la
```

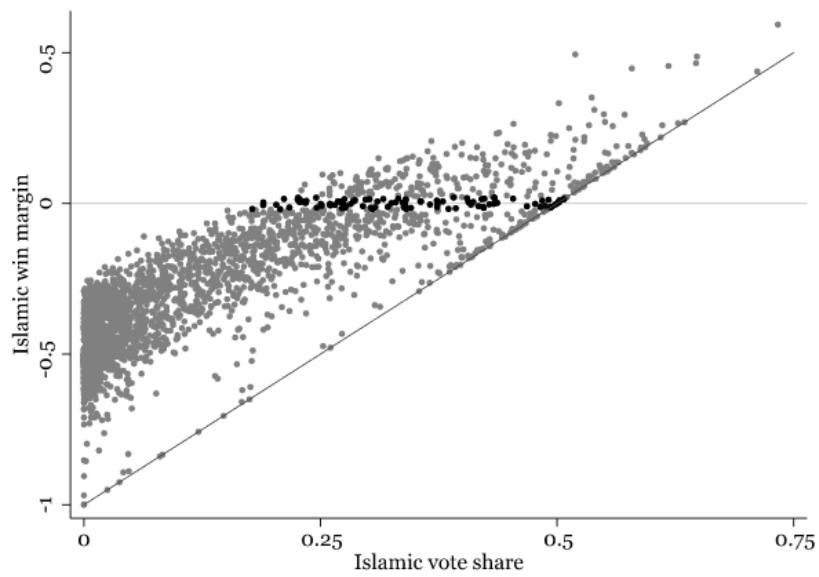
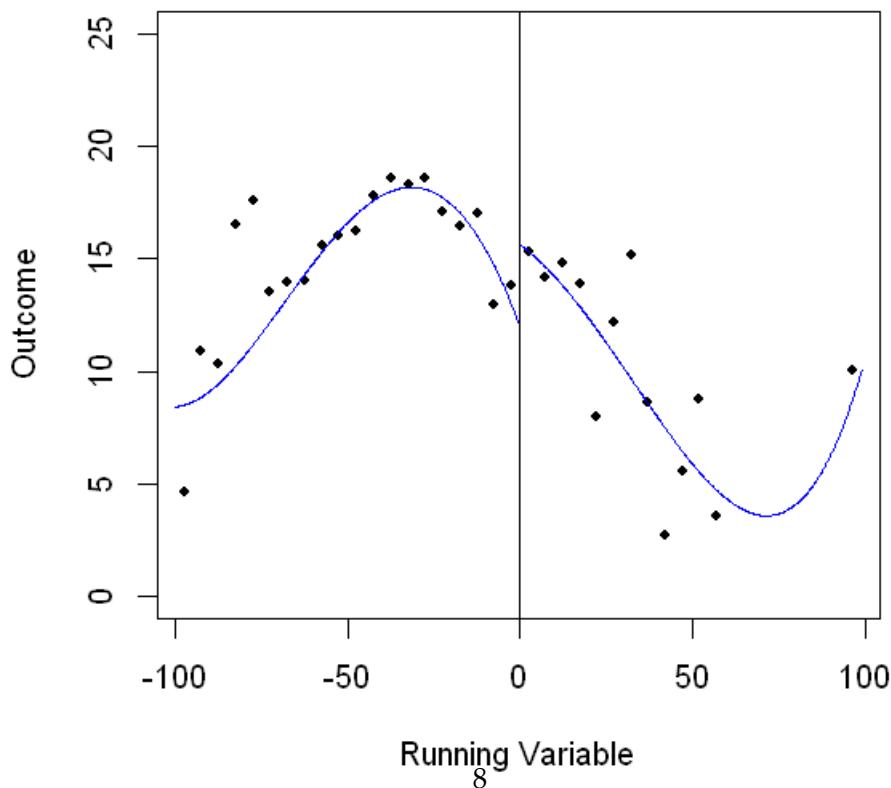


FIGURE 1.—Islamic win margin and Islamic vote share in 1994. The graph shows the total vote share for the Islamic party plotted against the Islamic win margin—the difference between the Islamic party's vote share and the largest secular party's vote share—both in 1994. Observations within 2 percentage points of the threshold at zero are in black. The diagonal line is the hypothetical one-to-one relationship between the two variables in an election with only two parties.

Meyersson



The estimating equation:

$$Y_i(0) = f(X_i) + \epsilon_i$$

$$Y_i(1) = Y_i(0) + \beta$$

All in one:

$$Y_i = f(X_i) + \beta D_i + \epsilon_i$$

The function $f(X_i)$ (e.g. a polynomial) must be continuous at X_0

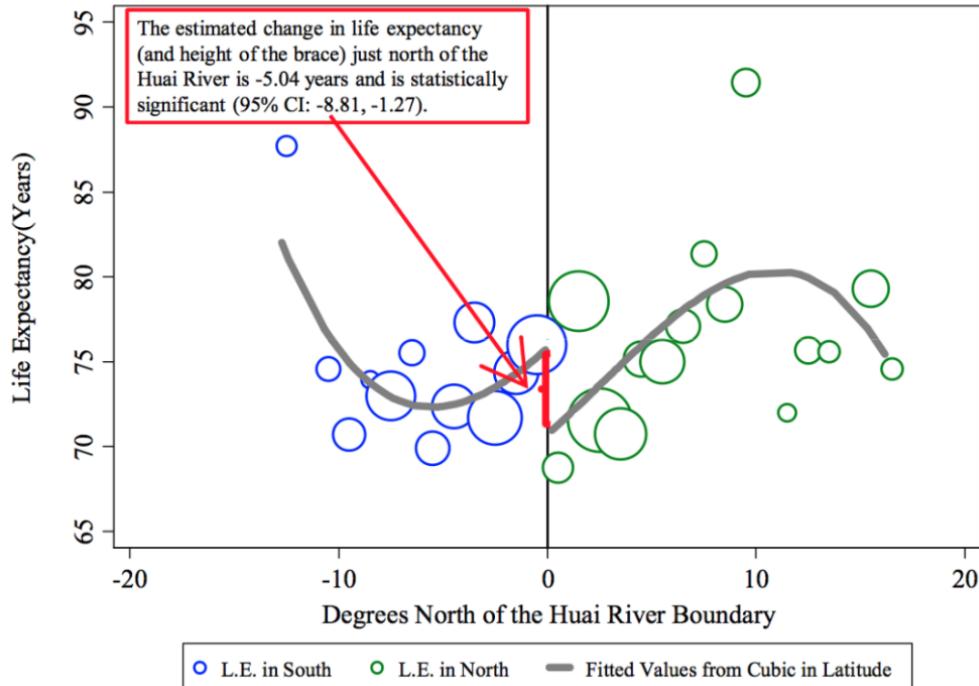
The RD estimate is difference between weighted average of outcomes on the either side of the discontinuity. Fitting a high order polynomial can mean these weighted averages are driven by observations far from the threshold.

Parametric (polynomial on full data) or non-parametric (local regression closer to cutoff) approaches?

Andrew Gelman's [blog post from 8/13](#) discusses this issue. See also [Development Impact Blog](#)

Chen et al (2013) "Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy," *PNAS*.

Policy discontinuity: North of China's Huai river free coal for heating is distributed in winter. None to the south. Using RDD method find total suspended particulates (TSPs) air pollution 55% higher just North of river compared to just south. Estimates China's coal-burning was reducing lifespan by 5 years for half a billion people.



Are observations far from threshold affecting polynomial fit, driving results? Smaller estimates with linear fits?

Natural Experiments in History

**Geographic regression discontinuity
designs (RDD)**

See [Jupyter Notebook](#) for backgrounder on RDD

The Persistent Effects of Peru's Mining Mita

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





Mining and the Spanish Conquest of Peru

- In colonial Peru and Bolivia, a major economic activity was mining, based at Potosí (silver) and Huancavelica (mercury).
- To support the mines, from 1573 to 1812, indigenous communities were forced to send 1 of 7 of their adult male population to work in the mines.
- Local native elites were required to find the conscripts. What might this do? In addition to direct health effects on the conscripts (high mortality rate), might reduce trust, undermine institutions, encourage out migration, make local labor scarce.

The Mita had a well-defined border

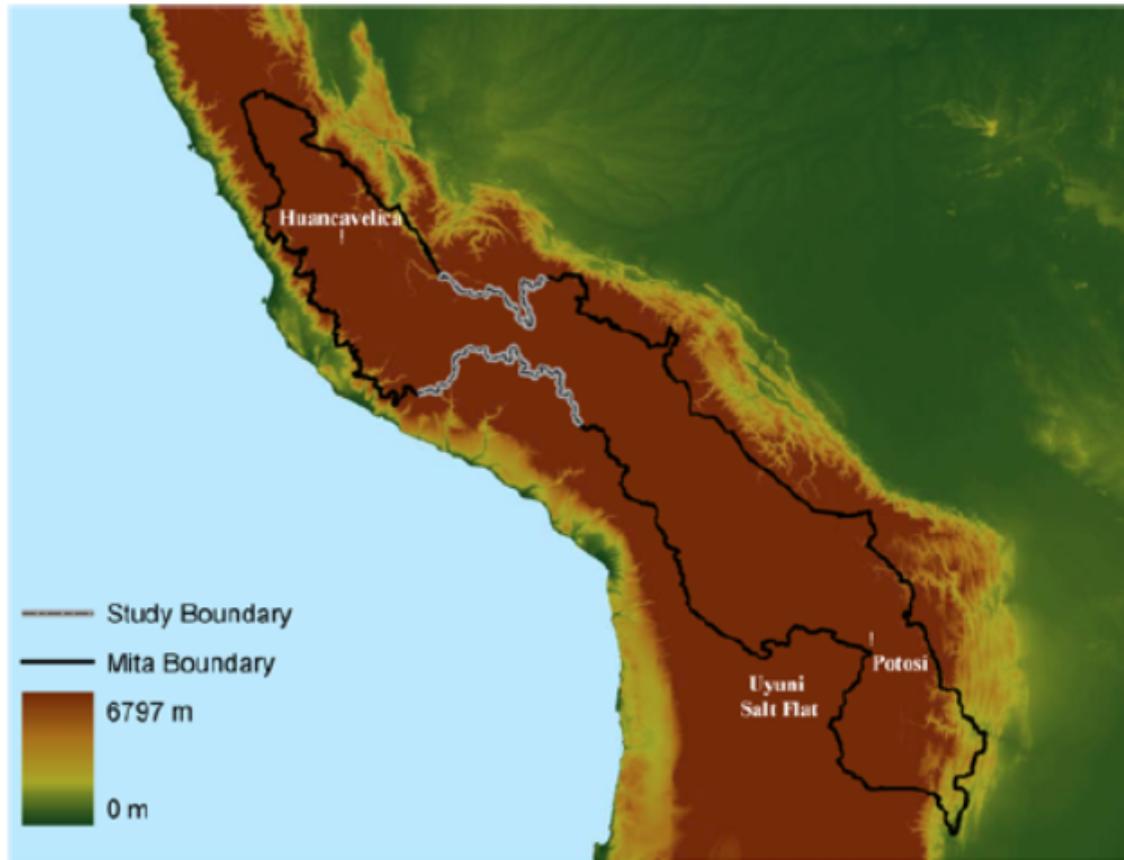


FIGURE 1.—The *mita* boundary is in black and the study boundary in light gray. Districts falling inside the contiguous area formed by the *mita* boundary contributed to the *mita*. Elevation is shown in the background.

- In early 17th century Potosi had a pop. of 200,000, larger than London, Milan or Seville at the time. At one point 70% of world silver production came from 'Cerro Rico' mountain of Potosi.
- daily quota of 25 bags of silver ore, each weighing around 45kg, to the surface .
- Mita boundary established a discontinuity in longitude-latitude space.
- Valid RD design requires all relevant factors besides treatment to vary smoothly at *mita* border. Study segment used has statistically identical elevation, ethnic distribution and other observables.

Estimation

$$c_{idb} = \alpha + \gamma \cdot mita_d + X'_{id}\beta + f(geolocation_d) + \phi_b + \epsilon_{idb}$$

Observation i in district d along segment b of $mita$ boundary.

$mita_d = 1$ if district contributed to $mita$.

X_{id} = covariates (e.g. demographic variables, # of children and adults in HH). $f(geolocation_d)$ RD polynomial controls for smooth functions of geographic location (polynomial in lat , lon and interactions).

ϕ_b = set of boundary segment FE that denote which of 4 equal lengthy boundary segments is closes to the observations's district capital.

Identification. All relevant factors besides treatment vary smoothly at *mita* boundary: $E[c_1|x,y]$ and $E[c_0|x,y]$ are continuous at the discontinuity threshold.

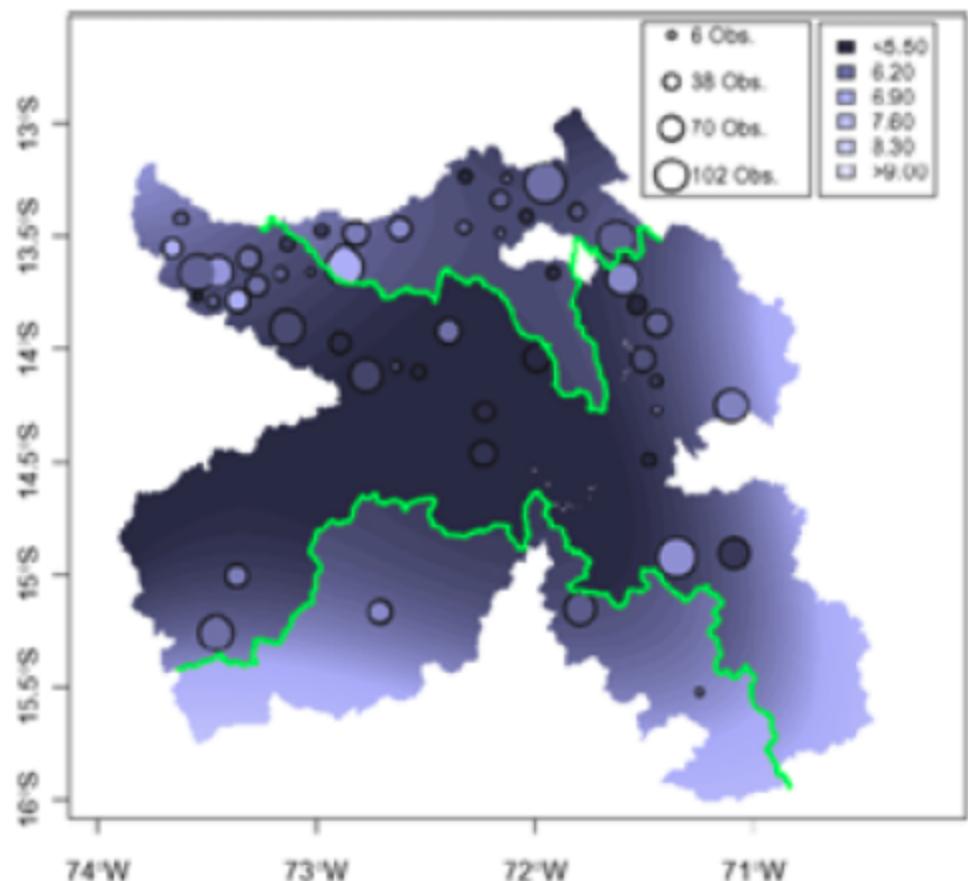
Test if true for important characteristics: elevation, terrain ruggedness, soil fertility, rainfall, ethnicity, preexisting settlement patterns, local 1572 tribute (tax) rates, and allocation of 1572 tribute revenues.

Robustness: try different specs for RD polynomial and different buffers around border from 50 -100 km.

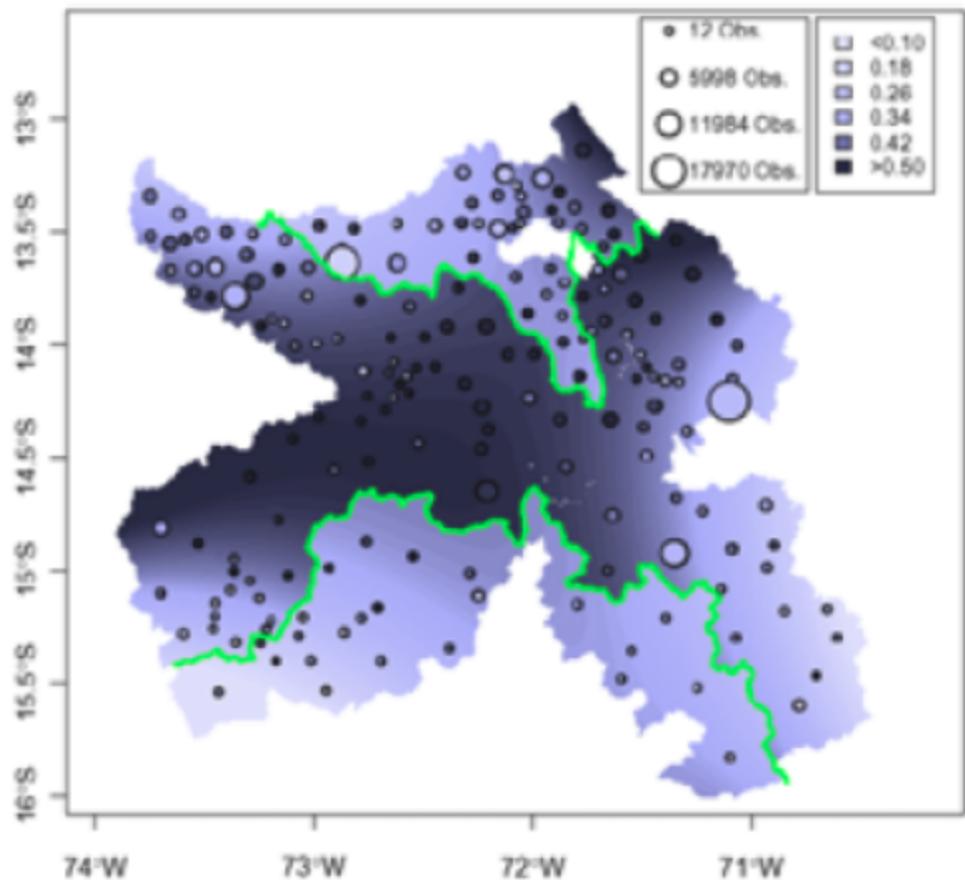
Long run impacts of the Mita

- Consumption in present day Mita areas is 25% lower
- 6% more height stunting in 6-9 years old students
 - This is an ATE. Along the boundary estimated effect ranges from 0.5% to 11.5%.

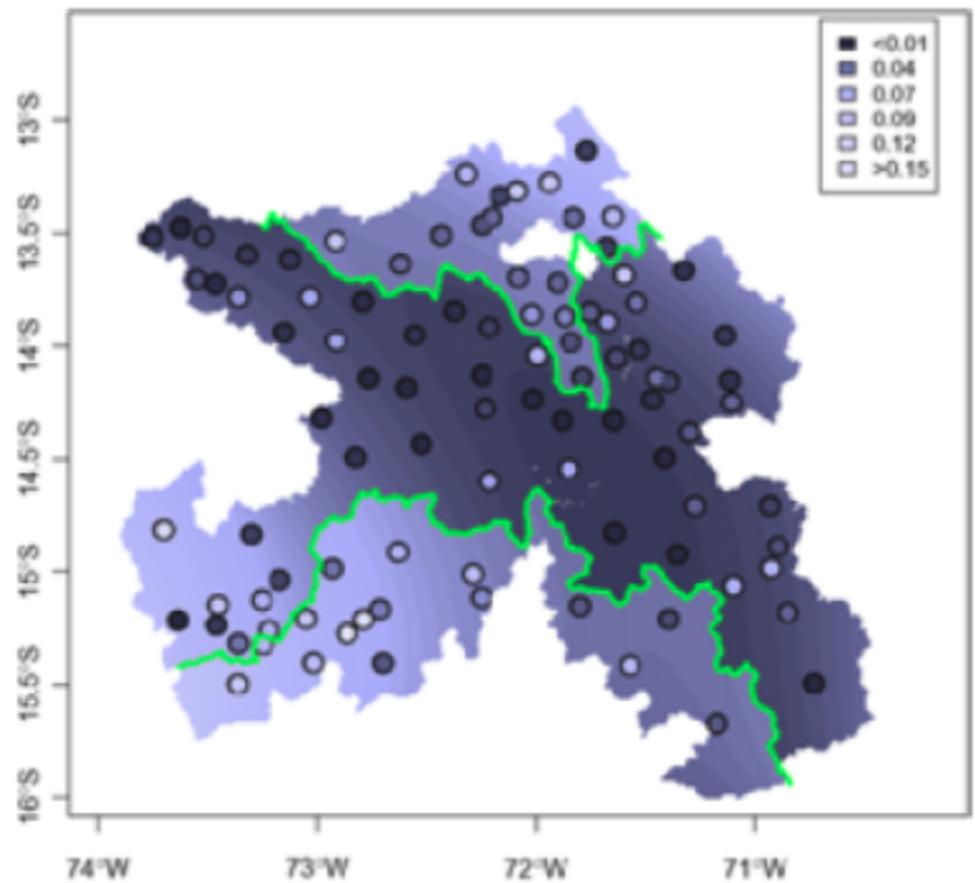
- Diagrams in next slides are analogous to standard two-dimensional plots with one forcing variable (x)
- Here two forcing variables (x-longitude) and (y-latitude)
- Mita region sandwiched between non-Mita regions to North and South.
- Dot size indicates # of observations in district (at capital location).
- Shading indicates predicted outcome variable. Cubic polynomial in lon-lat and the mita dummy.



(a) Consumption (2001)

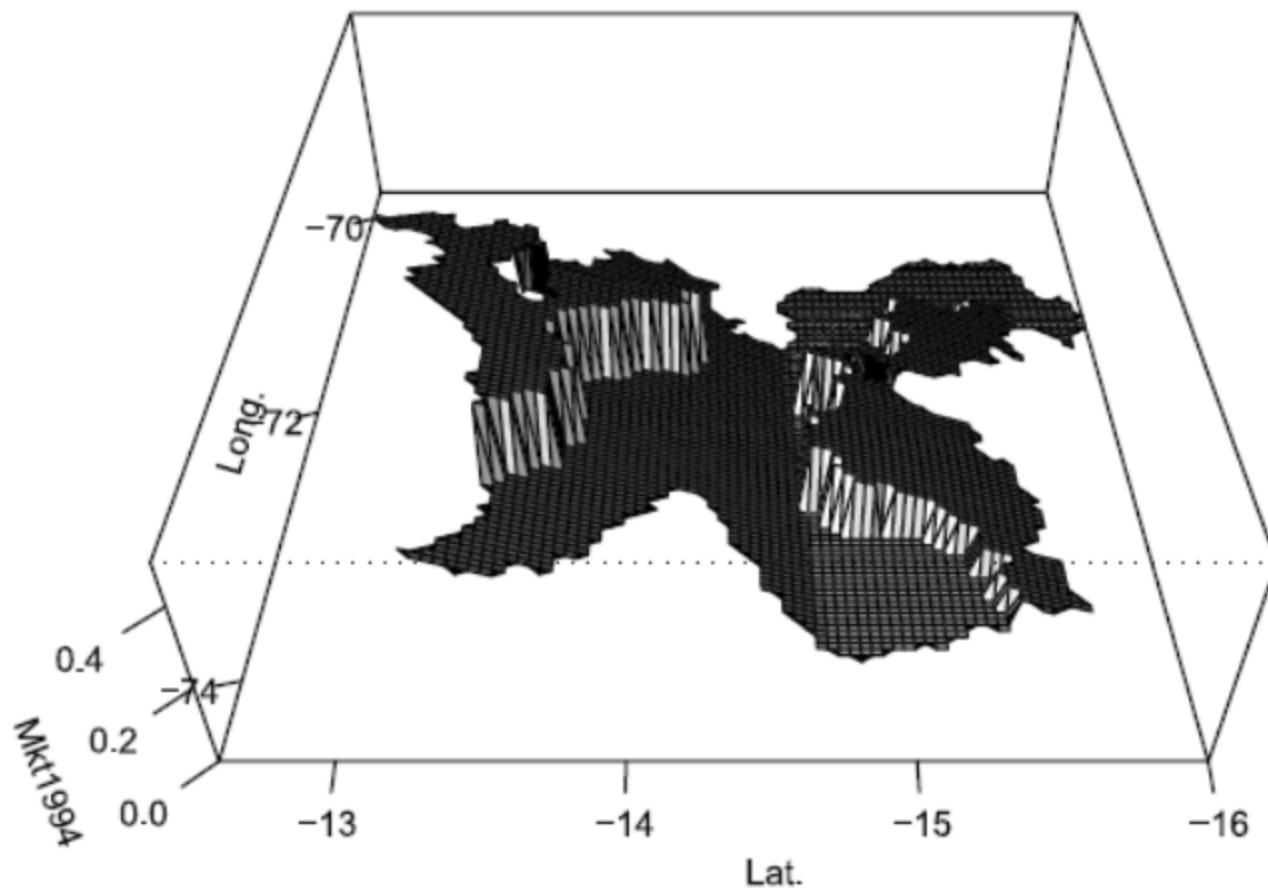


(b) Stunting (2005)



(f) Education (1876)

Market Participation



(j) Linear Polynomial in Lon-Lat

Channels of Persistence

- Land tenure
- Public Goods
- Market Participation

Land Tenure

- Peru was first parceled off into *encomiendas*. Right to collect tribute.
- Population falls rapidly due to disease and over-exploitation of labor, particularly in mining.
- *Mita* system partly effort to rationalize (1 in 7 ratio)
- *Haciendas* were discouraged in Mita areas to limit power of landlords politically and in labor market competition.
Haciendas secluded peasants from Mita.
- Much lower concentration of Haciendas in Mita areas.
- Unequal but secure property rights.

Land Tenure

- Mita abolished in 1812 as well as indigenous communal tenure that had been predominant.
- Did not replace it with enforceable peasant titling. Led to *hacienda* expansion through land grabs and violence.
- Peasant rebellions, banditry and livestock rustling, property insecurity.
- 1969 land reform dissolved *haciendas*. Much higher allocation of land to peasants outside *mita* catchment (20% of HH heads) compared to within (9%).

Public Goods

- More schooling and education attainment outside *Mita* areas measured in 1876, 1940. Not significant by 2001
- Greater road density in non-mita

Land property rights, origins, evolution and economic and political impacts

Institutions

Douglas North: Institutions

- "are the rules of the game .. the humanly devised constraints that shape human interaction ... structure incentives"
 - economic, political, social
 - formal and informal (norms, codes of behavior, conventions)
- "reduce uncertainty by providing a structure to everyday life"
- Differential performance of economies over time is fundamentally influenced by the way institutions evolve

North's sports analogy

- **Institutions:** like rules of the game in competitive sport
- **Organizations:** like teams
 - political (parties, village council), economic (firms, unions, cooperatives), social (churches, clubs, families?), educational
 - also provide structure.. but purpose is to 'win/advance interests' of team
 - are agents of institutional change

"The Central puzzle of human history:"

- to account for widely divergent paths of historical change and disparate performance

Diagram on next slide from Binswanger, Deininger, Feder (1995)

How to account for different property rights systems and production relations and trajectories from one form to another?

Land tenure and production relations: trajectories

Hunter-gatherer

Territorial rights to hunt and gather

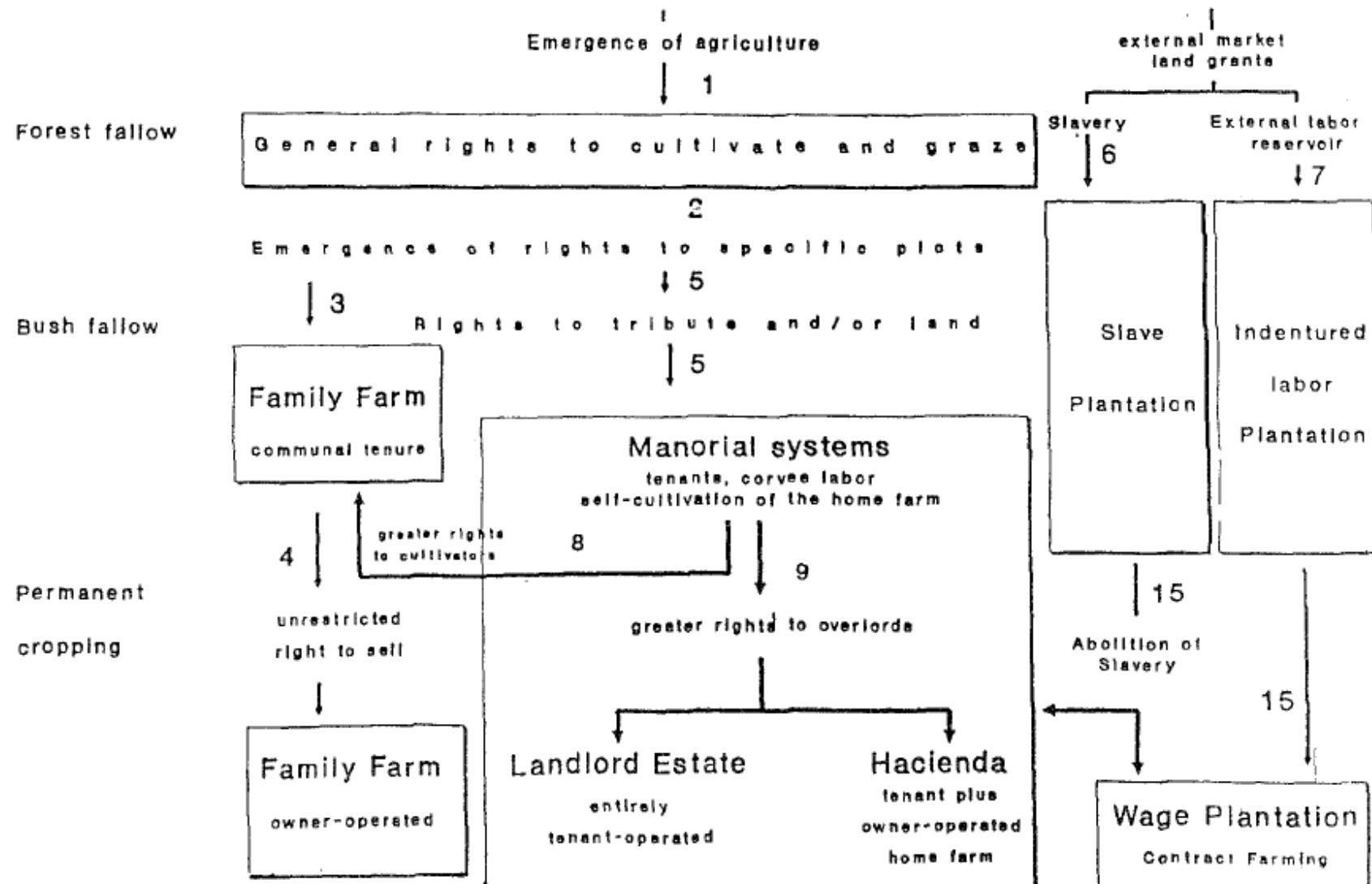
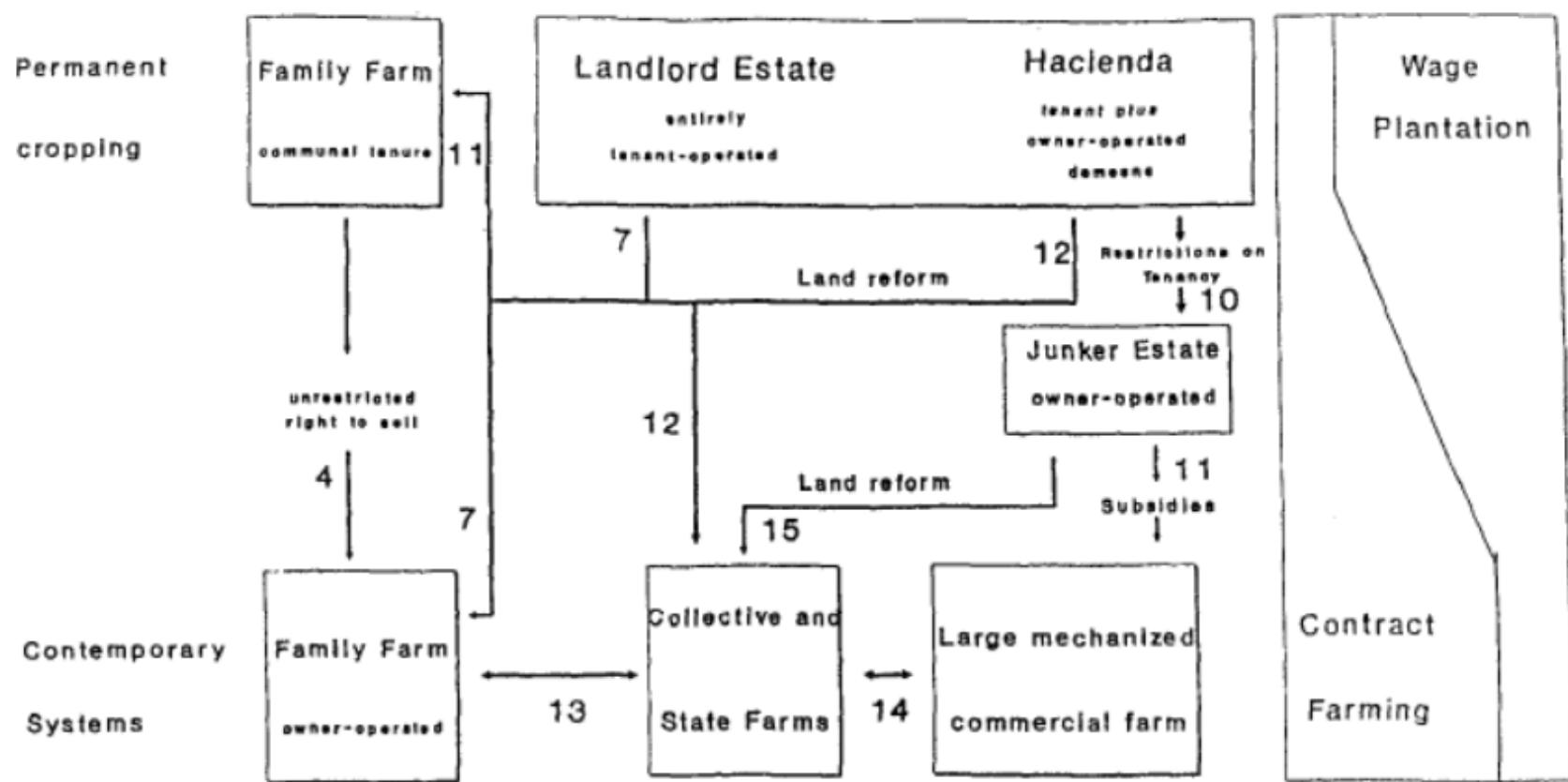


Figure 42.1. Evolution of production relations & property rights.



What drives institutional change?

In most accounts:

- changing relative factor scarcities (e.g. rising population)
- technological innovation and change
- new opportunities for trade, changing relative prices
- State capacity and power, constraints on the state.
- Imposed political and economic change (appropriation, coercion, tribute)

Evolutionary versus non-evolutionary approaches

- Evolutionary adaptions/innovations to take advantage of new opportunities. Emergent, spontaneous.
- Purposefully imposed reforms, enabling institutions
- Power balance between those who want to impose their interests and those who resist

Do institutions, property rights and land tenure systems evolve to organize production more efficiently over time? Or do dysfunctional institutions arise and persist?

Approaches to study of land institutions

- **Classical** (Smith, Ricardo, Mill...). Great attention to land.
- **Neo-classical** (marginalist revolution). Institutional and organizational problems black-boxed, land just one more factor.
- **New-institutional** (transactions costs; CDAWN -Coase, Demsetz, Alchian, Williamson, North). Institutions and contract forms shape incentives; evolve over time.
- **Marxian**: More conflict base model of institutional change. Appropriation and control.
- **Modern contracting** (Stiglitz, Holmstrom, Tirole, Hart). Property rights and contracting matter with asymmetric information.
- **Modern political economy** (later North, Acemoglu/Robinson, Engerman/Sokoloff and others). Institutions fundamental, shaped by political as well as economic interests.

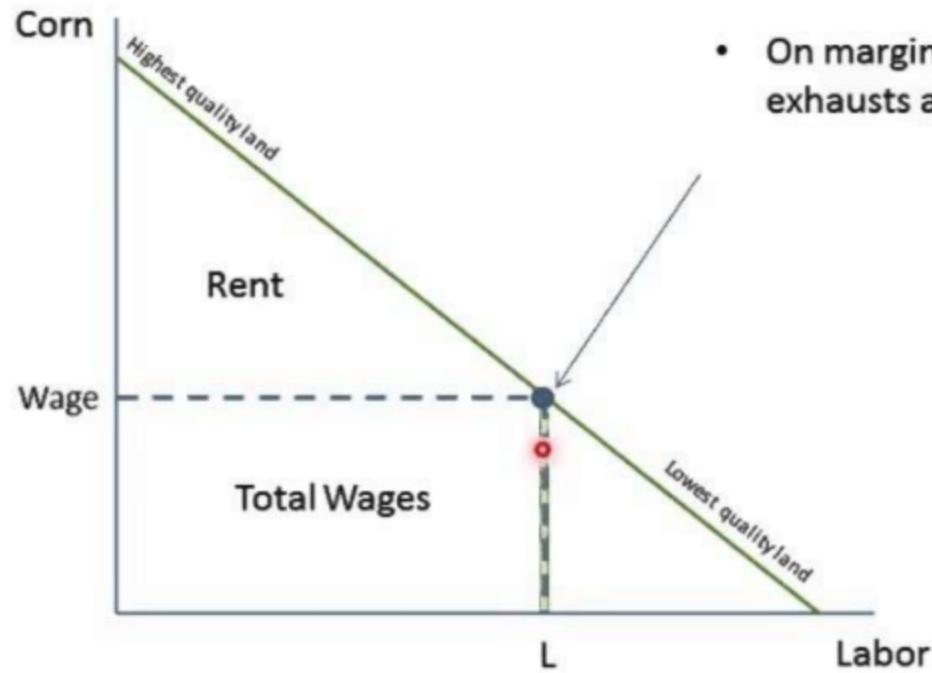
Classical economists on land rents, enclosure and incentives

How land ownership and contracts shaped incentives and divided output a central concern. Writing in 18th and 19th centuries:

- "landlords' right has its origin in robbery (Say)"
- "landlords...love to reap where they never sowed... demands a rent even for unimproved land... when the lease comes to be renewed.. the landlord commonly demands augmentation of rent [made by the tenant] (Smith)"
- "Those laws and customs so favorable to the yeomanry, have perhaps contributed more to the present grandeur of England, than all their boasted regulations of commerce taken together .. the security of the tenant is equal to that of the proprietor (Smith)"
- Marx on transformation of manoralism and enclosure. On Wakefield and land policy in colonies.

Ricardian Rent

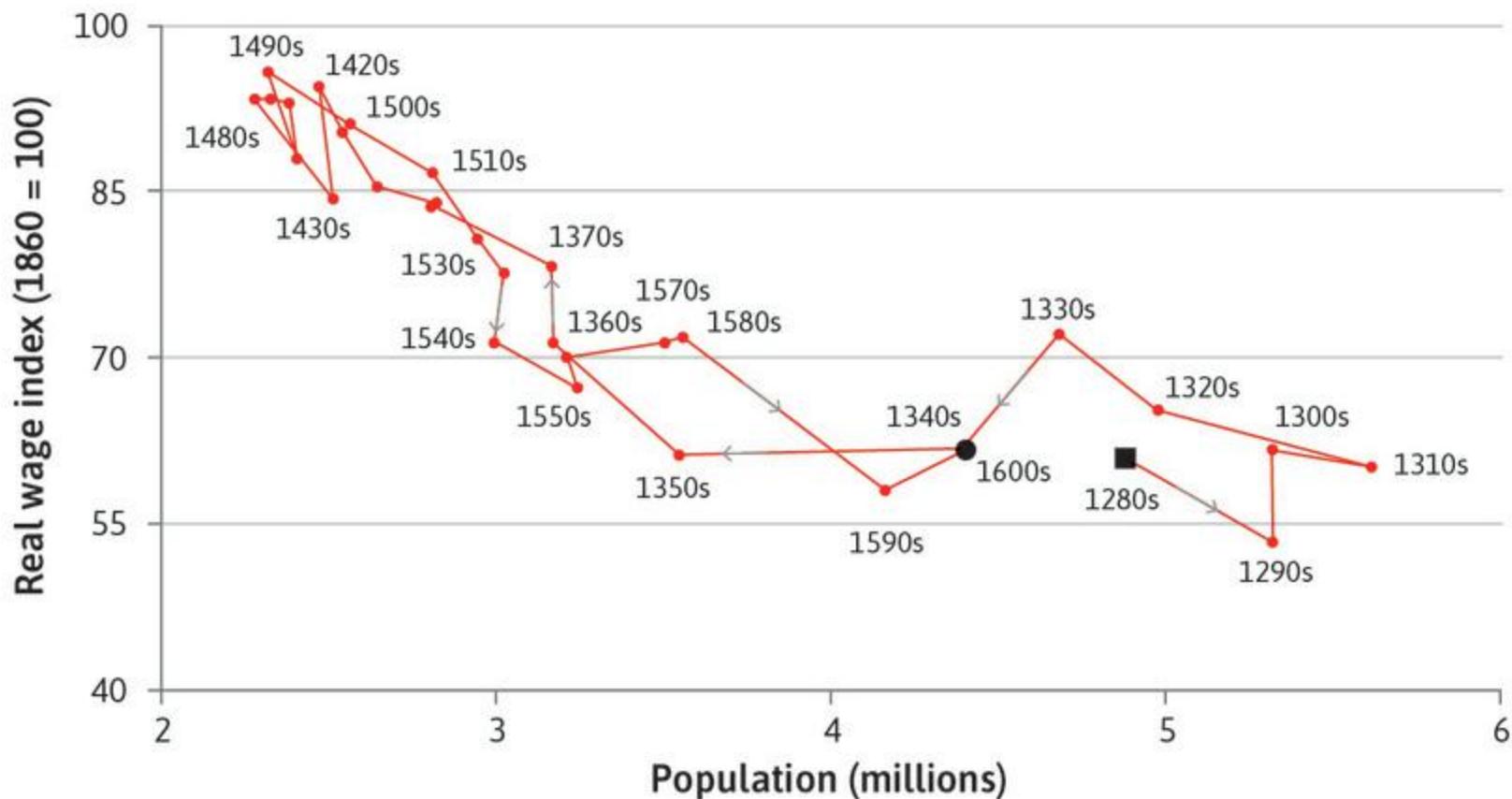
- Most fertile land used first.
- No 'rent' can be charged (above cost of clearing land) can be charged if worker can clear land of same quality on frontier
- Land rent zero on 'marginal' (last to be used) land so long as not-exhausted.
- Positive rent only on infra-marginal land. Rent charged for resource scarcity of higher fertility, better access/location.

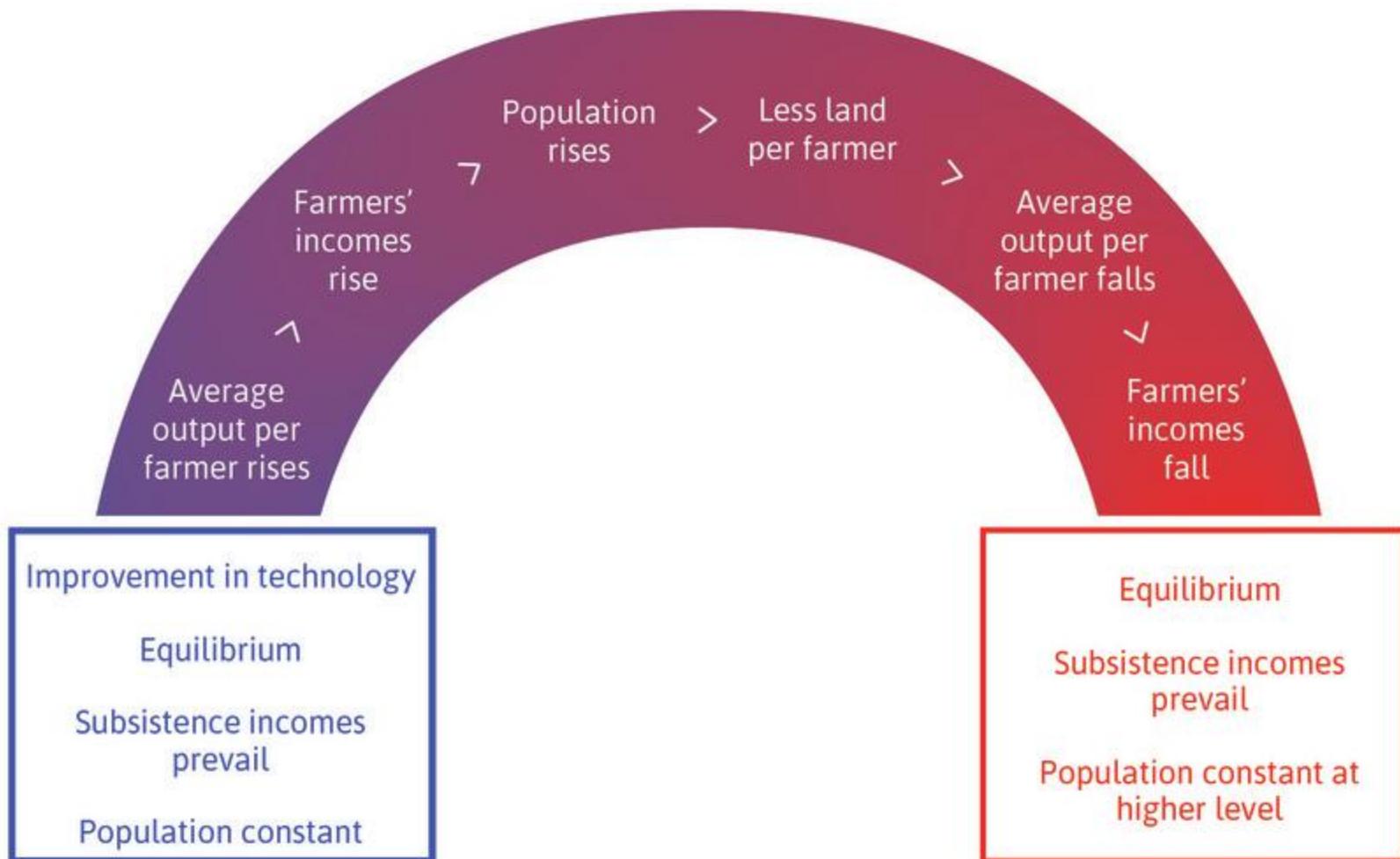


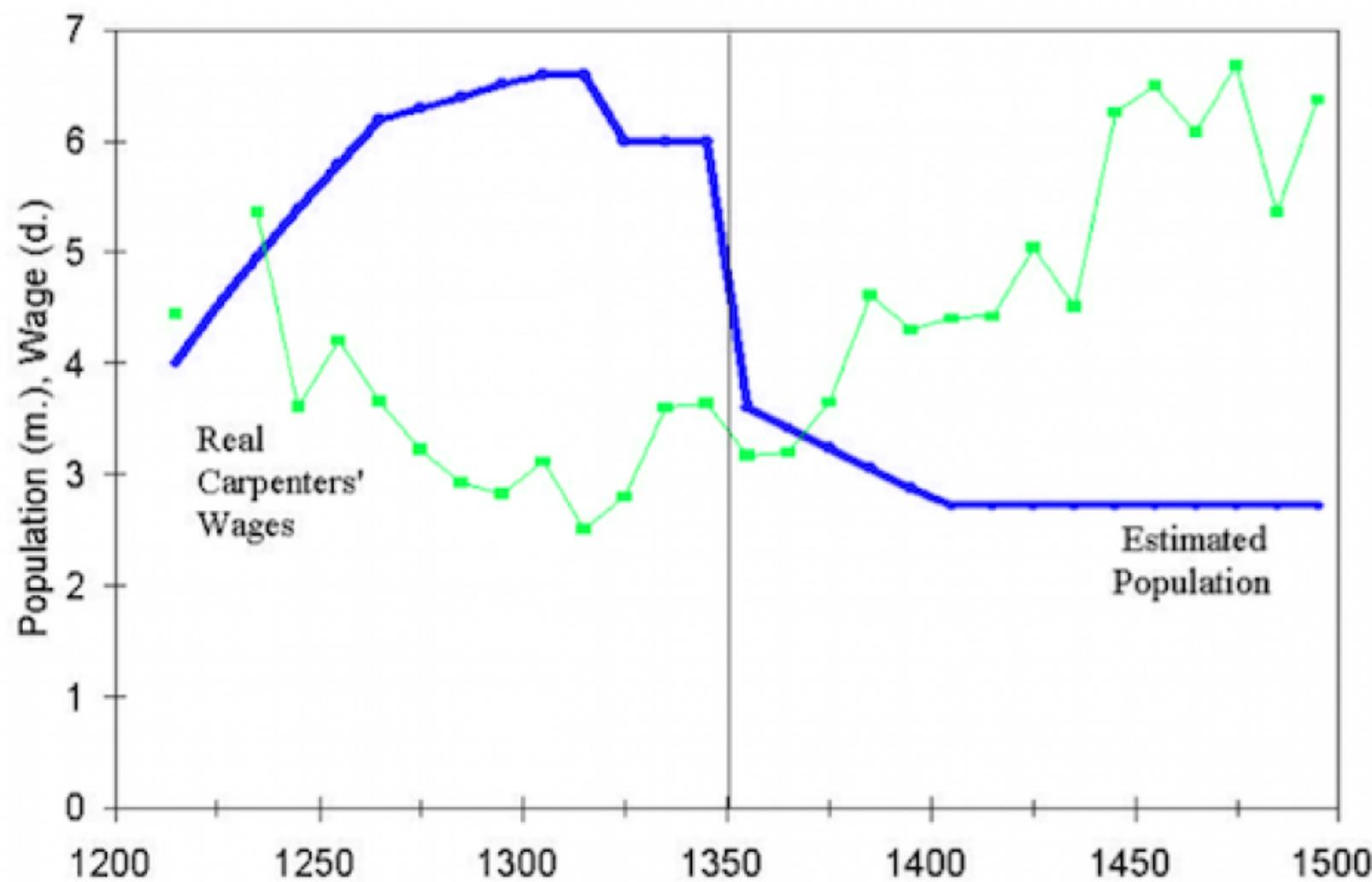
- On marginal land, rent is zero—wage exhausts all product.

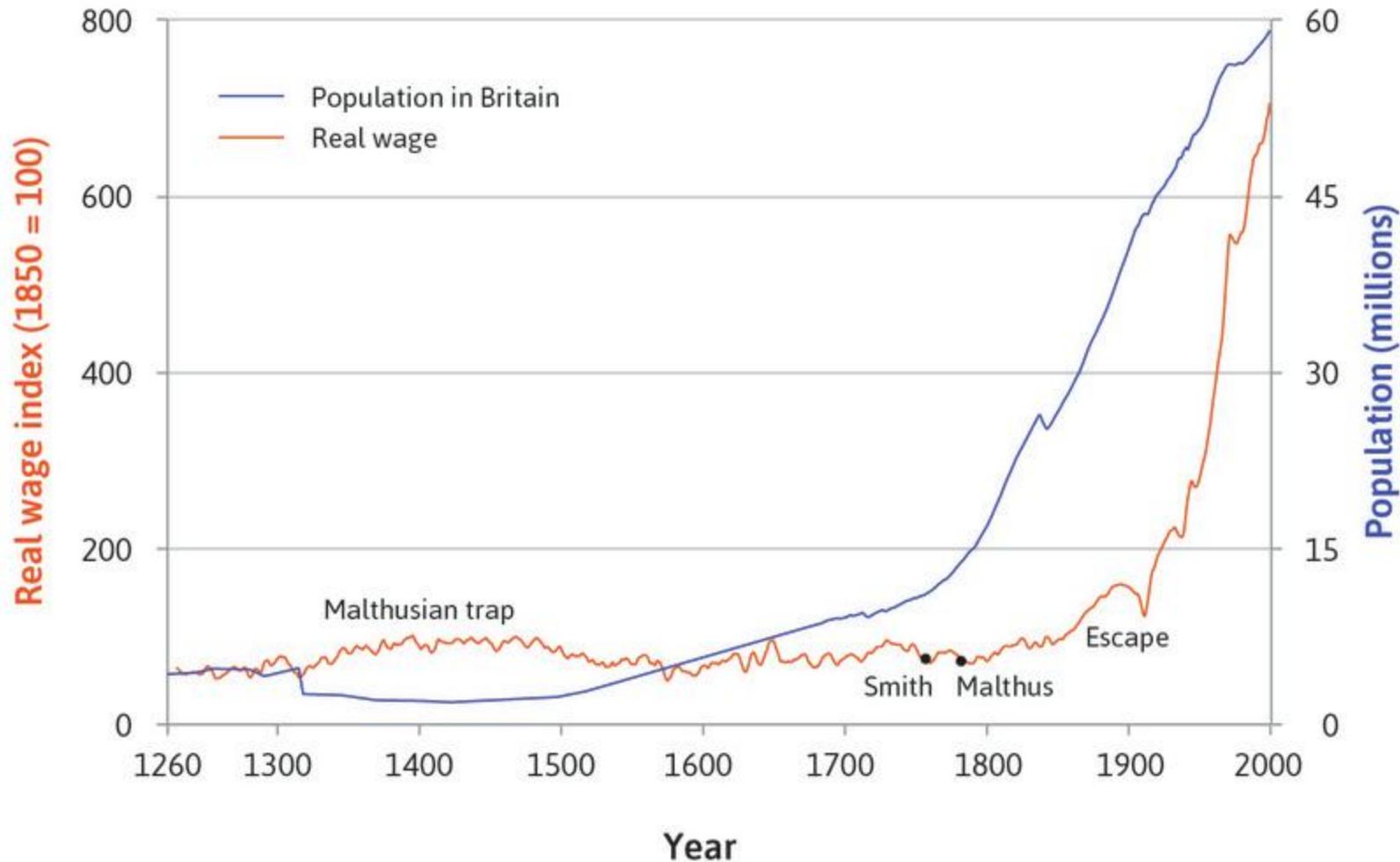
Ricardo, Malthus and diminishing returns

With technology fixed, rising population pushes against fixed land and other natural resources.









Ricardo and Malthus were contemporaries, Marx wrote in late 19th

What allowed this escape?

- Technology, industrialization. But what allowed those to happen
- Structural and institutional transformation
 - What role the transformation of customary land tenure and enclosures in Europe (much more below)?

Neo-classical approaches

Pareto, Walras, Jevons, Marshall. The marginalists.

- Land now treated more symmetrically with other factors
- Contracting and property rights problems assumed away

Neo-classical efficient allocation

- Under strong assumptions about technology and preferences and the perfect and costless enforcement of property rights: complete markets.
- **First-welfare Theorem** (Smith's 'invisible hand'): competitive market equilibria with complete markets will be Pareto efficient (*regardless of the initial distribution of property rights*).
- Abstracts away (assumes too much about) how property and contracts are enforced.
- Institutional and organizational detail erased . Firms are black boxes, contracts are all arms length.
- Claim that efficiency and equity considerations can be separated.

"Economics has gained the title 'Queen of the Social Sciences' by choosing solved political problems as its domain.'

Abba Lerner (1972) cited in Bowles and Gintis (1993)

New-institutional Economics

- Coase (1937) 'The Boundaries of the Firm', Coase (1960) "The Problem of Social Cost."
- "Transactions Costs" get in the way of trades. Views:
 - "Property Rights and Markets Paradigm": Institutions and organizations emerge/evolve to economize on transactions costs, capture potential gains to trade. Bad institutions are weeded out via process similar to natural selection (Alchian, Demsetz, early North).
 - Transaction costs may be hard to overcome (coordination, information, etc) so dysfunctional institutions may be slow to change.
 - Those with power try to shape institutions in their interests, may not be efficient.

Spontaneous order versus planning...

Customs are better understood as a living, negotiated tissue of practices which are continually being adapted to new ecological and social circumstances—including, of course, power relations. Customary systems of tenure should not be romanticized; they are usually riven with inequalities based on gender, status, and lineage. But because they are strongly local, particular, and adaptable, their plasticity can be the source of microadjustments that lead to shifts in prevailing practice.

Scott, James C. *Seeing Like a State*, p.34

The Emergence of Property rights to Land

Coase and the Property Rights and Markets paradigm

- Property rights emerge when they become worth enforcing
- Rising land scarcity leads to better definition of rights; over time leading to accessible sale and rental markets
- Perhaps empirically true in some cases, clearly not in others.
- Important grain of truth worth understanding.
 - Why does it fail to happen.

When land is abundant control over labor

- Critical issue is access to labor, not land.
- Little incentive to invest in soil fertility (restored naturally through long tree fallow)

"When population densities rise, fallow periods ...shortened until the land is continually cultivated. Then plows, manure, artificial fertilizers, and other investments and labor intensive methods ...required to maintain soil fertility ... [m]arginal lands ...brought under cultivation requiring higher investments... Only now, ownership security becomes and important incentive

Boserup, 1965, quoted in Binswanger, Deininger Feder (1995)

Transformation of land tenure systems in response to rising population pressure (Boserup)

'Before the emergency of private property in land...certain families are recognized as having cultivation rights within a given area...

Members 'general cultivation right to cultivate a plot inalienable ...but after lapse of normal period of allow if family does not re-cultivate a given plot, it may lose its right to this particular plot ... As long as forest-fallow cultivators has abundant land ...shift to new plot or have it allocated by the chief of the tribe...'.

Boserup (1965) cited in Binswanger, Deininger, Feder (1995)

Otsuka, Keijiro, and Frank M. Place. 2001

"Issues and Theoretical Framework", *Land Tenure and Natural Resource Management: A Comparative Study of Agrarian Communities in Asia and Africa*. IFPRI & Johns Hopkins University Press.

Synthesis evolutionary model of farming systems & induced technical change

In a book with chapters on Ghana, Malawi, Uganda, Nepal, Sumatra, Vietnam and Japan. Property rights institutions or land tenure systems:

- communal, state, common-property, individual
- As population grows and markets penetrate demand for individual property rights grows, communal and state ownership may face serious difficulties.
- Not clear that making private property is always preferable (e.g. negative externalities like soil erosion may intensify, inequity may rise, costly defense)

Model elements

Endowments, technology and choice of techniques

- territory-wide endowment of land \bar{T} and labor \bar{L}
- $F(T, L)$ assume CRS or linear homogenous at first
 - isoquant and choice of technique
 - iso-cost lines
 - cost-minimization

Technology vs. choice of technique

$$F(T, L) = A \cdot T^\alpha L^{1-\alpha}$$

Simplify to two groups of identical farmers

Land T : includes 'fallowed lands'. Fallow land is not unused.

If population is scarce and land abundant little incentive to claim individual property rights. Forest area use is unrestricted except exclusion of outsiders.

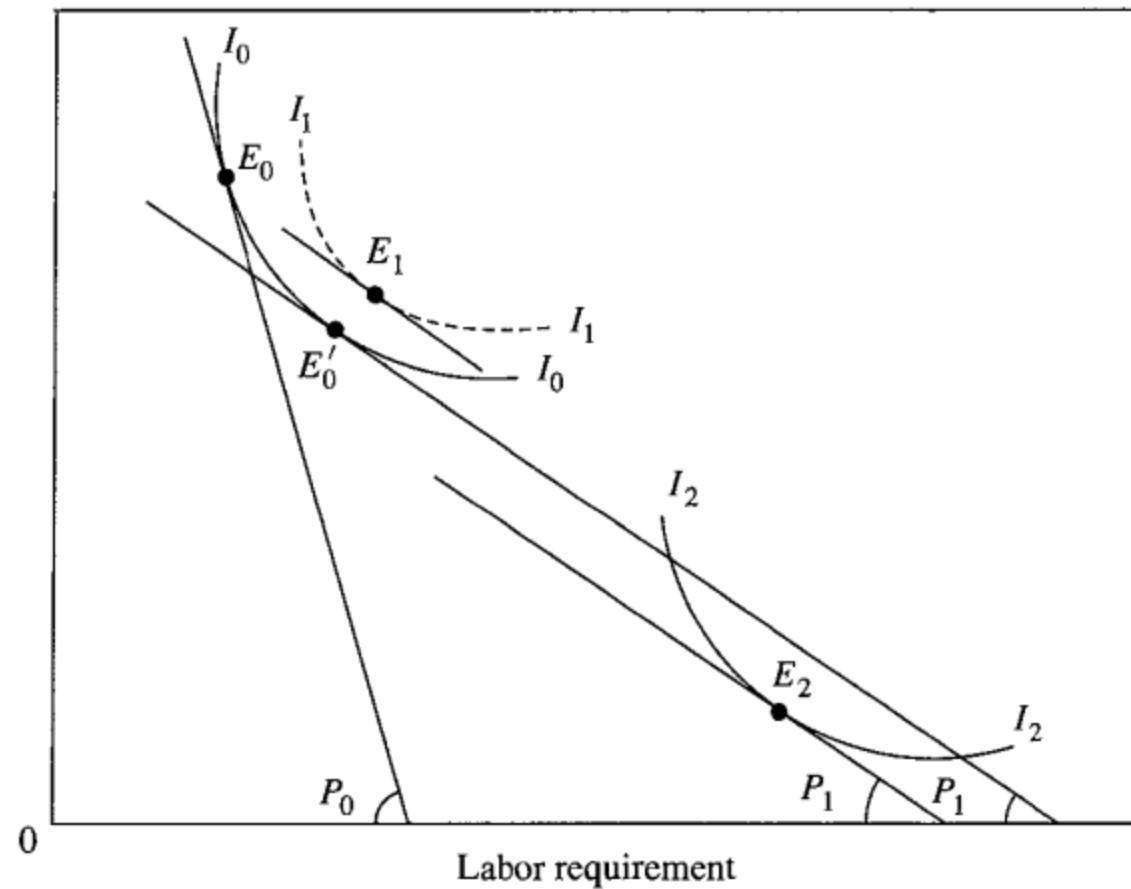
Usufruct rights of individual members are well establish for cultivated fields but less so for fallow. Community chief may determine its allocation

Diagrammatic analysis

- Homogenous production functions, properties.
- Isoquant and isocost lines
- A as total factor productivity and land quality parameter
- Planner and competitive market first order necessary conditions (FOC) for efficient allocation
 - Appropriate choice of technique
 - Equilibrium (shadow) wage-rental
 - Edgeworth Box

FIGURE 1.2 A model of induced institutional innovation

Land or natural
resource requirement



(On Chalkboard)

- Effect of rising population density
 - Change to Edgeworth Box
 - Change in equilibrium efficient choice and shadow w/r
 - Shorter fallowing → declining land productivity

Without technological/institutional change commercialization accelerates process placing pressure on most elastic factors (land, resources)

Efficient/Sustainable responses:

- improve land quality by investing in irrigation or terracing
- investing in commercial trees (cocoa, coffee, rubber, etc). To maintain soil fertility under continuous cultivation new farming systems with composting and other organic and inorganic fertilizer.
- Viewed as *new* more labor intensive production technology
- Depict new technology as more profitable

Land tenure system adaptation for sustainability

- restricted transfer rights and not totally secure usufruct rights under traditional land tenure may lower expected returns to investment.
 - Fear may not reap full benefits of investment or inability to bequeath to desired heirs or sell land freely if need arises.
- Establishment of clearer common property for degraded secondary forests

Why institutions may fail to adapt

Will technological and institutional change toward greater individual security to promote conservation or investment take place, or will we see continued resource degradation?

Factors that may inhibit

- high cost of investments, or poor returns
- difficulties in organizing collective actions
- high transaction costs
- legal restrictions (e.g. nationalization of forests, granting leasehold/freehold to large holders, suppression of tenancy contracts)

Coase, Property rights and the 'Coase Theorem'

Coase, R. H. 1960. "The Problem of Social Cost." *The Journal of Law and Economics* 3:1–44.

Coase, Ronald H. 1937. "The Nature of the Firm." *Economica* 4 (16):386–405.

(Also see jupyter notebook on Coase)

Coase (1960): A rancher and wheat farmer

On adjacent fields. No fence.

The Wheat Farmer

The wheat farm chooses inputs for a maximized profit of $\Pi_W = 8$.

- to things simple assume this all or nothing choice.

The Rancher

Chooses herd size x to maximize profits:

$$\Pi_C(x) = P \cdot F(x) - c \cdot x$$

P is cattle price and c is the cost of feeding each animal.

FOC for optimal herd size x^* : $P \cdot F'(x^*) = c$

If $F(x) = \sqrt{x}$, FOC are:

$$\frac{P}{2\sqrt{x}*} = c \rightarrow x^* = \frac{P^2}{4c^2}$$

Example: If $P_c = 4$ and $c = 1$

the rancher's privately optimal herd size: $x^* = 4$

The external cost

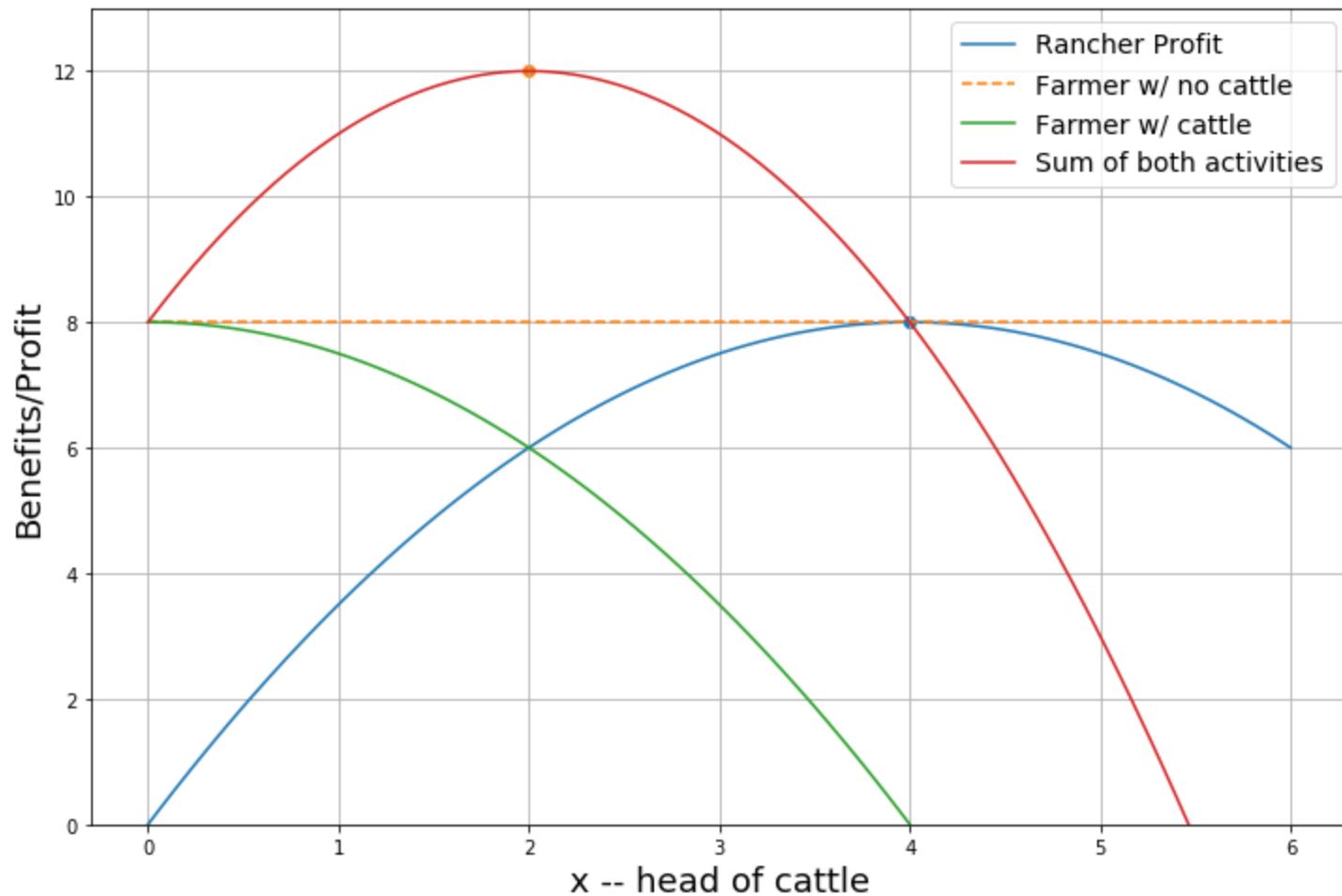
No effective barrier between fields so cattle can stray into wheat farmer's fields, damaging crops and profits.

Specifically, herd of size x reduces net wheat profits to:

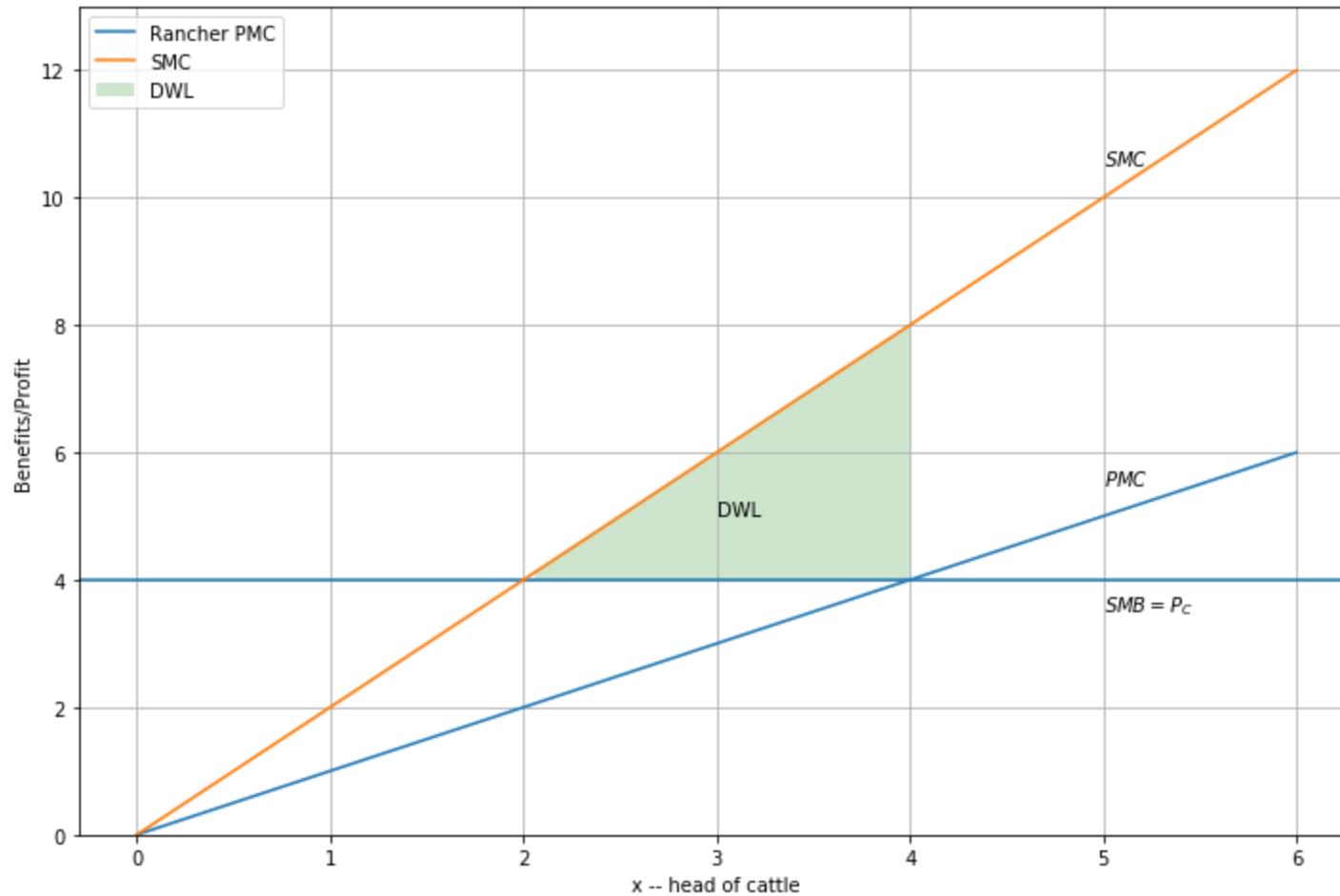
$$\Pi_W(x) = \Pi_W - d \cdot x^2$$

Suppose $d = 1$.

At ranchers private optimum $x^* = 4$ wheat profits are zero.



As private social marginal benefits and costs to see DWL:



Assigning Property Rights

Who is causing harm to who?

The cattle damages crops but if we prohibit all cattle then rancher is harmed.

Assignment of liability equivalent to assigning property rights

Useful to think of tradable permits to graze +1 head cattle

Case 1: Property Rights to the Farmer

Farmer has right to enjoin cattle herding (prohibit via an injunction).

Rancher now earns \$0. Farmer \$8.

This is not Pareto efficient.

If rancher herded just 2 would earn \$6. Could offer \$2 compensation to the wheat farmer and capture $\$6 - \$2 = \$4$.

...or they could bargain to divide the gains to trade of \$4 in other ways.

Case 2: Property Rights to the rancher

Rancher has right to graze with impunity.

Farmer earns \$0 if rancher herds at private optimal of 4 cattle.

This is not Pareto efficient.

Farmer pay \$2 to have rancher reduce herd by 2 leaving rancher no worse off but raising farmer earnings from \$0 to \$4 (= 6-2).

...or they could bargain to divide the gains to trade of \$4 in other ways.

The 'Coase Theorem'

With zero transactions costs :

- The initial assignment of property rights does not matter:
The parties bargain to an efficient outcome either way.
- However legal rights are valuable, so *the initial allocation will affect the distribution of benefits and incomes between parties*
- The farmer might 'buy out the rancher" (or vice-versa) to create a larger single firm that internalizes the costs.

Creating Property Rights

The emergence of property rights: Even if there were no initial assignment of property rights the parties would create them by negotiating to establish an efficient outcome.

Creating tradable legal-entitlements to complete markets. Restore efficiency.

When transactions costs are positive

- With zero transactions costs property rights gravitate to who values them most.
- With positive transactions costs this may not happen. Hence the initial allocation of property rights can affect the efficiency of the outcome.
- Simple example: suppose rights to herd cattle are issued but cannot be traded due to high transactions costs. If allocate all rights to rancher then social output is below allocation where allocation is 2 and 2.

Coase and the development of a land market

Two scenarios:

1. Open frontier: where land is still abundant
2. Congestion or Land Scarcity.

A stylized system of "customary tenure"

An open field and no land market.

Under what we will call 'customary law' land is allocated to person with more status in village. They can clear as much land as can 'productively use'.

The other villager obtains access to remaining land or as much land as they can profitably use.

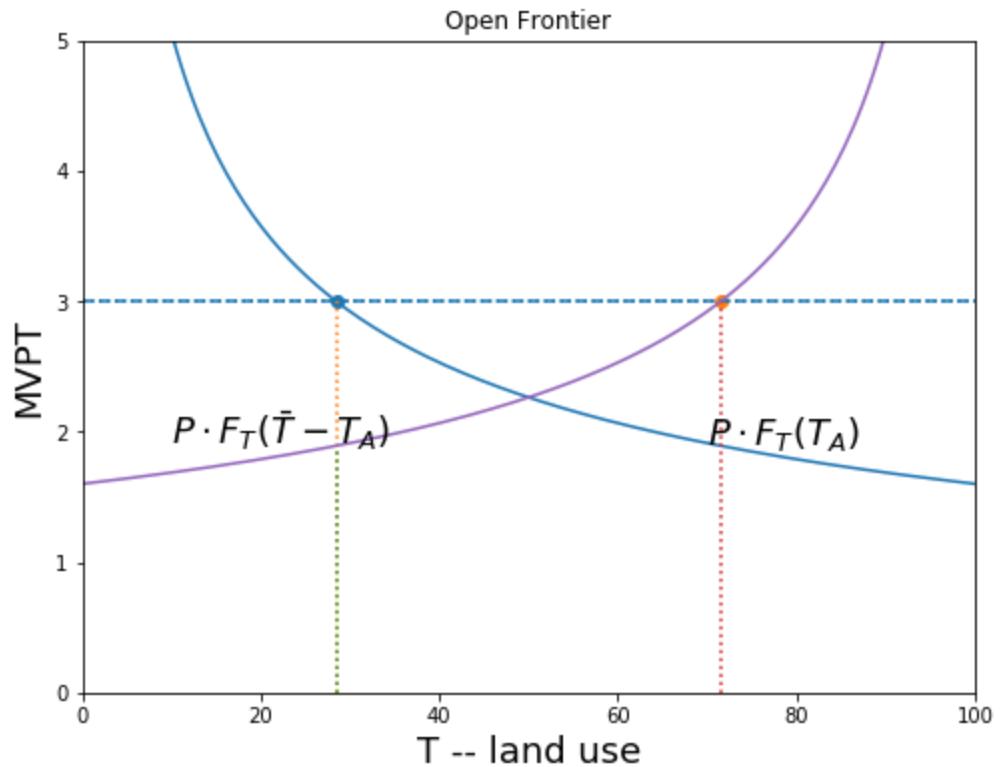
Land abundance or non-congestion

\bar{T} units of land and $N=2$ households.

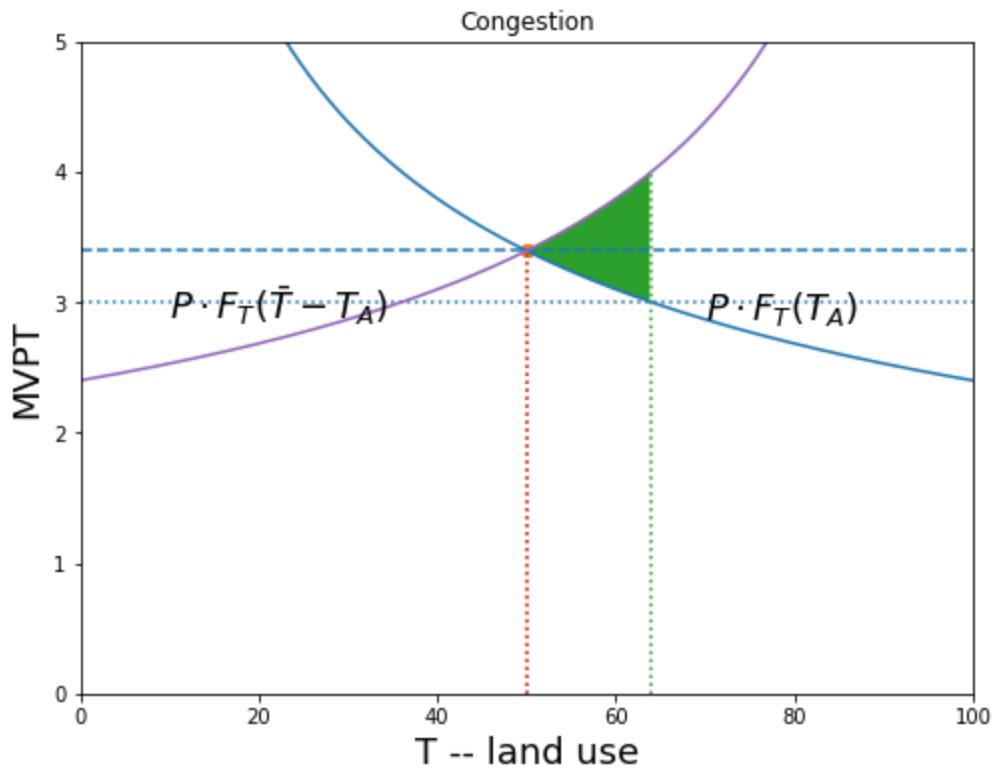
Land clearing cost c . Frontier land not yet exhausted.

Each farmer will maximize profits at $P \cdot F_T(T) = c$

No land rent (above cost of clearing land)



Congestion/land scarcity



- Why is the initial allocation inefficient?
- How do we calculate deadweight loss?
- What kind of bargains can farmer B offer to farmer A (or vice-versa)?
- How would a land market work?
- What 'transactions costs' might stand in the way of such a solution?

The 'Coase Theorem'

Costless bargaining between the parties will lead to an efficient outcome regardless of which party is awarded the rights?

Here farmer B can offer to pay farmer A to rent out the land farmer A has claimed. Emergence of a land market.

Initial assignment of land rights does not matter... those who value rights more highly will be willing to compensate those who value them less to transfer the rights to highest value use.

Coase Theorem: True, False or Tautology?

Tautology?: "if there are no costs to fixing things, then things will be fixed."

Like the First Welfare Theorem (complete competitive markets will lead to efficient allocations, regardless of initial allocation of property rights).

The Coase Theorem 'works' by assuming new legal entitlements can be created and made tradable.

Key issue to which we return: If land is secure and tradable and 'small family farm' is most efficient operational size (issue we examine later) then a large landholder would have rental tenants rather than farm themselves.

With transactions costs, initial property assignments matter

Transactions costs in the land rental market:

- asymmetric information about plot characteristics
- fear that tenant will 'squat' and not pay rent/return land
- under some forms of customary farmer A may fear that rental to B will be viewed as evidence that A does not need as much land. A earns more by farming inefficiently than by giving up claim

Under insecure property rights as above then initial 'property rights' assignment matters (more output if A and B gets original assignment)

Land tenure and enclosure in Europe

Manorial Estates, open field system and customary tenure

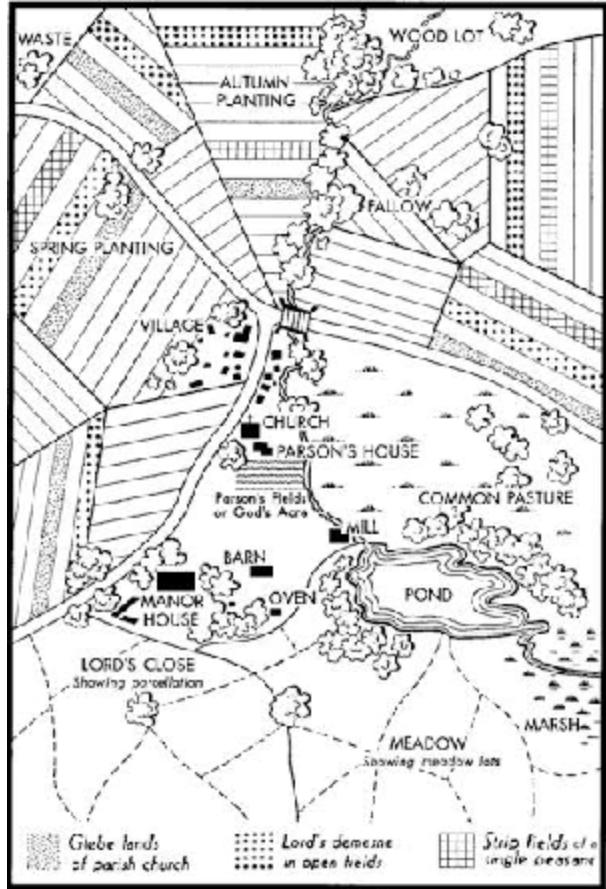
- Open-field system prevalent throughout Europe during middle age. Up to 20th century in many parts of Western Europe, Turkey, Iran.



source

The open field system

- Manor or village had 2-3 large fields divided into long narrow strips (or selions) cultivated by tenants or serfs.
- Lord levied rents and demanded labor service for own demesne land.
- Peasants customary use rights to cropland and common land.
- elaborate laws and controls, partly set by Lord and partly by tenants regulated planting, harvest, and pasturing. Inheritable usufruct rights, rights to commons, strip rotation, grazing rights
- Variations around similar forms around the world: e.g. Russia, Turkey, Western Europe.



Enclosure Movements

- Legal process of consolidating communal fields, meadows, pastures and other commons lands into individually owned and managed plots.
- In England from 12th century to end of 19th. In most of rest of Europe mostly in 19th century and into 20th century.
 - Landlords appropriated public lands for own purposes
 - In England alone more than 800 Parliamentary acts to consolidate properties.

Triumphant interpretations

- Led to agricultural Revolution and Industrial Revolution
 - Land markets led to more efficient use, crop yields increased
 - Rising gentry 'improving capitalists'.
- Civil War... Constraints on the King, Rise of Democracy
- Structural change: peasant proprietors and serfs to 'free'urban wage-laborers

Natural Experiment: dissolution of monasteries

Heldring, Robinson, Vollmer. 2015. "Monks, Gents and Industrialists: The Long-Run Impact of the Dissolution of the English Monasteries." Working Paper 21450. National Bureau of Economic Research. ([link](#))

- Long-run impacts of Dissolution of the English monasteries in 1535
- Tawney (1941) thesis that led to 'rise of gentry' tied to commercialization of agriculture and location of industrial Revolution.

- Monasteries controlled large portion of lands in late medieval period.
 - No effective land market.
 - Feudal privileges, customary tenure
- in 1530s Henry VIII expropriated and then sold off enormous estates

Table 1: Distribution of Landownership in England in 1436 and 1688: Percentages of cultivated land owned

	1436	1688
Aristocracy and greater gentry	15-20	15-20
Middling and lesser gentry	25	45-50
Yeomen, family farmers and other small owners	20	25-33
Church & Crown	25-35	5-10

Notes: Adapted from Clay (1986, p. 143)

Natural Experiment: How did plausibly exogenous geographic variation in institutions (land markets) affect long run outcomes:

- Digitized the 1535 Valor Ecclesiasticus (locations and values)
- Outcomes: areas with more land converted from monasteries
 - had more non-noble farm gentry (1680)
 - Agricultural revolution
 - Wheat yields 1836
 - Agricultural patents
 - land enclosures 1750-1840
 - Industrial revolution (more Mills in 1838)

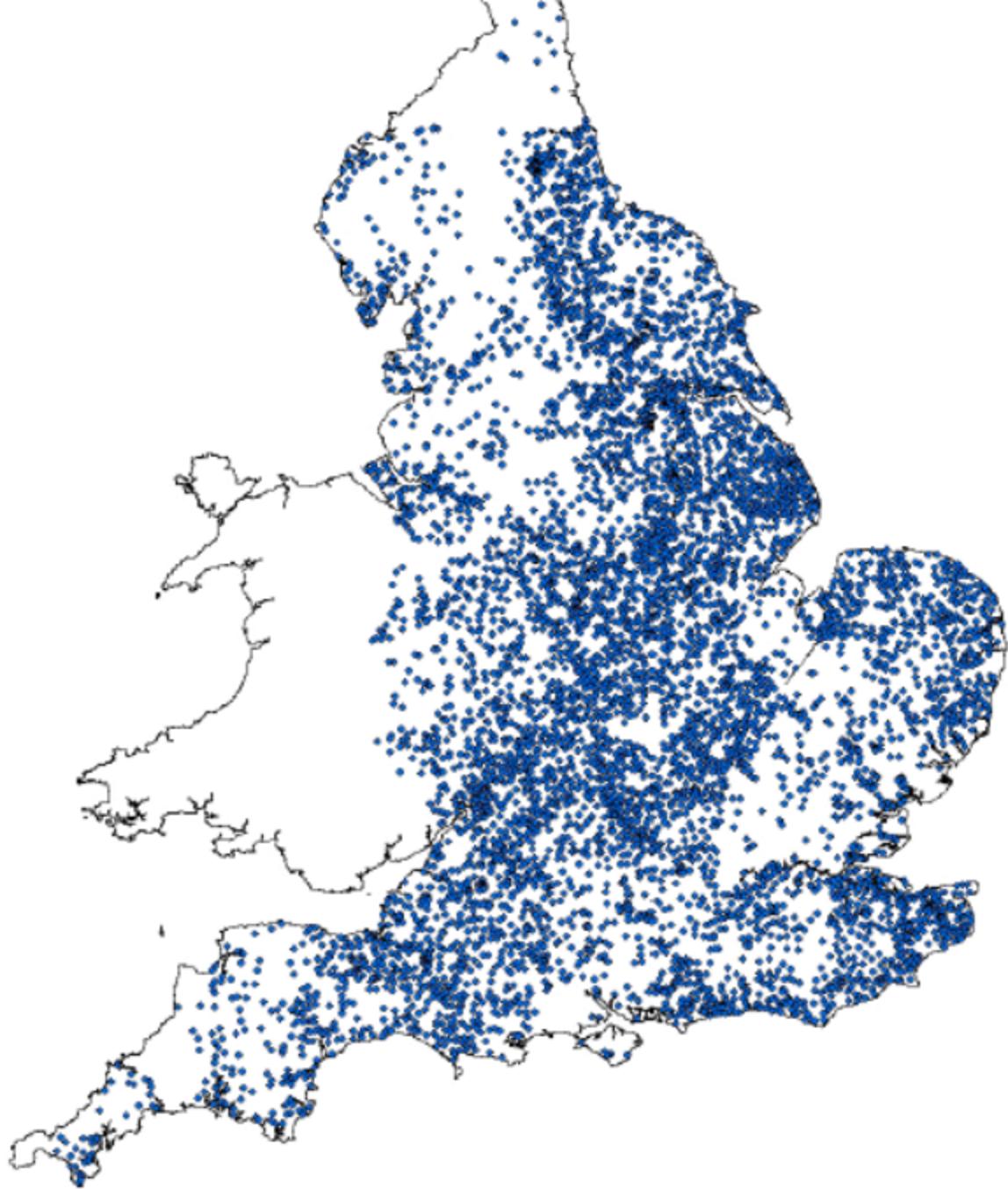


Figure 3: Spatial distribution of Monastic property. One dot indicates at least one monastic property in 1535.

$$y_p = \gamma_f + \alpha_M \cdot M_p + \alpha \cdot X_p + \epsilon_p$$

- y_p is parish level outcome
- γ_f county or 'hundred' fixed effects
- X_p controls (physical area, soil, 1524 tax levy, distance to nearest town, etc)

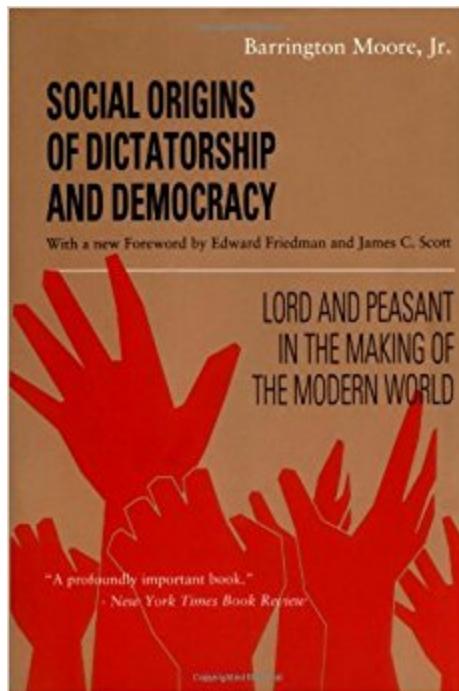
Enclosure and dispossession

Stop to consider how the so-called owners of the land got hold of it. They simply seized it by force, afterwards hiring lawyers to provide them with title-deeds. In the case of the enclosure of the common lands, which was going on from about 1600 to 1850, the land-grabbers did not even have the excuse of being foreign conquerors; they were quite frankly taking the heritage of their own countrymen, upon no sort of pretext except that they had the power to do so.[35]

George Orwell in 1944:

That the violence and coercion which produced these results took place over a long space of time, that it took place mainly within a framework of law and order and helped ultimately to establish democracy on a firmer footing, must not blind us to the fact that it was massive violence exercised by the upper classes against the lower.

Barrington Moore



Long run impact of Colonial Land Tenure Systems in India

Banerjee, Abhijit, and Lakshmi Iyer. 2005. "History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India." *American Economic Review* 95 (4):1190.

Historical Accidents placed colonial India under two different land tenure and revenue collection systems:

1. Landlord based revenue system (*Zamindari*). Permanent-settlement, large landlord revenue collectors.
2. Individual Cultivator based (*Raiyatwari*) . Tax paid directly or via village body.

Evidence that English often mistook local (non-landlord) chieftains for landlords in many areas... inadvertently creating larger landlords!

John Stuart Mill worked for East India company, ideas favored cultivator system on incentive grounds.

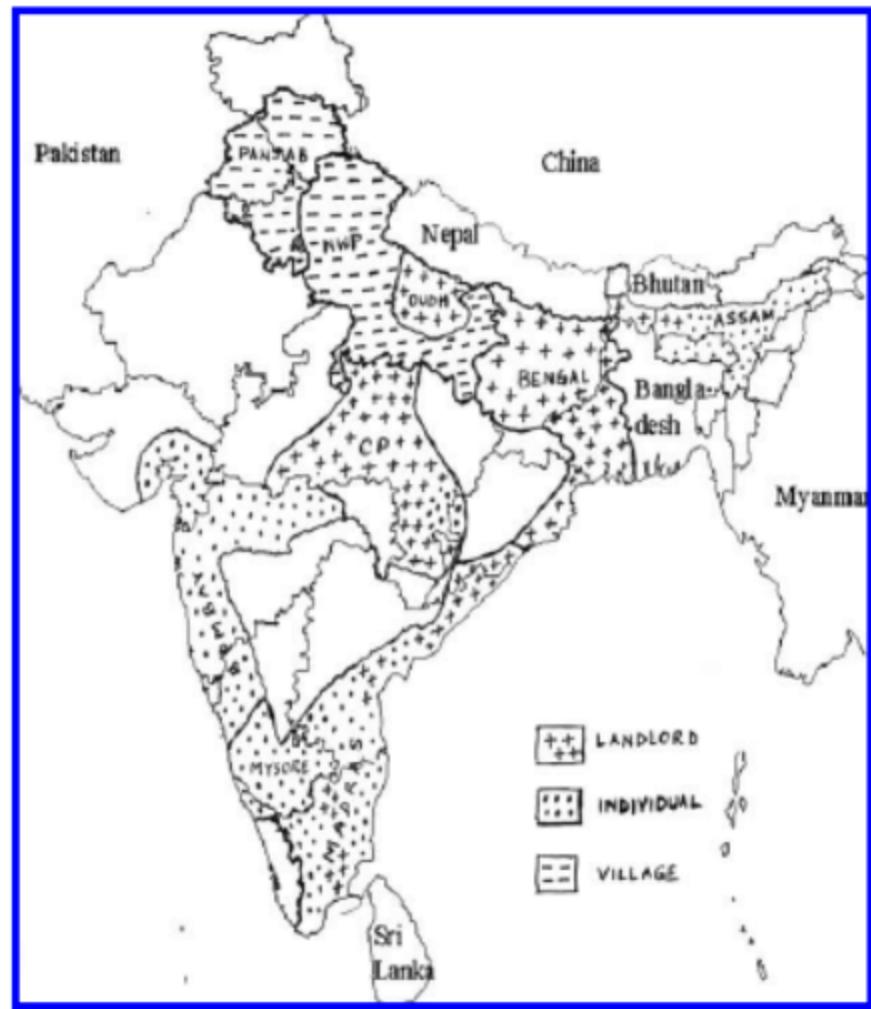


FIGURE 1. MAP OF INDIA

Methods and Findings

- Compare modern day measures in areas historically under different regimes on either side of boundaries. Instrument for conquest date. Balanced.
- **20th century outcomes. In cultivator regions:**
 - Higher yields (~16%) and investments, higher adoption of HYV seeds

Authors attribute differences to political economy (landlord dominated areas spend less on development, more conflict) and insecurity of tenant property rights in landlord areas.

Summing up thus far

- Benchmark models of efficient allocation and induced innovation
 - Effects of rising population pressure on optimal choice of technique and mix of production technologies
 - farming tenure adaptations needed to support such adaptations.
 - potential development and operation of land rental market
- Transactions Cost and Coasian theories of institutional change
 - when insecurity and transactions costs prevail 'wrong' initial assignment of property rights can have lasting impacts
- Some historical evidence that conflict, appropriation shape ownership in concentration sometimes associated with worse

Claimed impacts of more secure land property rights

- Investment demand response
- Less resources to appropriation and conflict
- Credit Supply response
- Other Gains to Trade and improved resource allocation

Figure 1a: standard presentation of expected impacts from titling

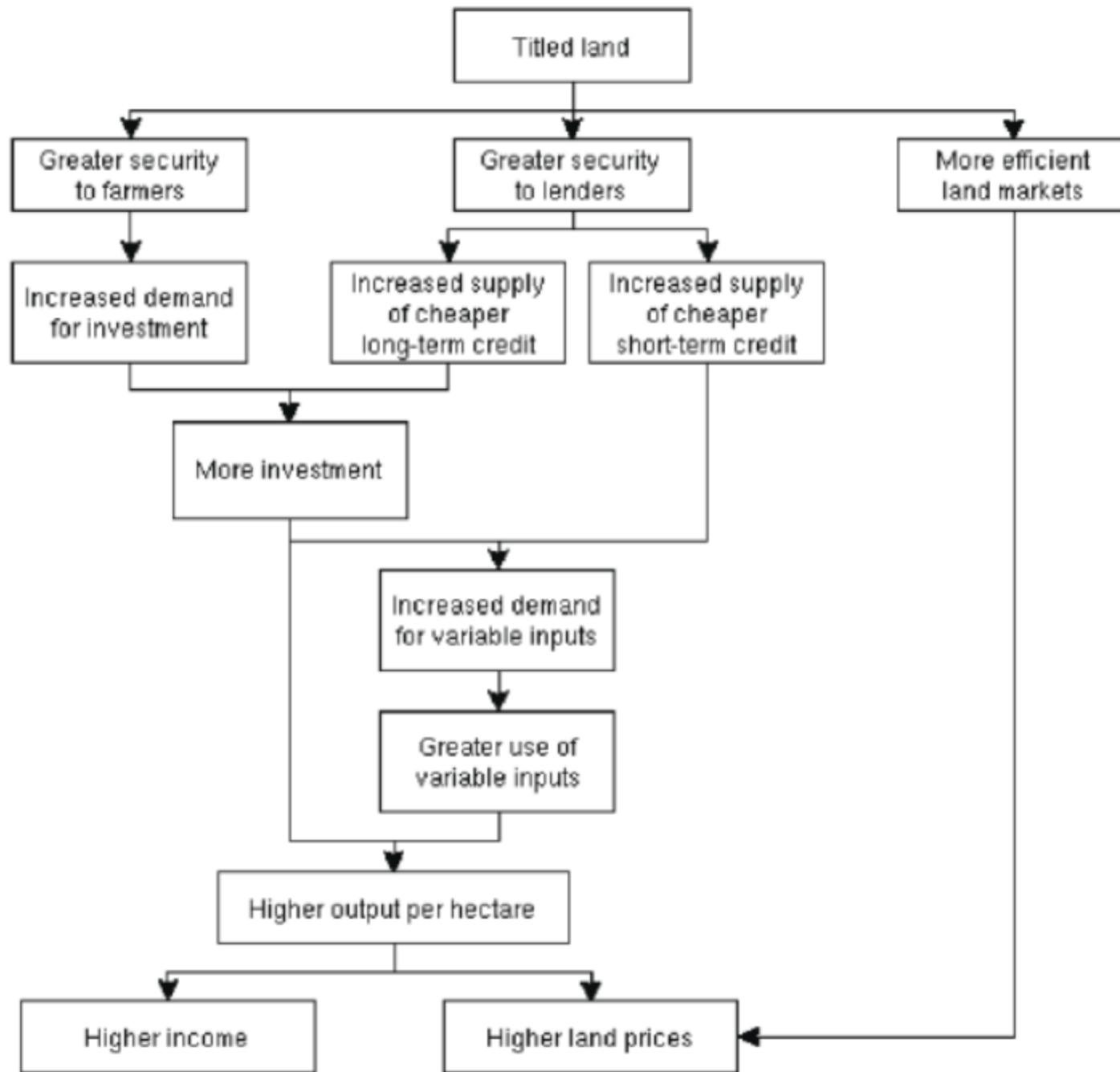
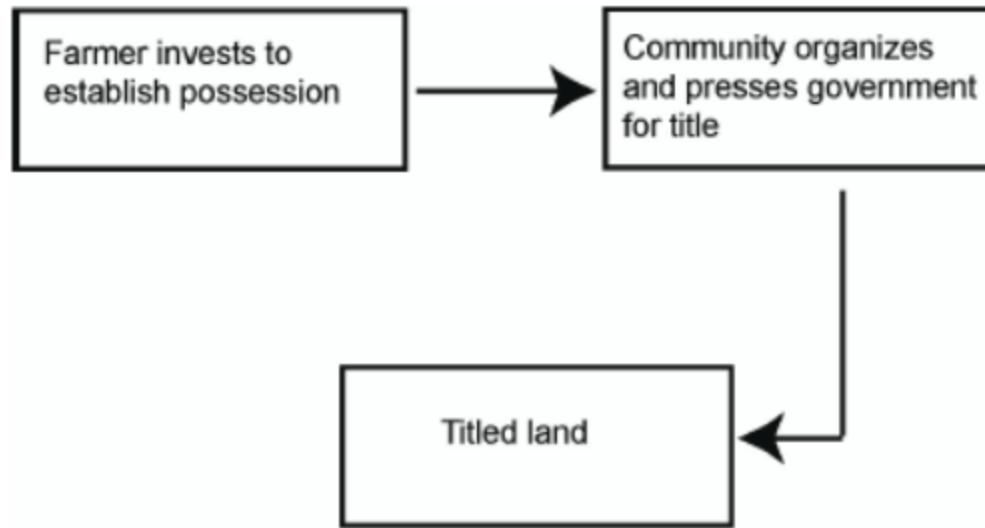


Figure 1b: The likely endogeneity of title placement



- productive and unproductive investments to establish and defend claims

Investment Demand channel

Investment will be less if fear cannot appropriate full returns of investment due to without fear of challenge or expropriation.

Consider labor (or investment) input choice L in project that returns:

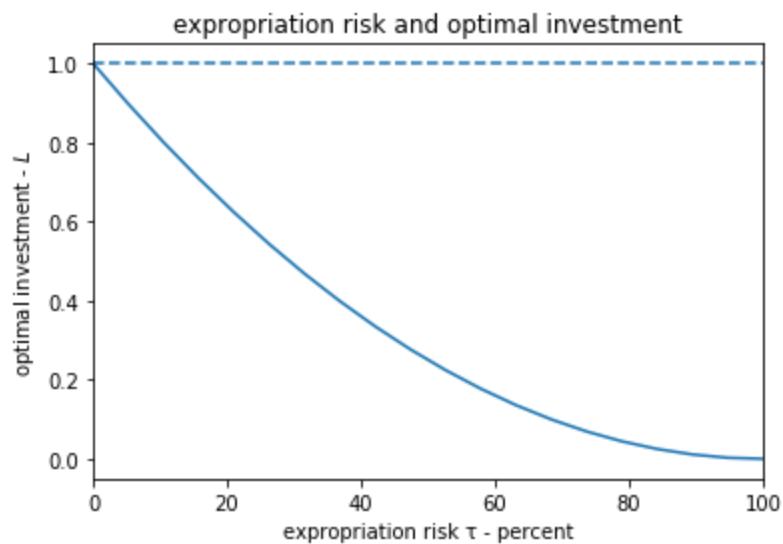
$$(1 - \tau) \cdot \sqrt{L} - L$$

where τ is probability of expropriation (or tax rate)

Investment/labor effort inverse to expropriation risk:

$$L^*(\tau) = (1 - \tau)^2$$

Investment/labor effort $L^*(\tau) = (1 - \tau)^2$



Less resources to appropriation and conflict

When cannot rely on third party definition and external enforcement

- Devote resources to defensive or incursive activities
- occupy and build on land to establish possession
- build defenses, pursue legal channels, etc
- Some activities productive (e.g. building house, improving land)
- Others non-productive: posting guards, staying home rather than work.
- We study models of appropriation and conflict later

Credit Supply response

- If improved security and *transferability* of property may allow land to be used as collateral asset that can expand access to credit
- Putting 'dead capital' to work (de Soto, 2001)

Other Gains to Trade

More secure property rights may lead to more efficient resource allocation via:

- credit supply (just mentioned)
- better function land lease and sale markets (next topic)
- better functioning complementary markets (e.g. more secure land may allow those who previously protected property claim value via possession may now work off-site, migrate)

Impact identification challenges

- Endogenous program placement
- Beneficiary self-selection
- Channels work in opposite directions (e.g. more secure property may lead to increase in productive investment but *decrease* in defensive investment)
- Expectation of reforms

Property rights insecurity and investment

Goldstein, M. and C. Udry. 2008. "The Profits of Power: Land Rights and Agricultural Investment in Ghana." *Journal of Political Economy* 116 (6): 981–1022.

- Invest in raising land productivity by fallowing plots.
- Less secure property holders fear that long fallow period will weaken property rights claims.
- Inefficiently short fallow periods (investment)
 - Careful attention to unobserved heterogeneity
 - household and individual level fixed effects
 - Property rights insecurity and misallocation even within households!

Resource Allocation and Production Organization

- Extend simple land allocation model to land, labor and managerial ability or skill
- Technology, factor market imperfections and the efficient farm scale
- General equilibrium resource allocation benchmarks

Farm Household Models

- We built simple model of land market (no real labor market). -
Now we study land and labor markets together for several applications:
- Endogenous labor supply
- Work own farm plot and/or hire or sell labor from the market.
Market for land leases.
- Misallocation from shutting down one or more markets. Role of asset distribution with non-traded factors.
- Land rent and land taxes
- Equilibrium farm size distributions and (mis) allocation

See [Farm Household jupyter notebook](#) on Farm Households

What determines the size distribution of farms?

And patterns of Land and Labor market activity?

- Nature of Technology (returns to scale)
- Factor and product market imperfections
 - Transactions costs non-tradability in market of labor, land and farming skill or managerial ability
 - Access to credit, insurance, marketing assistance
 - Factor market power distortions

(continues)

- Size-biased policy distortions
 - Credit/subsidies that favor large (small) or well-connected
 - Discriminatory land policies, land ceilings, etc

Technology

Returns to scale

$F(T, L)$ is homogenous of degree k if $F(\tau T, \tau L) = \tau^k F(T, L)$

$k = 1$: constant returns (or linear homogenous)

(e.g. double both inputs gives double the output.

$$F(2 \cdot T, 2 \cdot L) = 2^1 F(T, L))$$

Returns to scale

$k < 1$: decreasing returns (rising marginal cost)

$k > 1$: constant returns (falling marginal cost)

Cobb-Douglas $A \cdot T^\alpha L^\beta$ is homogenous of degree $\alpha + \beta$

Homogenous and homothetic functions

- Higher output isoquants are 'blown up' versions of lower output ones
- Follow a $\frac{T}{L}$ from the origin and tangencies at intersection with every isoquant will have the same slope

With CRS, efficient scale of farm cannot be determined

- With $F(T, L)$ and $k = 1$ only efficient ratio $\frac{T}{L}$ determined

$$\max_{T,L} \quad p \cdot F(T, L) - r \cdot T - w \cdot L$$

$$p \cdot F_L(T^*, L^*) = w$$

$$p \cdot F_T(T^*, L^*) = r$$

$$\rightarrow \frac{F_L}{F_T} = \frac{w}{r}$$

Marginal Cost curve slopes

Competition means $P = MC(q)$

At an optimum $\frac{w}{F_L} = p = \frac{r}{F_T} = MC$

$MC(q) = AC(q)$ is constant when $k = 1$. Firm size indeterminate.

$MC(q)$ is rising when $k < 1$ so efficient scale q^* and hence factor input levels T^*, L^* can be determined from $P = MC(q^*)$ when $k < 1^*$

Efficient allocation with CRS with n-1 markets

Suppose there are N farmers each with access to a CRS Cobb-Douglas production technology $F(T, L) = T^\alpha L^{1-\alpha}$.

$$\frac{F_L}{F_T} = \frac{w}{r}$$

$$\frac{1-\alpha}{\alpha} \cdot \frac{T}{L} = \frac{w}{r}$$

All farms face same w/r and have same α so will employ same T/L

Equilibrium and Efficiency with CRS

- Farm size indeterminate.
- Can close down one market (e.g. land) and still reach efficient allocation

Land ownership endowments \bar{T}_i for each farmer i . No land market to trade.

Competitive labor market enough to equalize $F_L(\bar{T}_i, L_i^*) = \frac{w}{p}$ across all farms i

Efficient allocation at $L_i^* = \frac{\bar{T}_i}{\bar{T}} \cdot \bar{L}$

(useful b/c this extends to more complex models below where $F(\bar{S}_i, T_i, L_i)$ and \bar{S}_i non-traded)

Land and Labor Market Equilibrium

Suppose we have initial allocation of land property endowments \bar{T}_i across N farmers, but no land market.

There is however a labor market. Can we achieve efficient resource allocation despite 'failure' on land market?

With CRS one market to fail without efficiency cost

$N = 2$ example. Total endowment $\bar{T} = 100$. $\bar{T}_1 = 20$, $\bar{T}_2 = 80$

Labor market equilibrium: $L_1 + L_2 = \bar{L}$

Efficiency can be achieved using labor market to allocate more labor to farms with more land, to reach $\frac{T_1}{L_1} = \frac{T_2}{L_2} = \frac{\bar{T}}{\bar{L}}$

Tradable factor moves to the non-tradable: $L_i = \frac{T_i}{\bar{T}} \cdot \bar{L}$

The role of labor markets when land market is closed

Suppose economy has land $\bar{T} = 100$, and labor $\bar{L} = 100$. Each household has $\bar{L}_A = \bar{L}_B = 50$. If land is non-traded but property rights initially assigned as: $\bar{T}_A = 80$ and $\bar{T}_B = 20$

Efficient labor allocation on each farm would be:

$$L_A = \frac{\bar{T}_A}{\bar{T}} \cdot \bar{L} = \frac{80}{100} \cdot 100 = 80$$

Household *A* hires $L_A - \bar{L}_A = 80 - 50 = 30$ units of labor and household *B* sells that amount.

Value of labor endowment would be same even if land endowments had been different -- same equilibrium wage.

Farming skill and its distribution (adapts Lucas 1978)

Adapts Lucas (1978) "On the size distribution of firms".

- Span of control production function. Farm i :

$$\hat{F}(T_i, L_i, S_i) = S_i^{1-\gamma} [T_i^\alpha L_i^{1-\alpha}]^\gamma$$

- linear homogenous in S,T,L (i.e. CRS)
- S_i is **non-traded** farming skill or managerial ability
- T_i, L_i are traded land and labor

The Efficient Size Distribution of Farms

$\hat{F}(T_i, L_i, S_i)$ is linear homogenous in 3 factors. Only optimum
 $\frac{T}{L}, \frac{T}{S}, \frac{L}{S}$

S_i is non-traded so other factors move to it to form farms.

Analogous to how we found efficient labor allocations when T_i non-traded in simpler $F(T, L)$ case, now:

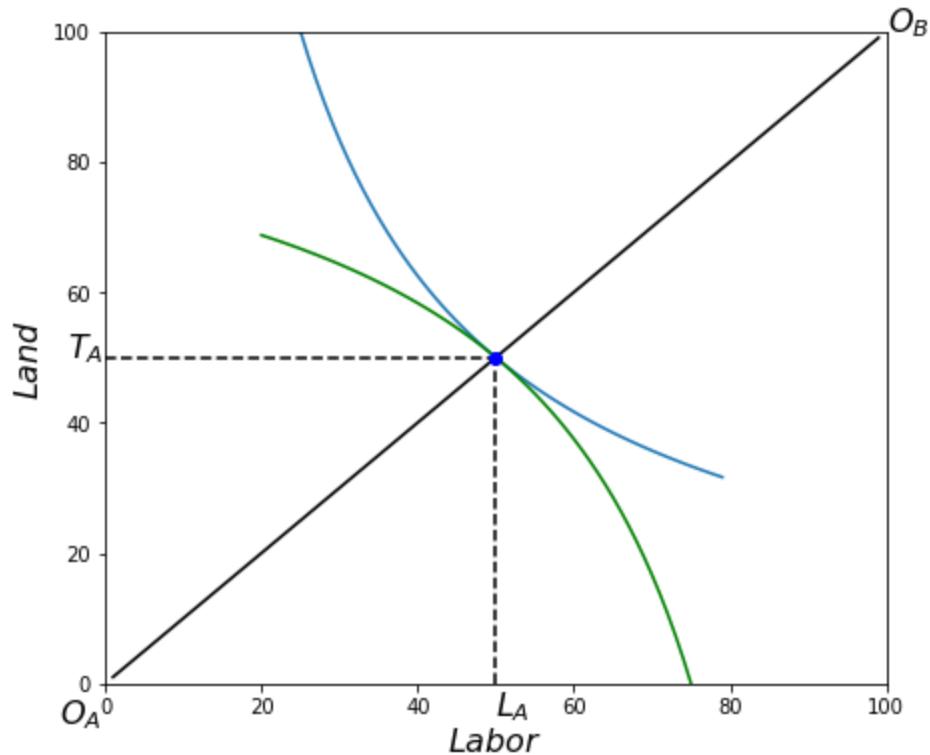
$$T_i^* = \frac{S_i}{\sum S_j} \bar{T}$$

$$L_i^* = \frac{S_i}{\sum S_j} \bar{L}$$

Identically skilled farmers

- $N = 2$ farm households (HH). Total land and labor
 $\bar{T} = \bar{L} = 100$
- HH have same skills $\bar{S}_A = \bar{S}_B = 50$, so $\bar{S} = 100$. Efficient use:
 - $T_A = \frac{\bar{S}_A}{\bar{S}} \cdot \bar{T} = 50$ and $L_A = \frac{\bar{S}_A}{\bar{S}} \cdot \bar{L} = 50$
 - $T_B = \frac{\bar{S}_B}{\bar{S}} \cdot \bar{T} = 50$ and $L_B = \frac{\bar{S}_B}{\bar{S}} \cdot \bar{L} = 50$
- if HH A's endowment is $\bar{T}_A = 40$ and $\bar{L}_A = 60$ it on NET HIRES IN:
 - $T_A - \bar{T}_A = 50 - 40 = 10$ units of land (hires *in* land)
 - $L_A - \bar{L}_A = 50 - 40 = -10$ units of labor (hires *out* labor)

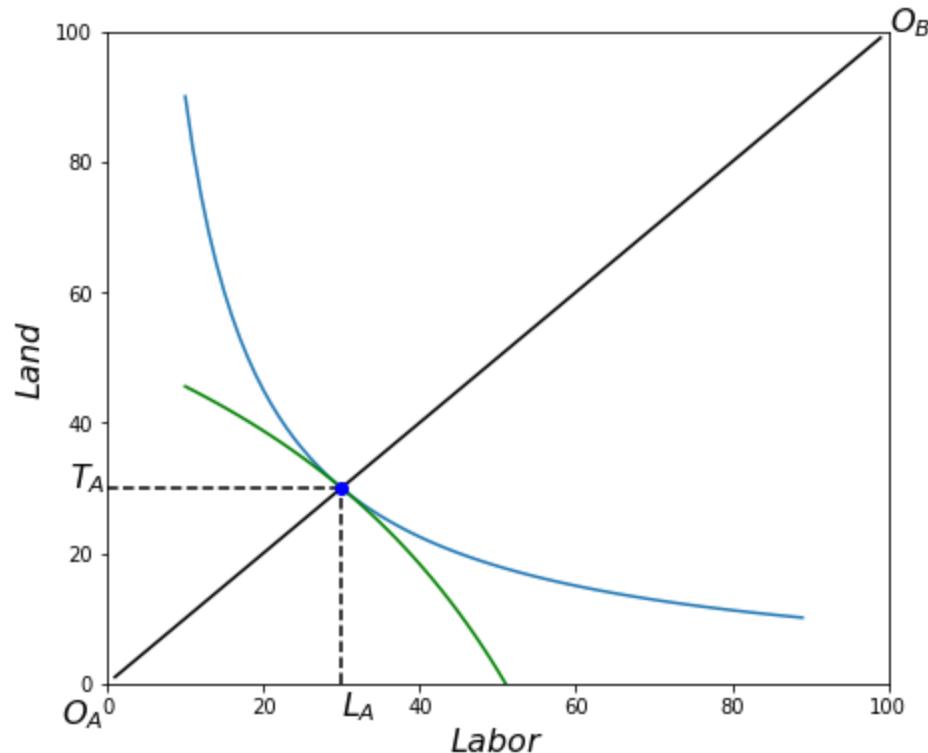
Equal distribution of farm skill:



Household A has less farm skill than B

- HH have skills $\bar{S}_A = 30$, $\bar{S}_B = 70$, so $\bar{S} = 100$. Efficient use:
 - $T_A = \frac{\bar{S}_A}{\bar{S}} \cdot \bar{T} = 30$ and $L_A = \frac{\bar{S}_A}{\bar{S}} \cdot \bar{L} = 30$
 - $T_B = \frac{\bar{S}_B}{\bar{S}} \cdot \bar{T} = 70$ and $L_B = \frac{\bar{S}_B}{\bar{S}} \cdot \bar{L} = 70$
- if HH A's endowment is $\bar{T}_A = 40$ and $\bar{L}_A = 60$ it on NET Hires In:
 - $T_A - \bar{T}_A = 30 - 40 = -10$ units of land (hires out land)
 - $L_A - \bar{L}_A = 30 - 60 = -30$ units of labor (hires out labor)
 - Lowering A's relative skill, increased its net factor supplies

HH A has less farm skill compared to B:



Resource allocation and property rights assignment

- With complete markets (enough 0 transaction costs markets) efficient allocation does not matter on how initial property rights over \bar{S} , \bar{T} and \bar{L} are distributed across households.
- Markets reallocate factors to most productive uses leading to same output and competitive factor market prices w and r regardless.
- Initial assignment does affect income distribution. Household i 's income: $w \cdot \bar{L}_i + r \cdot \bar{T}_i + \Pi(\bar{S}_i)$
 - where $\Pi(\bar{S}_i)$ are 'farm profits' (return to non-traded skill)
 - Total economy output the same under any property rights assignment but HH with larger endowments earn more.

Any farm skill distribution

There are $N = 5$ farmers. Endowments \bar{T} and \bar{L}

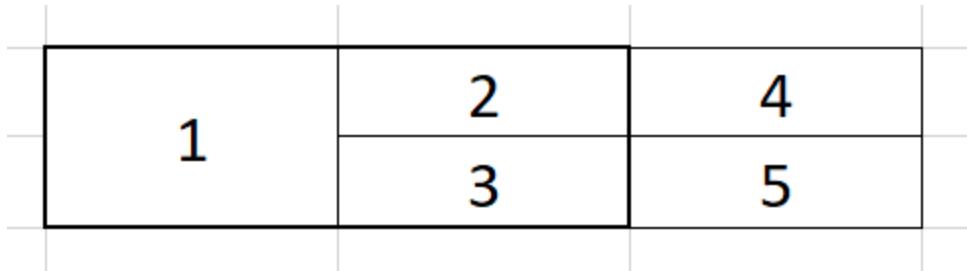
If farmer 1 has skill $\bar{S}_1 = 2$ and farmers $i=2..5$ skill $\bar{S}_i = 1$

Then $\sum_{i=1}^5 \bar{S}_i = 6$ and efficient operation now has:

farmer 1 operate farm of size $T_1 = \frac{1}{3}\bar{T}$ and $L_1 = \frac{1}{3}\bar{L}$

other farmers operate farms of size $T_i = \frac{1}{6}\bar{T}$ and $L_i = \frac{1}{6}\bar{L}$

Note: efficient farm size independent of land ownership



Farmer 1 operates $1/3$ of the land. Remaining farmers operate $1/6$ each.

Suppose thick line represent land ownership by farmer 1 (owns $2/3$ of all land). As shown farmers 2 and 3 become rent-tenants.

Cobb-Douglas forms

$$\hat{F}(T_i, L_i, S_i) = S_i^{1-\gamma} F(T_i, L_i)^\gamma$$

Also note for CD, marginal products relate to average products:

$$\hat{F}_L = \gamma(1 - \alpha) \frac{\hat{F}(T_i, L_i)}{L_i}$$

$$\hat{F}_T = \gamma\alpha \frac{\hat{F}(T_i, L_i)}{T_i}$$

When $\gamma = 1$ linear homogenous (CRS) production function

$$F(T_i, L_i) = T_i^\alpha L_i^{1-\alpha}$$

Planner's problem

(e.g. village leaders acting as planner)

$$\max_{T_i, L_i} \sum_i S_i^{1-\gamma} [T_i^\alpha L_i^{1-\alpha}]^\gamma$$

subject to

$$\sum_i T_i = \bar{T} \quad \sum_i L_i = \bar{L}$$

FOC:

Also equates marginal products of land and labor across farms.

Efficient allocation under planner or perfectly competitive market solution:

- equates marginal products of land and labor across farms
- For this homothetic production same $\frac{T_i^e}{L_i^e}$ across all farms
- Farms with larger S_i operate larger farms:

$$T_i^e = \frac{S_i}{\sum S_j} \bar{T} \quad L_i^e = \frac{S_i}{\sum S_i} \bar{L}$$

Cost minimization approach

Firms choose optimum input mix to maximize profits.

For any given output level q the firm minimizes costs:

$$TC(q) = \min_{T_i, L_i} rT_i + wL_i$$

$$\text{s.t. } F(\bar{S}_i, T_i, L_i) = \bar{q}$$

$$\text{FOC: } F_L(\bar{S}_i, T_i, L_i) = w \text{ and } \hat{F}_T(\bar{S}_i, T_i, L_i) = r$$

Efficiency requires any two firms i and j have same marginal value products

$$F_L(\bar{S}_i, T_i, L_i) = w = F_L(\bar{S}_j, T_j, L_j)$$

And similar for F_T .

In the efficient equilibrium

$$T_i^e = \frac{S_i}{\sum S_j} \bar{T} \quad L_i^e = \frac{S_i}{\sum S_i} \bar{L}$$

So the (common efficient) marginal products can be written:

$$w = F_L = \gamma(1 - \alpha) \frac{F(\bar{S}, \bar{T}, \bar{L})}{\bar{L}}$$

$$r = F_T = \gamma\alpha \frac{F(\bar{S}, \bar{T}, \bar{L})}{\bar{T}}$$

Equilibrium $\frac{w}{r} = \frac{1-\alpha}{\alpha} \frac{\bar{T}}{\bar{L}}$ varies with economy-wide T/L

Case study: misallocation in Malawi.

Restuccia, D. and Santaella-Llopis (2017) "Land Misallocation and Productivity", NBER Working paper No. 23128, January ([link](#)).

- Household and farm plot production data
- Measure "shocks"

Table 1: Size Distribution of Farms (% of Farms by Size)

	ISA 2010/11 Malawi	World Census of Agriculture 1990 Malawi	Belgium	USA
Hectares (Ha):				
≤ 1 Ha	78.3	77.7	14.6	–
1 – 2 Ha	17.8	17.3	8.5	–
2 – 5 Ha	3.7	5.0	15.5	10.6
5 – 10 Ha	0.2	0.0	14.8	7.5
10+ Ha	0.0	0.0	46.6	81.9
Average Farm Size (Ha)	0.83	0.7	16.1	187.0

- Average farm size 0.83 Ha
- Only 16.6% of HH used rented or purchased land.

Measuring Farm Productivity s_i

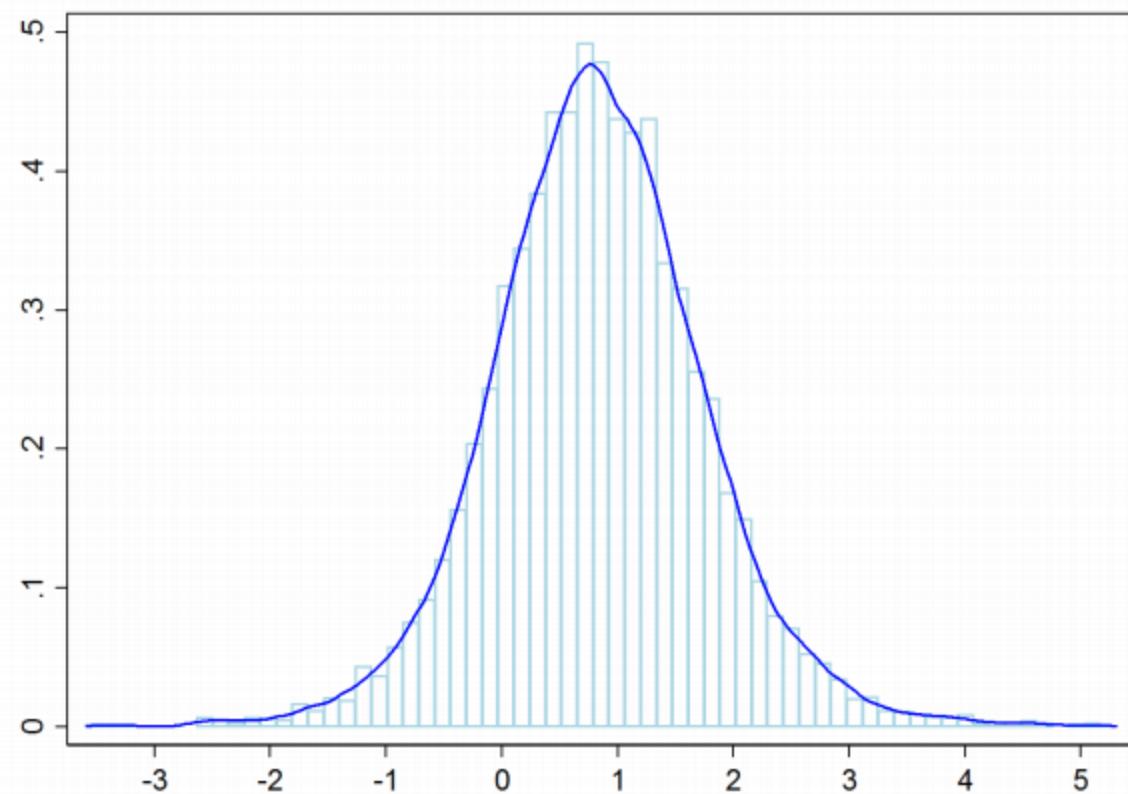
Farm production function

$$y_i = s_i \varsigma_i k_i^{\theta_k} (q_i l_i)^{\theta_l}$$

- y_i is real value added, k_i is capital, l_i is land in operation, q_i is a measure of land quality, ς_i is a rain shock. All in per total labor hour terms.
- set input elasticities $\theta_l = 0.18$ and $\theta_k = 0.36$
- from US parameter estimates (note $\theta_l + \theta_k < 1$) (!!)

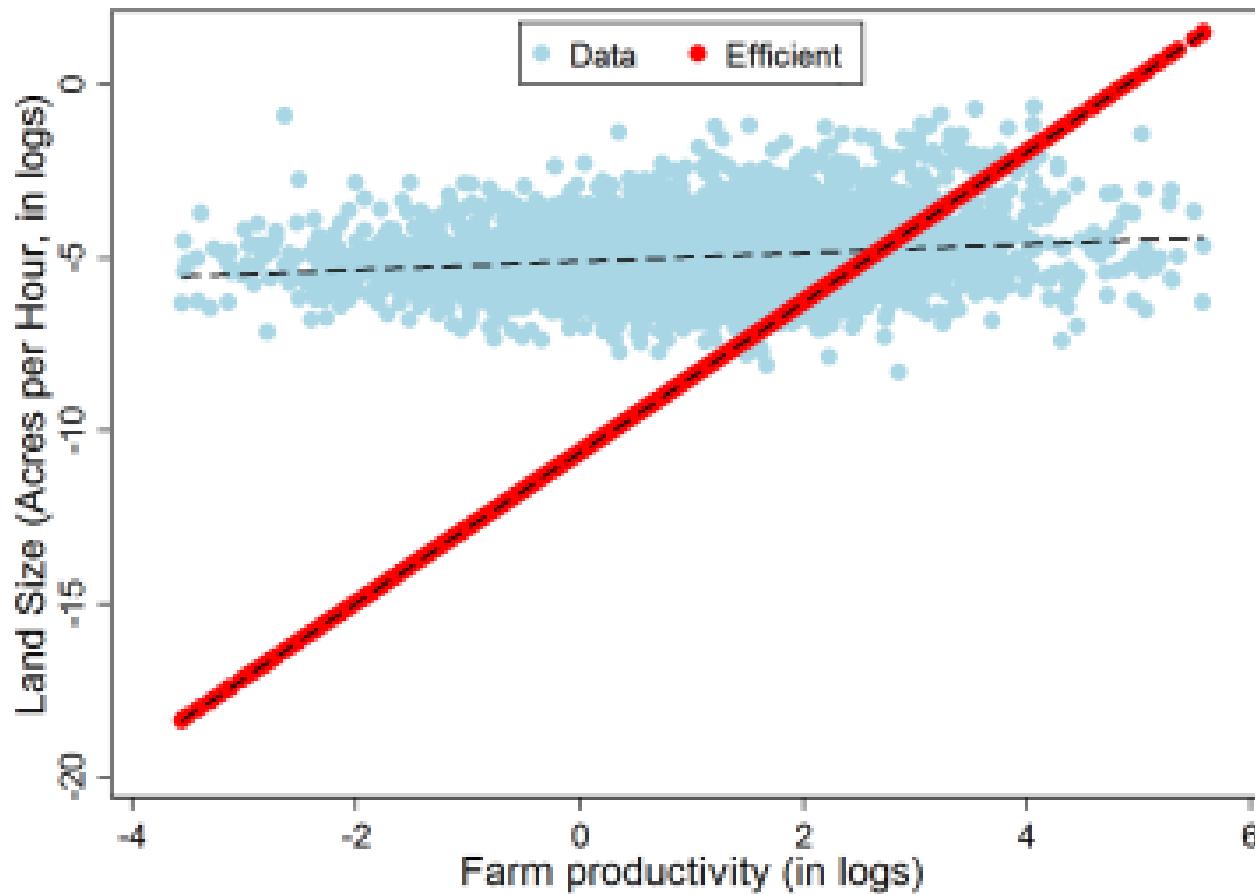
Can find a measure of 'TFP' s_i as a residual. You should be suspicious already, but let's move on...

Figure 2: Density of Farm Productivity s_i (in logs), Malawi ISA 2010/11

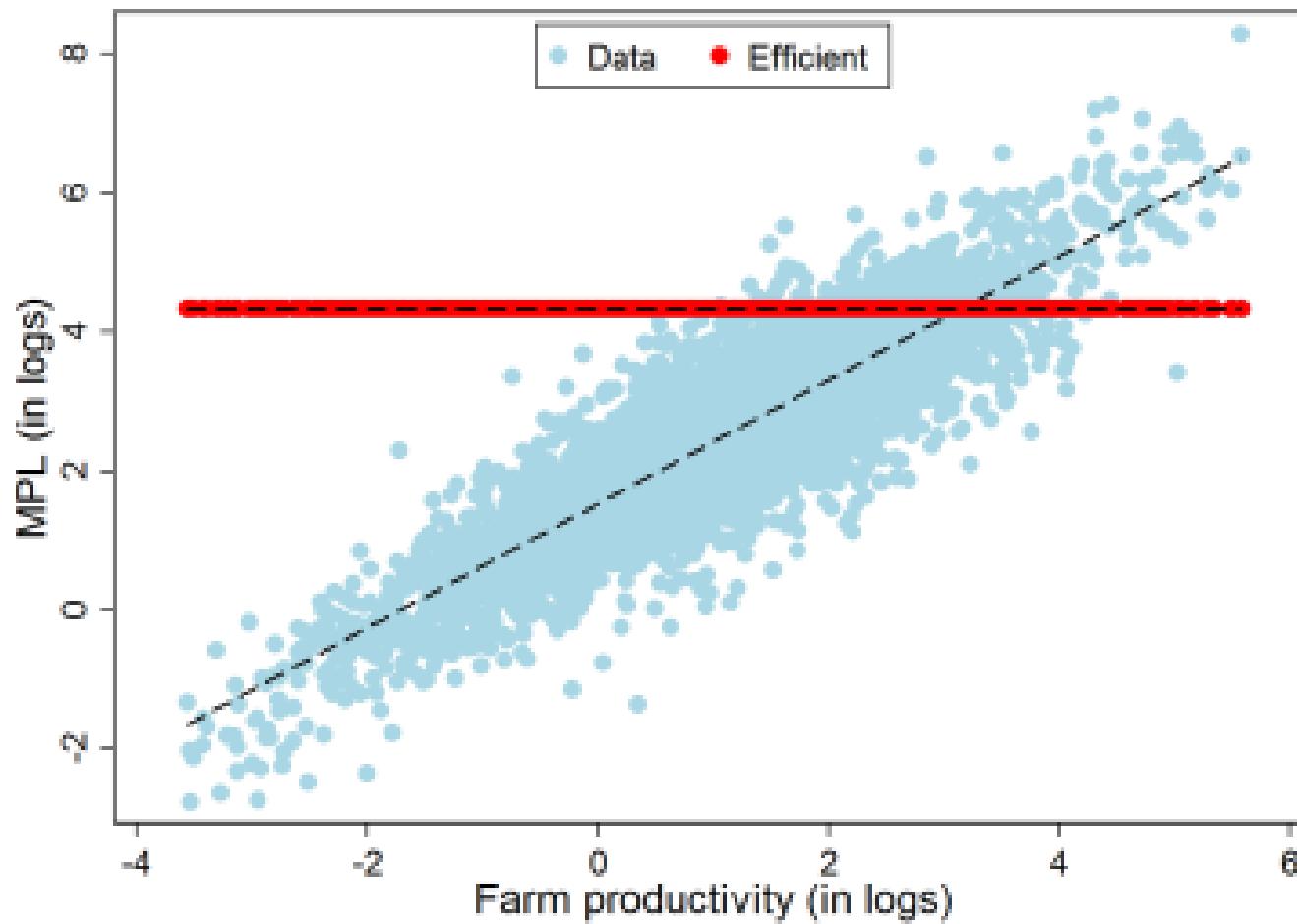


Predicted efficient (red) versus actual land use:

(a) Land Size vs. Farm Productivity



(b) MPL vs. Farm Productivity



Efficiency requires MPL be equalized across farms, but apparently not.

- Authors attribute misallocation to land-market imperfection
- Argue output could be 260% higher !
- Read summary [here](#)

Are there methods attributing too much of the observed differences in productivity across farmers to 'skill differences'?

- Gollin and Udry (2017) accuse yes

Dangers of misattribution: Gollin and Udry's critique (2017)

- With cross section it is very easy to mis-attribute measured productivity differences to inherent 'TFP' (skill) differences
- Dangers in rushing to conclusions. Implausibly large claimed costs of misallocation.
- Need better data:
 - panel data
 - measure inputs
 - members within the household
 - multiple plots per individual

Panel datasets for Ghana, Tanzania, and Uganda

- ideosyncratic shocks'
- measurement error
- heterogeneity in observed land quality

"any estimates of the potential gains from reallocation need to account carefully for mis-measurement and heterogeneity"

Find re-allocations gains at most 15-50%

Malawi study had found 260 percent!!

Farm Household Models

- Thus far we've treated labor supply as exogenous: HH inelastically supplies $L_i^S = \bar{L}_i$, its entire labor supply.
- Farm Household models consider HH as consumer and producer. Farm consumption-leisure tradeoff:

$$\max_{c,l} U(c, l)$$

subject to HH income generated from factor market sales and farm profit maximization.

Separable and non-separable models

- Different models depending on terms of HH' participation on product market and one or more factor markets.
 - Separable: shadow prices = market prices
 - Non-separable: shadow prices may not be equalized across HH
 - Not first-best
- See jupyter farm household notebook notes to continue.

**Land insecurity and misallocation: Goldstein/Udry
2008**

Goldstein, Markus, and Christopher Udry. 2008. "The Profits of Power: Land Rights and Agricultural Investment in Ghana." *Journal of Political Economy* 116 (6):981–1022.

- Much more careful measurement of productivity (control for unobserved heterogeneity)
- Evidence of mis-allocation, plausible causal explanation tied to insecure property right of women and non-officeholders.

TABLE 1
PERCEPTIONS OF LAND RIGHTS

	PERCENT OF CULTIVATED PLOTS ON WHICH RESPONDENT CLAIMS RIGHT TO				PLOTS FALLOWED MORE THAN 6 YEARS (%)
	Determine Inheritance (1)	Rent Out (2)	Lend Out (3)	Sell (4)	(5)
Nonofficeholders	4	15	21	10	18
Officeholders	18	37	42	22	26
<i>t</i> -test for equality	6.39	6.51	5.56	4.36	2.23
Observations	846	847	847	846	813

"in the farming system we consider, the most important investment in land quality is leaving land fallow in order to permit soil fertility to regenerate."

"...under traditional land tenure institutions, there is no strong guarantee that the cultivator can keep fallow land for his or her own use in the future" (Otsuka et al. 2003, 78)."

Women and weak stakeholders have lower measured output

Violates Unitary household and Bargaining Household models!

Udry, Christopher. 1996. "Gender, Agricultural Production, and the Theory of the Household." *Journal of Political Economy* 104 (5):1010–1046.

- Differences in yield on men vs. women's plots... difference in
- "The large dispersion of yields and input intensities across similar plots planted to the same crop by members of different households in a village reflects the virtual absence of functioning land rental and labor markets in rural Burkina Faso (Fafchamps 1993)."

Binswanger and McIntire argue moral hazard stands in the way of labor market

Goldstein/Udry 2008

Notes that follow taken directly from Goldstein's seminar presentation!

Material ahead and next week

- Models with equilibrium farm size distribution
- Efficient benchmarks
- Land and or/labor market distortions
- Credit Market distortions
- Market-power and political/policy distortions.
- Geospatial empirical studies: Fenske (2013) and Dippel et al (2017)

Production Organization Theory (again)

We will make good use of variants of the following model.

- 3-factor production, non-traded farming skill:

$$\hat{F}(T_i, L_i, S_i) = S_i^{1-\gamma} [T_i^\alpha L_i^{1-\alpha}]^\gamma$$

- $\hat{F}(T_i, L_i, S_i)$ is linear homogenous (CRS) in the 3 arguments. Can only determine optimum $\frac{T}{L}, \frac{T}{S}, \frac{L}{S}$
- $T_i^* = \frac{S_i}{\sum S_j} \bar{T}$ and $L_i^* = \frac{S_i}{\sum S_j} \bar{L}$

Pset 2: endogenous labor supply (on and off farm)

- Non-traded land and traded labor.
- Endogenous labor supply (consumption-leisure tradeoff)
- Allows for on farm and off-farm labor, predictions of activity on land and labor markets
- Separable and non-separable HH model
- Inverse farm-size productivity when non-separable

Notes on chalkboard

- Farm profit maximization and optimal labor in

A note on Land Taxes

- standard tax incidence diagrams
- rising rent and land speculation
- Land supplied inelastically. Labor endogenous supply response.
- Henry George and the 'single Tax' (on unimproved land)
- diagram analysis on chalkboard

Modeling credit constraints

- Chalkboard presentation
- Textbook analysis: unconstrained profit maximization.
 - assumes firm/farm has full access to capital (i.e that can sell state-contingent claims)
 - asymmetric information and costly enforcement can severely restrict what promises can be sold.
 - Contract may require collateral to back promised payments in certain states.

A simple way to model a credit constraint

- Firm has to pay for inputs in advance, using cash raised from its own factor market sales and any feasible borrowing
- feasible borrowing $\phi + B(\bar{T}_i)$ rises with land ownership (collateral)

Profit maximization now subject to a constraint:

$$\max p \cdot F(\bar{S}_i, T_i, L_i) - rT_i - wL_i$$

$$\text{s.t. } wL_i + rT_i \leq w\bar{L}_i + r\bar{T}_i + \phi + B(\bar{T}_i)$$

If we solve this constrained optimization by method of Lagrange,
FOC are:

$$F_L = w \cdot (1 + \mu) \text{ and } F_T = r \cdot (1 + \mu)$$

where μ is the constraint multiplier. The constrained farm cannot achieve efficient scale, scales down both factors proportionately (to maintain T_i/L_i).

Distortions to the farm size distribution

- Credit constrained farms use less land and labor (inefficiently small)
- Increases factor supply to remaining farms, leads to lower equilibrium w and r and now (inefficiently) larger scale of operation
- Measured marginal product of land (and labor) would be higher on credit-constrained farms (inverse farm-size productivity)

Example

- Example: all farmers have same S and labor endowment, different land endowments.
 - Without credit constraints: all households operate farms of same size (some may rent-in) and self-sufficient in labor.
 - With credit constraints: smaller farms may become laborer-cultivators (small plot and sell labor to others); non-constrained become 'small capitalists' (run larger farms, hire in labor)

Eswaran and Kotwal (1986) Access to Capital and Agrarian Production Organization

Eswaran, M., and A Kotwal. 1986. "Access to Capital and Agrarian Production Organization." *Economic Journal* 96:482–98.

- Classic paper on how initial distribution of land can affect general equilibrium production organization and occupational choice (class structure)
- Model elements and assumptions:
 - Land, Labor and labor supervision (similar to S)
 - Credit constraint
- Explains:
 - Distribution of households into Four modes of cultivation

Model elements

Like our benchmark model with non-traded S , traded T, L and credit constraint, but modeled in a somewhat more complicated way.

Two market imperfections → initial allocation of land rights matters.

Household (HH) labor supply is endogenous due to demand for leisure.

$S(L)$ is time required to monitor L hired workers, also means rising marginal cost so that in absence of other imperfections, no big farms.

Household time constraint: $R + t + s(L) + l = 1$

where R is leisure, t is work off farm, $S(L)$ is time supervising hired labor L and l is work on own farm.

Fixed cost and credit constraint:

Fixed cost K to set up farm (will rule out very small farms and make some pure laborers)

Working capital constraint:

- Cannot spend more on inputs than money can raise from selling land and labor to the market plus amount that can borrow
- Borrowing \bar{B} is proportional to land owned.

1. **Laborer-cultivator**: works on own farm and sells labor.
2. **Self-cultivator**: works only on own farm, without hired labor
3. **Small Capitalist**: own and hired labor
4. **Large Capitalist** : Only hired labor

In a world with full access to capital all would be self-cultivators..

Land-ownership is given by a Pareto distribution with parameter δ . Depending on land ownership a household has access to capital $B(\bar{T})$ which places HH into one of following regimes:

PROPOSITION I. *The solution to (6) admits of four distinct modes of cultivation, separated by three critical values, B_1, B_2, B_3 (with $0 < B_1 < B_2 < B_3$) of B , such that the entrepreneur is a*

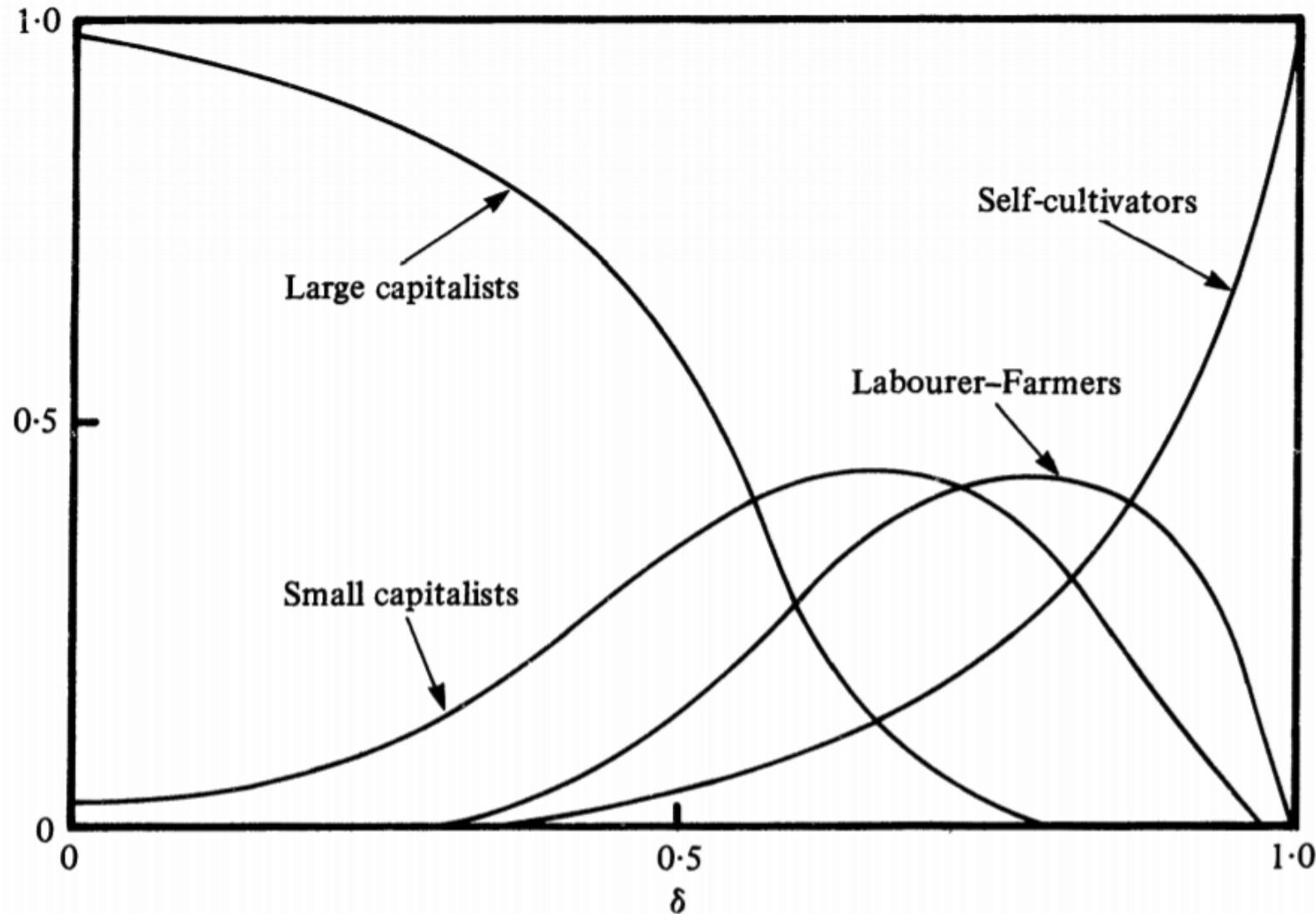
- (I) *Labourer-cultivator ($t > 0, l > 0, L = 0$) for $0 \leq B < B_1$,*
- (II) *Self-cultivator ($t = 0, l > 0, L = 0$) for $B_1 \leq B < B_2$,*
- (III) *Small capitalist ($t = 0, l > 0, L > 0$) for $B_2 \leq B < B_3$,*
- (IV) *Large capitalist ($t = 0, l = 0, L > 0$) for $B \geq B_3$.*

Land ownership inequality affects modes of cultivation

Land distribution follows a Pareto distribution with parameter δ . A higher δ indicates more less land concentration.

In next diagrams remember every household is exactly the same except for initial ownership of land (and hence access to credit).

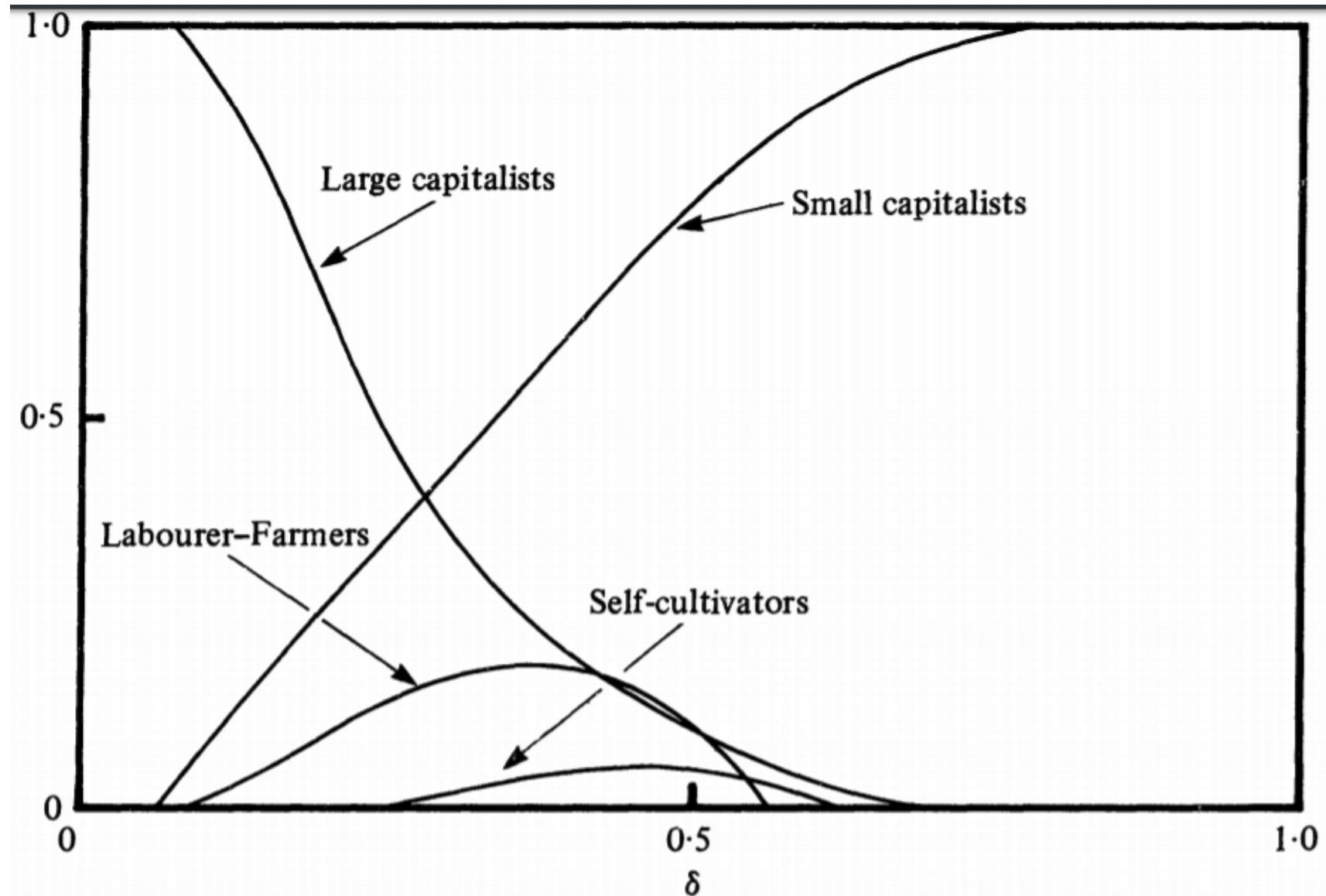
Cultivation modes (but with no landless)



With high inequality (low δ) large and small capitalists dominate.

With more egalitarian ownership self-cultivators dominate.

Cultivation modes (with a class of landless)



With high inequality (low δ) large and small capitalists dominate.

With more egalitarian ownership self-cultivators dominate.

Land inequality, poverty and welfare

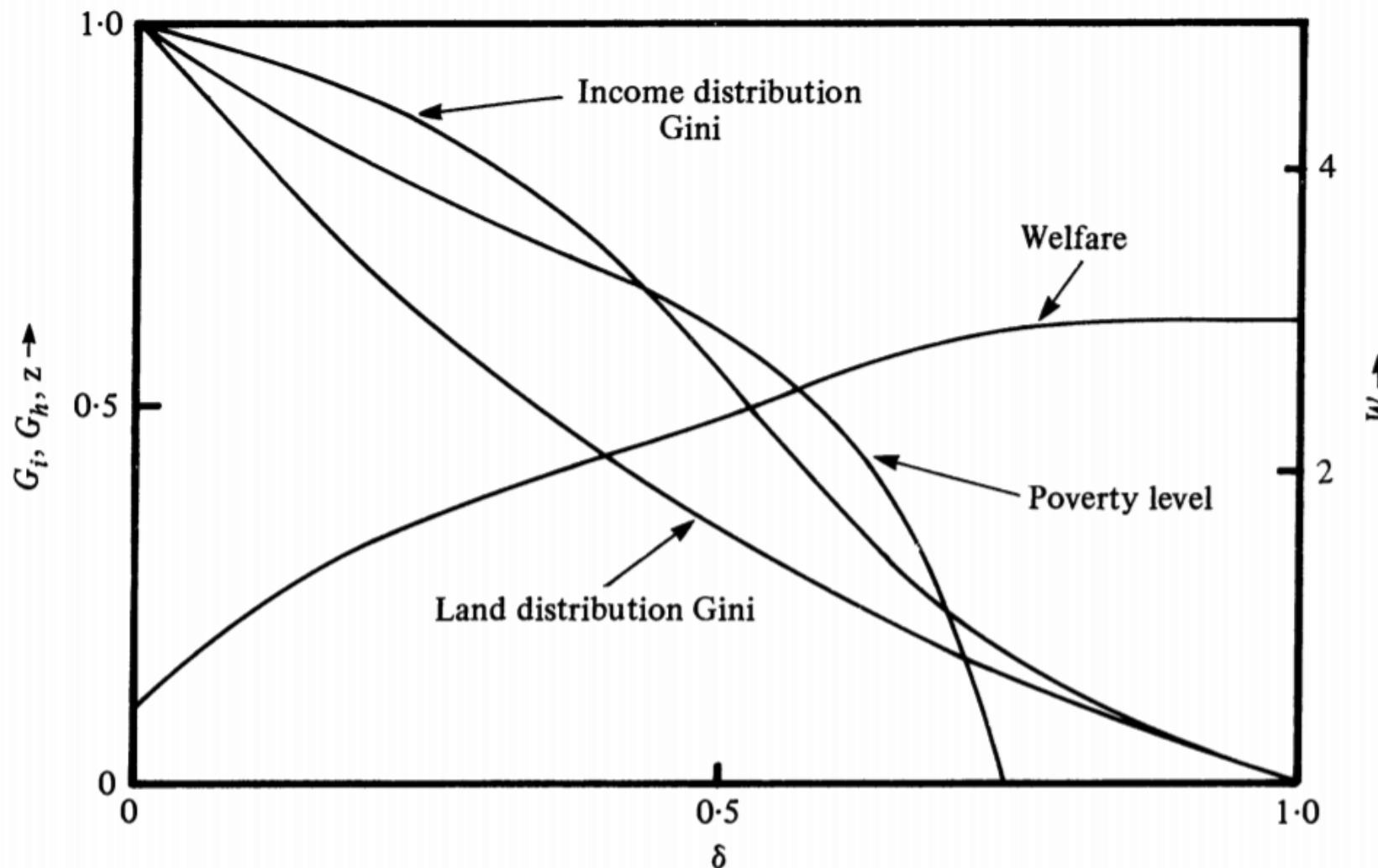


Fig. 3. Impact of land reform on the poverty level, income distribution and social welfare. Parameter values are same as those in Fig. 1. The poverty line is set at $Y_p = 1.3$.

Some observations

- Everything here driven by a credit market imperfection
- Otherwise identical farmers except for initial holding of land
- In benchmark model (w/ access to credit) all farmers production decisions would have been the same .
- Access to capital constraints leads to emergent hierarchical employment relationships
- More equal land → less distortion, higher total output (Land reform)

In Competitive Benchmark model

- Skill non-traded but land and labor markets achieve efficient
- The size distribution of farms follows S distribution.
- If farm technology simple , S likely similar across HH and expect relatively equal sized farms
- Owner-cultivators or tenants

Owned land versus operated land

Efficient allocation requires that allocation of factors across producers make best use of skills and technology.

With secure property rights and markets competitive with no market imperfections:

- Same efficient allocation (production organization) reached
- If ownership widespread: family owner-cultivators
- If land ownership unequal but farming skill shared: family operated tenancies

Why Family Farms

Dominant view (up to at least 1990s) (Binswanger, Deininger, Feder, 1995)

- Historically, economies of scale in agriculture rare limited to a few plantation crops.
- economies of scale in processing, marketing and transport but not production

The literature contains no single example of economies of scale arising for farm sizes exceeding what one family with a medium tractor could comfortably manage
(Binswanger, Deininger,Feder, 1993)

Why Family farms?

- Labor supervision/moral hazard issues raise costs on larger farms. Family labor advantage
- Family farming dominant and ubiquitous
 - owner cultivation
 - tenant farming
- Captured crudely/simply in our earlier model by non-traded \bar{S}_i assumption, and assumption that technology such that S does not vary greatly. Works for some crops/periods, less for others.

Distortions to an efficient farm size distribution

Explanations thus far:

- Factor market imperfections can give rise to distortion to size-distribution of farms
 - Eswaran Kotwal: credit constraint on small; too many big farms
 - Restuccia and Santaularia-Llopis: distortions on land market; too many small farms; the more skilled cannot access resources
- Is observed farm-size distribution natural or due to distortions?

Power distortions

The concentration of ownership observed in most developing countries ...are outgrowths of power relationships.

Landowning groups used coercion and distortions in land, labor, credit, and commodity markets to extract economic rents from the land, from peasants and workers...

...Such rent-seeking activities reduced the efficiency of resource use, retarded growth, and increased poverty of the rural population.

Binswanger, Deininger, and Feder (1995)

Distortions from high land ownership concentration?

Some channels:

- With competitive markets and secure rights no distortion.
- With asymmetric information, the asset-poor may face barriers (e.g. credit constraints)
- Land concentration may give rise to factor-market power (monopoly/monopsony) distortions
- Land inequality/concentration could be associated with higher
 - Property Rights insecurity
 - Labor monitoring/conflict costs
 - Political rents from land

We will explore these possible outcomes in turn. But first...

How do changes in relative land abundance (labor scarcity) affect outcomes in our simple economies

- factor prices and resource allocation?
 - production organization
- incentives for players to change property rights institutions

Manorial Estates, Haciendas, Juncker Estates

- Manorial Estates
 - Tenants inside manorial estates, farmed own plots and owed rent/tribute
 - Often obliged to also provide labor-service to landlords' fields (*demesne*)
 - Labor mobility often restricted (as in serfdom)
 - Tenant economies of Asia and Western Europe
- Haciendas and Juncker Estates
 - Internal tenancy much more reduced
 - Larger landlord operated fields

Factor Market power distortions

- Conning (2007, 2011) shows how the prevalence of non-prevalence of endogenous factor market power distortions may determine whether otherwise similar economies lead to economies dominated by small-holder farms, manorial estates or haciendas.
- Builds on neo-classical farm-size distribution model but adds possible factor-market power distortions.

A (distorted) factor market equilibrium

Each HH maximizes sum of profits plus value of their factor endowments

$$\max_{T_i, L_i} p \cdot F(\bar{S}_i, T_i, L_i) - r \cdot T_i - w \cdot L_i + r \cdot \bar{T}_i + w \cdot \bar{L}_i$$

All households (except for one large landlord) takes market factor prices as given. Optimal factor market demands $T_i(w, r, p)$ and $L_i(w, r, p)$.

The landlord chooses T_R and L_R for use on own farm but also understands that this affects how much land/labor left for smallholder economy:

$$\sum T_i = \bar{T} - T_R \text{ and } \sum L_i = \bar{L} - L_R$$

w and r determined within smallholder fringe ($r = F_T$ and $w = F_L$) but 'endowment' available to that sector $\bar{T} - T_R$ and $\bar{L} - L_R$ shaped by landlord.

Land monopoly-labor monopsony effects

Conning, Jonathan. 2007. "Latifundia Economics." *Hunter College Department of Economics WP 2* (1).

Conning, Jonathan, and Michael Kevane. 2007. "Freedom, Servitude, and Voluntary Contracts." In *Buying Freedom: The Ethics and Economics of Slave Redemption*, edited by Anthony Appiah and Martin Bunzl. Princeton University Press.

How can we make sense of these three different production organization forms:

- **Family-farm production** has dominated in many times and places, whether it be commercial family farming on American plains or 'tenancy' economies of Asia or medieval Europe
- **Latifundia-Minifundia** (bimodal) distribution of farms in many parts of the world (Hacienda, and Juncker Estate). Large estates employing wage or labor-service workers with only limited amounts of tenancy within large farms. Large estates often co-exist with fringe of very small (minifundia) property holders who often need to rely on selling labor to larger estates.
- There are many variations between these two extremes.

- All farmers are identical in terms of access to non-traded skill and farming technology (equal sized farms in efficient equilibrium)
- initial differences in the ownership of land may lead to endogenous market power distortions that give rise to latifundia-minifundia typeequilibria.

Once we understand the trade-offs involved, a lot of other historical policies start making sense (e.g. efforts to limit worker mobility, access to frontier lands, and other outside opportunities, discriminatory farm policies,)

The Model

By definition landlords owns a considerable amount of land.

Assume as a class own $\bar{T}_R = \theta \cdot \bar{T}$.

Landlord maxes farm profits plus value of endowment, but also understands how T_R, L_R affects relative factor supply and hence market equilibrium factor prices in smallholder sector. Acting like a non-price discriminating monopolist/monopsonist maxes:

$$\max_{T_i, L_R} F(\bar{S}_R, T_R, L_R) - r \cdot T_R - w \cdot L_R + r \cdot \theta \bar{T} + w \cdot \bar{L}_i$$

If land concentrated θ large may want to withhold land from tenants to drive up r but with less access to land, MPL on smallholder farms falls, leads HH to increase labor supply to the market. So land monopoly leads to labor monopsony.

By choosing T_R, L_R to maximize

$$\max_{T_i, L_R} F(\bar{S}_R, T_R, L_R) - r \cdot T_R - w \cdot L_R + r \cdot \theta \bar{T} + w \cdot \bar{L}_i$$

they are also choosing the 'size of the smallholder fringe economy' (think of it as choosing the size of the smallholder economy edgeworth box. As we previously saw, with available land $\bar{T} - T_R$ and labor $\bar{L} - L_R$ the smallholder economy will face factor prices:

$$\frac{w}{r} = \frac{1-\alpha}{\alpha} \frac{\bar{T} - T_R}{\bar{L} - L_R}$$

with $w = p \cdot F_L(\bar{S} - S_R, \bar{T} - T_R, \bar{L} - L_R)$ and
 $r = p \cdot F_T(\bar{S} - S_R, \bar{T} - T_R, \bar{L} - L_R)$

Substituting these expressions into the landlord cartel objective gives rise to more complicated non-linear first-order conditions.

θ is fraction of total land controlled by landlord(s). There are N farmers including the landlord.

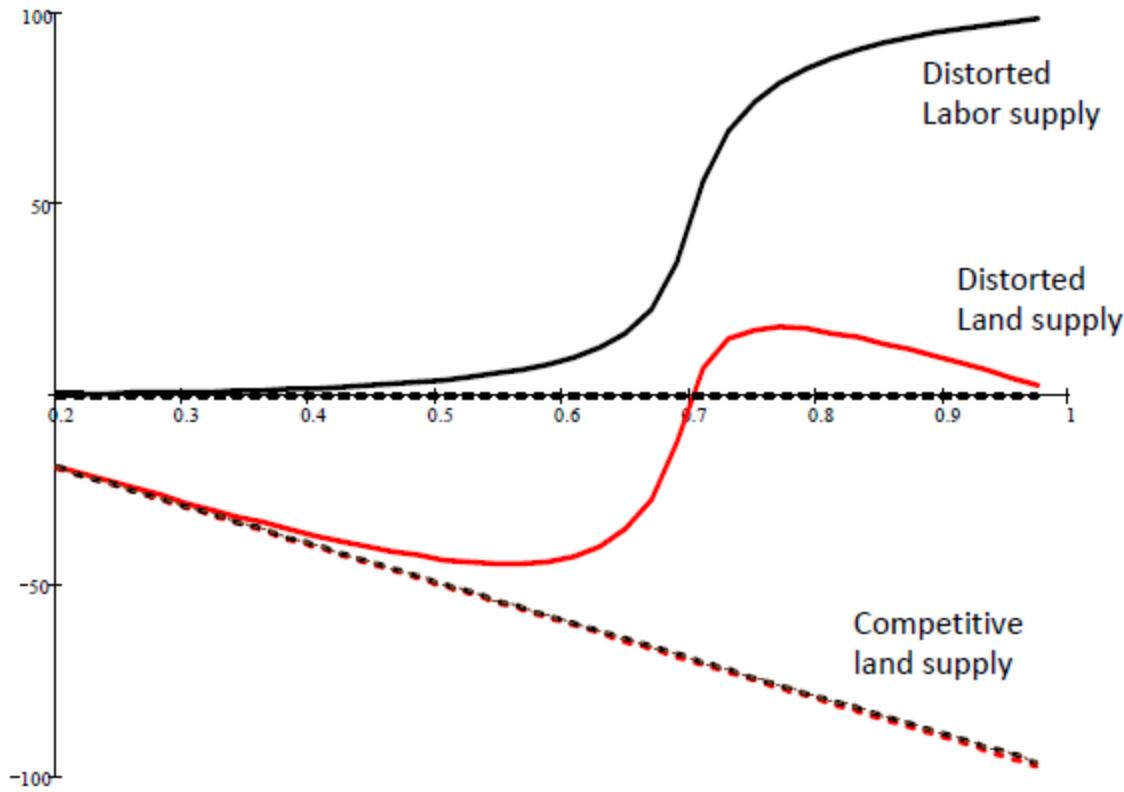
Landlord(s) have same $\bar{S}_R = \frac{\bar{S}}{N}$ as other farmers so efficient to run just a farm of operational land size $\frac{\bar{T}}{N}$ and lease out surplus land $\theta\bar{T} - \frac{\bar{T}}{N}$

At low θ landlords have very little land market power and the resulting equilibrium will look much like the competitive.

At higher θ landlords begin to withhold land to drive up r (and hence $r \cdot \theta\bar{T}$). This has an additional effect: limiting land to smallholders lowers the MPL on those farms, driving up smallholders' labor supply, lowering the wage w at which landlord hire. Land monopoly is paired with labor-monopsony.

Competitive vs. ‘Monopoly’ Equilibria

Peasant net supply of labor and land as function of Land Gini

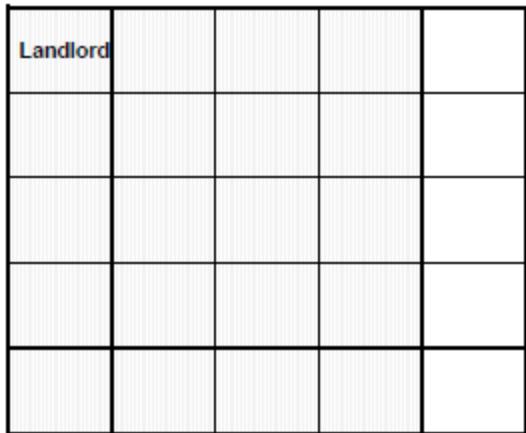


Landlord land supply and smallholder labor supply as a function of land concentration θ . When $\theta \sim 0.7$ landlord(s) withhold all land, at higher θ they actually hire in land.

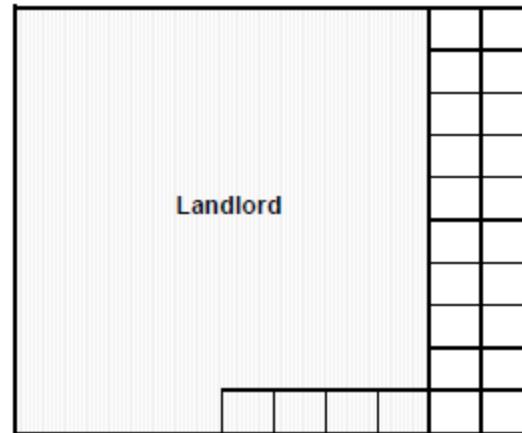
SIMPLE EXAMPLE

25 Farmers, each with identical DRS technology

1 Farmer owns 80% of land (dotted)



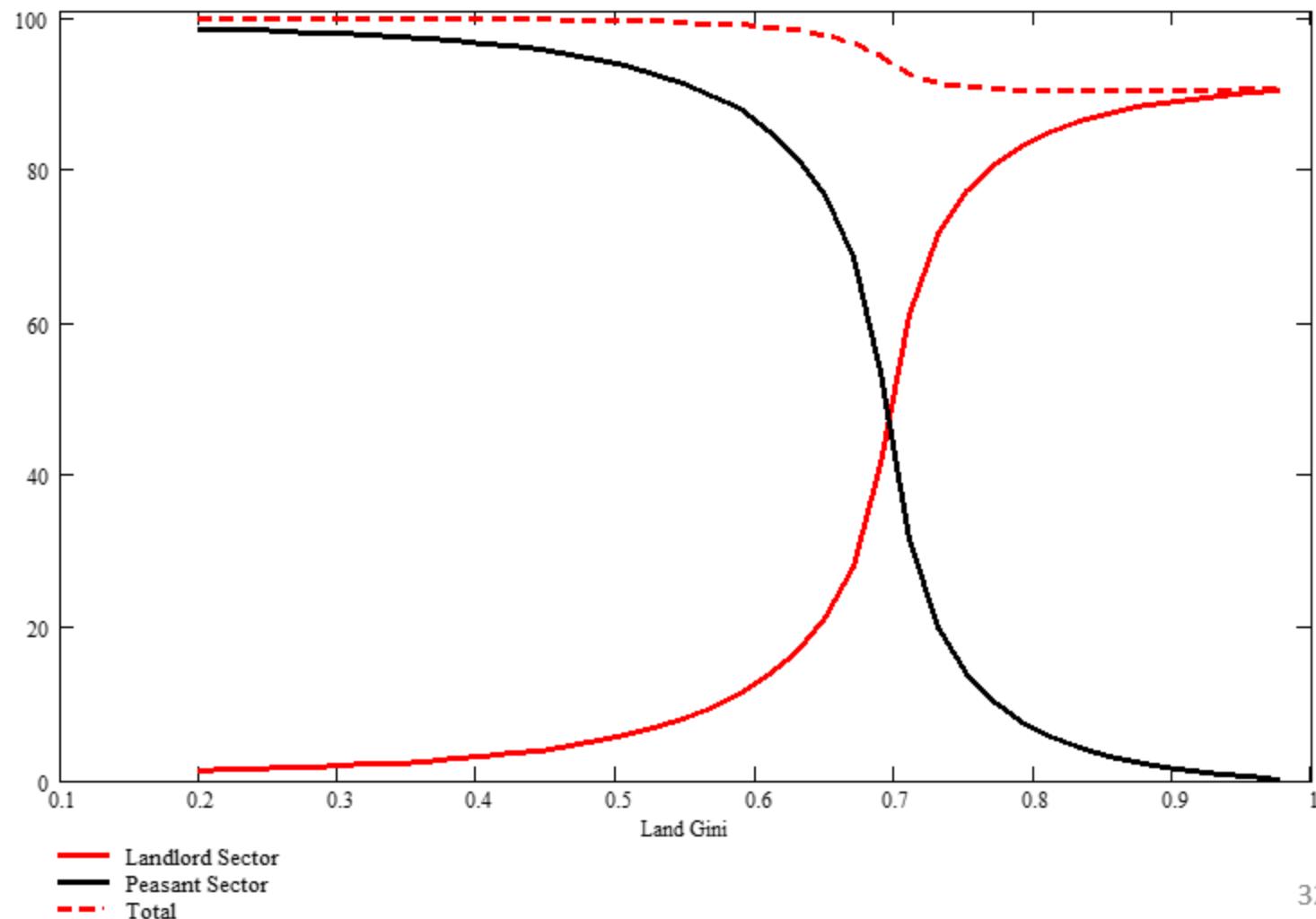
Competitive "American Road"
Large farmer leases out 95% of property
Efficient operational farm sizes
T/L ratios equalized



Monopoly "Junker Road"
Large farmer leases out 5% of property
Inefficiently large landlord estate
Higher T/L on landlord estate

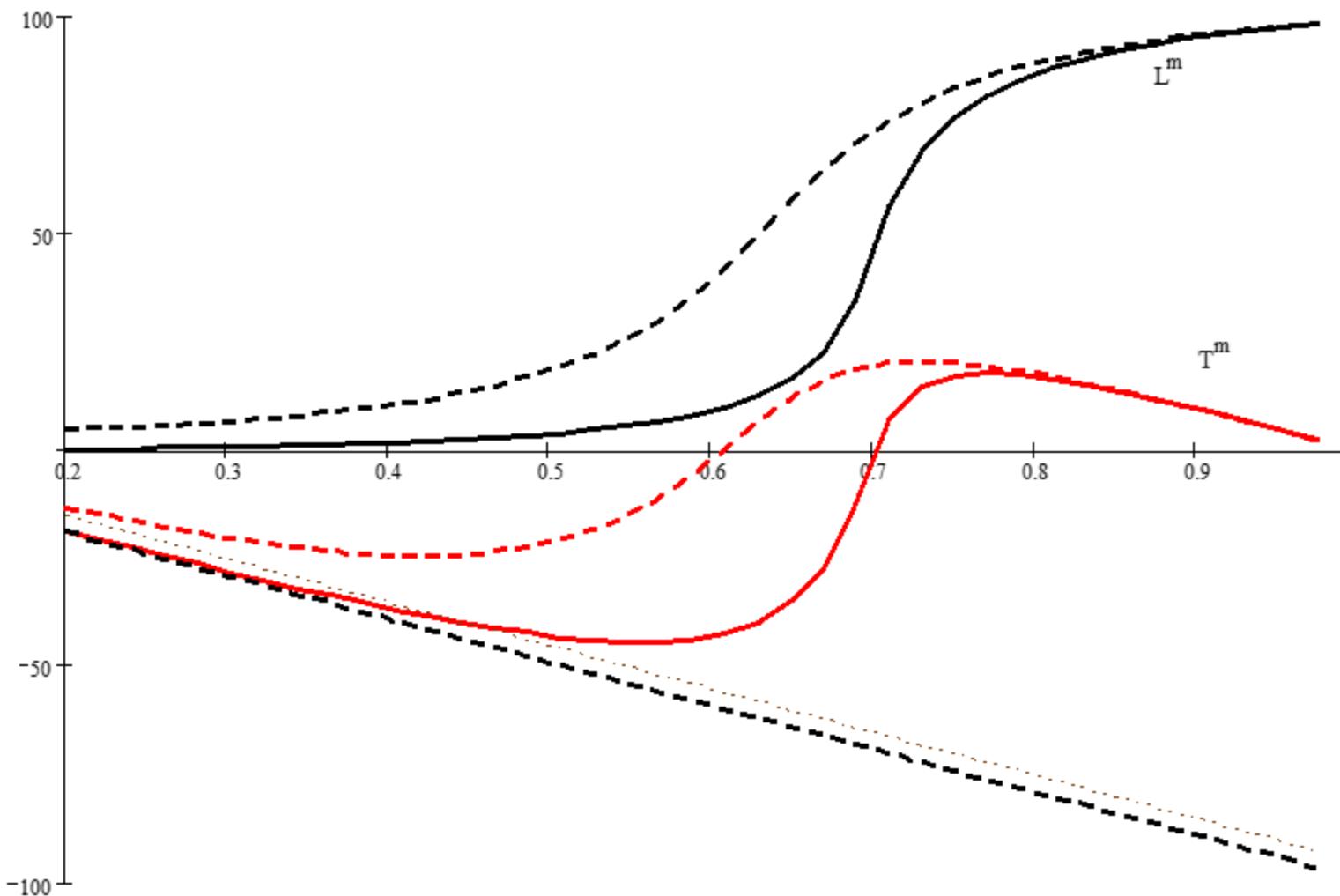
American vs. Junker Road

Landlord, Peasant, and total farm output function of Land Gini

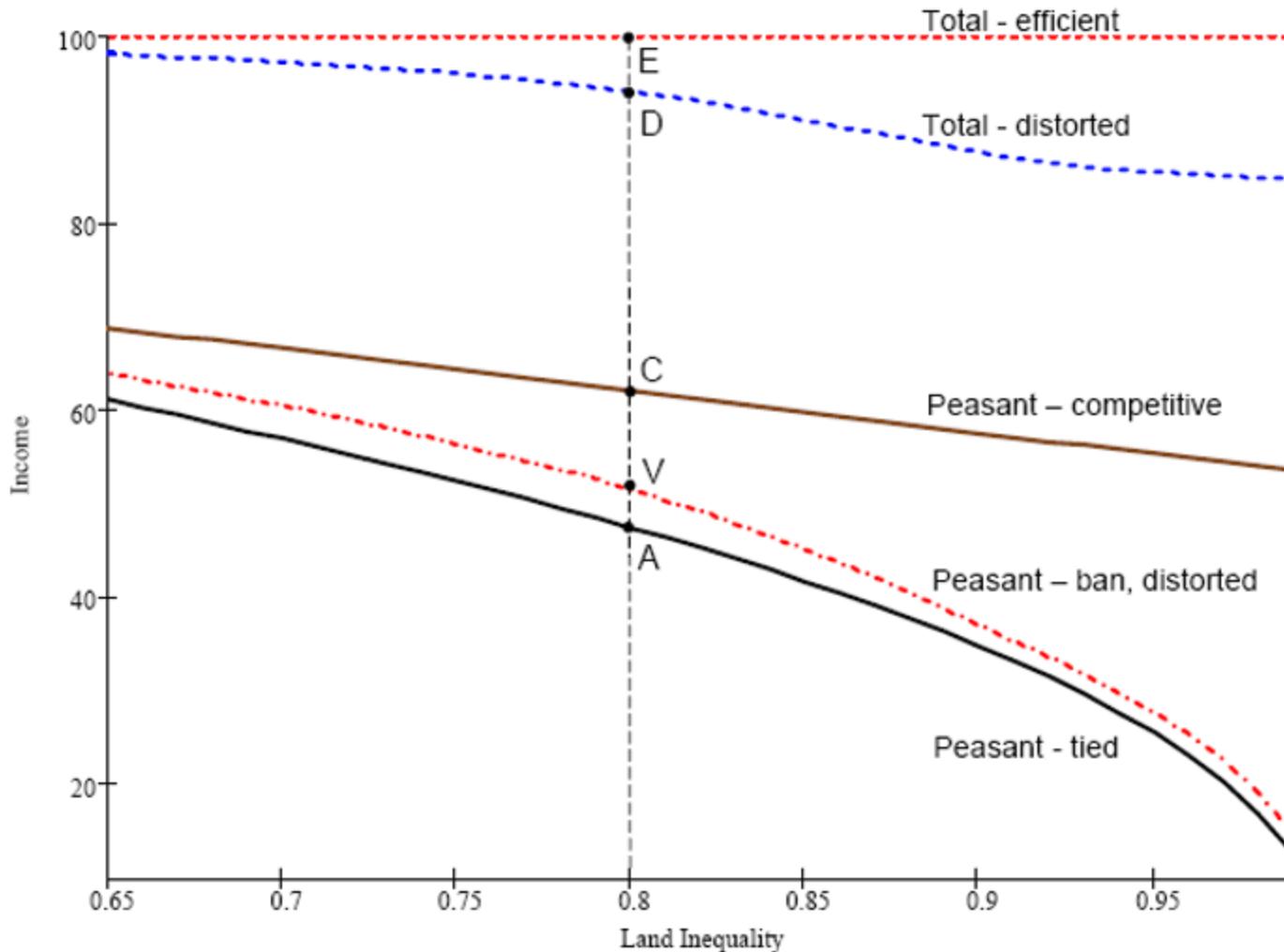


- Key tradeoff: withholding land from the market drives up land rents, drives down hiring wages versus opportunity cost of operating a large inefficient farm
- Anything such as increase in the relative skill of the lanlord or an increase in the relative price fo the landlords' crop that lowers this opportunity cost of being large can lead to an intensification of factor-market distortion mechanism
- Effects that might have been small on competitive markets lead to much larger responses in distorted markets.
- Rise of Juncker estates in Prussia or large Latifundia in Chile is associated with commercialization and export booms
- In both cases size of smallholder's tenancies were reduced and labor service obligations increased.

Improvement in Landlord's Relative Technology or Product Price Effect on net factor supplies



Price-discrimination, Serfdom and Labor-Service Tenancy



Extensions:

- Tied Labor-service tenancy contracts can be part of a strategy to extract surplus more efficiently (attempt to restore smallholder to more efficient operational farm size but avoid paying marginal products by extraction via lump sum tribute and tied labor service obligation to pay below marginal product of land)
- Earlier literature on 'interlinked' contracts view such tying as efficiency enhancing, but partial equilibrium focus made it seem that tenant was no worse off.
- In a general equilibrium setting this type of tying strategy can work to lower the smallholders' equilibrium outside opportunities.
- Ban on tied labor contracts can raise smallholder welfare (even if it may lower total output)

Land abundance and labor control

An increase in the relative abundance of land (the scarcity of labor)

- All else equal would seem to lead to a higher (shadow) $\frac{w}{r}$

Does this lead to:

- Strengthened bargaining power and freedoms for labor, or
- efforts by elites to control and coerce labor

Divergent historical outcomes:

1. Free peasantry, open frontier; dispersed settlement
2. Elite efforts at labor coercion: slavery, serfdom, restricted access to land

Scenario 1: Free peasantry

- Land abundance improves outside options/labor mobility:
- As land is abundant, MPL will be high (what peasant could earn farming own farm on frontier)
- Employer can't pay wage below reservation utility (otherwise worker would move to frontier)
- Cannot charge high rent where land abundant ...unless can establish property rights over labor (control mobility/access to land).
- Note: where no landlords, no tribute/tax, no centralized 'State'.

Scenario 2: unfree labor

- Where land abundant, it is property rights over labor, not land are valuable. If elites can collude to establish coercion/control over labor:
 - slavery
 - serfdom (limit on mobility and access to land)
 - Other forms to control labor: Patriarchy, polygamy, tight kin and extended family-cum-farm structures, etc.

Free or unfree peasantry?

Evsey Domar (1970): observed that cannot have free land, free peasants and non-working landlords at same time. Any two can co-exist :

1. Free land and free peasantry
2. Free land and landlords (serfdom)
3. landlords and free peasants (landlords can charge rent on scarce land)

Domar studies rise of serfdom in Russia and Eastern Europe following period of Russian military territorial expansion. This 'second serfdom' in early modern period (after serfdom had declined in Western Europe)

Free or unfree peasantry?

- A political question: balance of power
- Was there a strong central State
- Also conditioned by circumstances and technology (how easy to run away, how easy to seize crops)

Industrial scale slavery or maintenance of serfdom has required strong central State to help lords maintain cartel by limiting competition and peasant/slave mobility/escape.

Where strong labor and/or territorial control was imposed.

Examples:

- serfdom in Western Europe
- Second Serfdom in Russia
- Prussian Juncker estates, Latin American Haciendas
- Slavery in Caribbean and Southern USA

Where relatively free peasantry prevailed (often despite attempts to contrary)

- Northern American colonies (widespread squatting, runaway indentured workers)
- Eastern Europe (before 16th century), Nordic regions

Land abundant sub-Saharan Africa prior to arrival of white settlers had mechanisms of labor control in some places but on the whole relatively free farming communities. Little landlordism, few centralized states or elaborate tribute systems.

Does land abundance explain institutions in sub-Saharan Africa?

In sub-Saharan Africa, ruling families, lineages or larger social groups did try hard to 'capture peasantries' or develop systems of property rights in man. Yet, the presence of strong hierarchical societies ...has always been limited... people "knew too well the byways of the forest and hills in the country"

J.P. Platteau and K. Guirkinger (2015) in "Transformation of African farm-cum-family structures."

States and Power in Africa

Does land abundance explain the relative historical absence of strong centralized states in sub-Saharan Africa?

- in high population density Western Europe rise of States associated with rise of Kings and tributary lords, changing military technology, constant wars with associated needs to establish territory and systems of taxation and conscription (Charles Tilly).
- In land abundant Africa less less centralized state formation (J. Herbst)
- Technology of expropriation (crops) may even have played a role:

virtually all classical states were based on grain, including millets. History records no cassava states, no sago, yam, taro, plantain, breadfruit, or sweet potato states... only grains are

Fenske, James. 2013. "Does Land Abundance Explain African Institutions?" *The Economic Journal* 123 (573):1363–1390.

- Does labor scarcity predict pre-colonial land tenure and slavery
 - weak individual property rights to land
 - slavery, polygamy
- Do these institutions have lasting effects into modern times?
- Data sources:
 - Murdock's Ethnographic Atlas (database of 1267 societies)
 - historical estimates of population density
 - Modern day household survey data, geospatial data for soil quality, ruggedness, etc

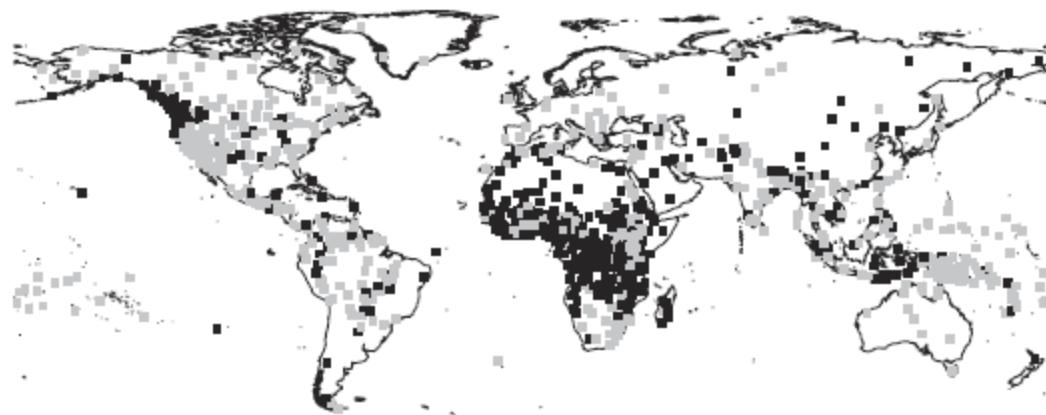
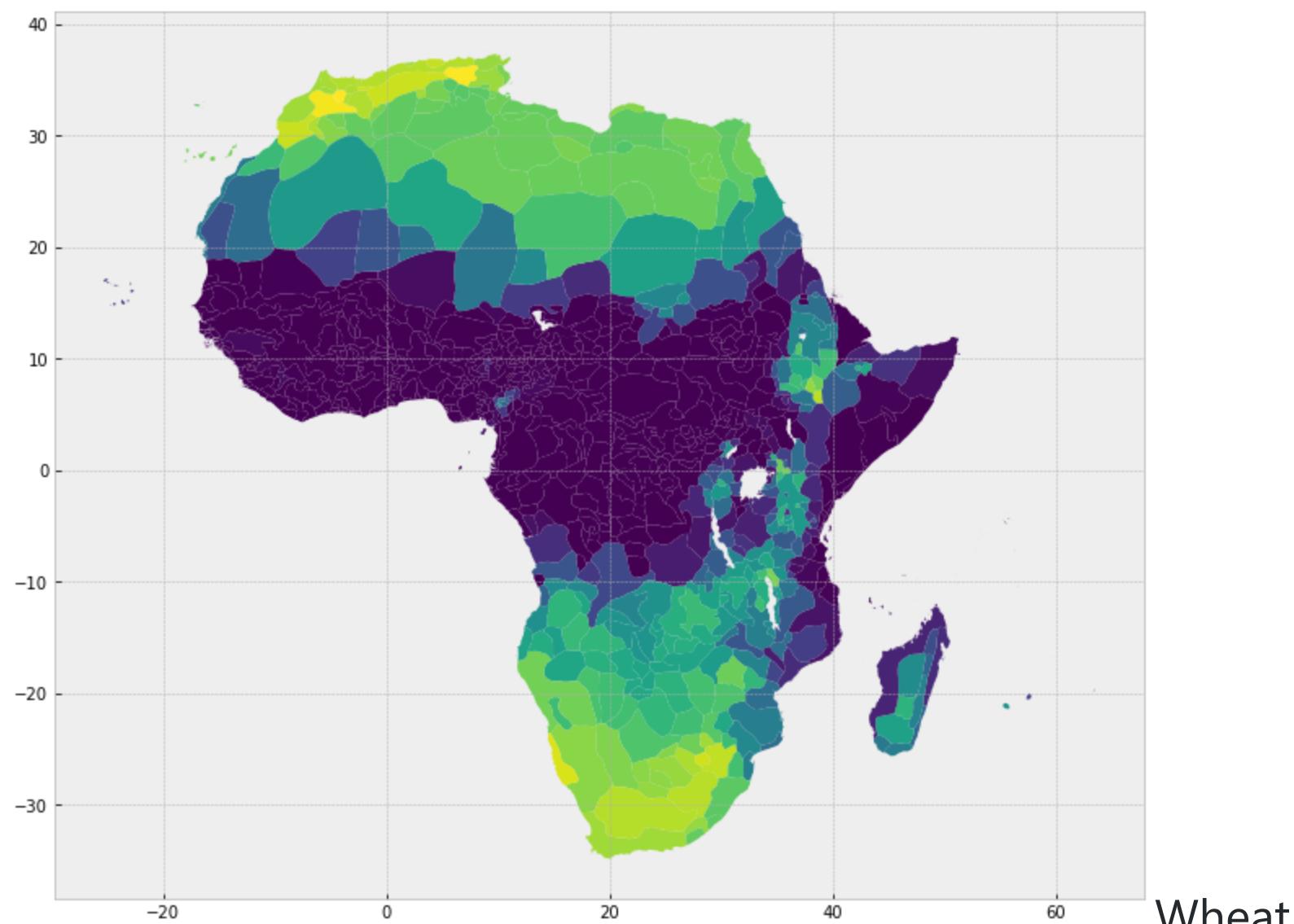


Fig. 1. *Slavery*

Notes. Black squares indicate presence of slavery. Grey squares indicate absence.



potential yield

Wheat

Fenske's results: Across all regions with entries in Ethnographic Atlas (not just Africa). Some suggestive but also mixed results:

- Careful to not interpret regressions as causal
- Early population density and land quality correlates with individual land rights
- Slavery... finds inverted-U relation to population density
- Persistent effects of land rights, polygamy, states (however, finds no clear relation to present day measures of state capacity)

Natural Experiments

Property rights and institutions are endogenous, co-determined alongside with social, political and economic outcomes. For this reason it's often difficult to establish what caused the emergence of a particular institutional form, or to assess the impacts of institutions on economic outcomes.

Although we cannot run history again and randomize treatments, careful interpretation of natural experiments in history may provide plausibly exogenous sources of variation to identify effects.

The following is a short collection of studies explore natural experiments to explore plausibly causal relationships between geography/land abundance or exogenous changes in market conditions and the evolution of production organization and institutions, or long-lasting impacts of institutions.

Recall also earlier natural experiment studies on India and Mexico.

The Rents From Trade and Coercive Institutions: Removing the Sugar Coating*

Christian Dippel[†]

Avner Greif[‡]

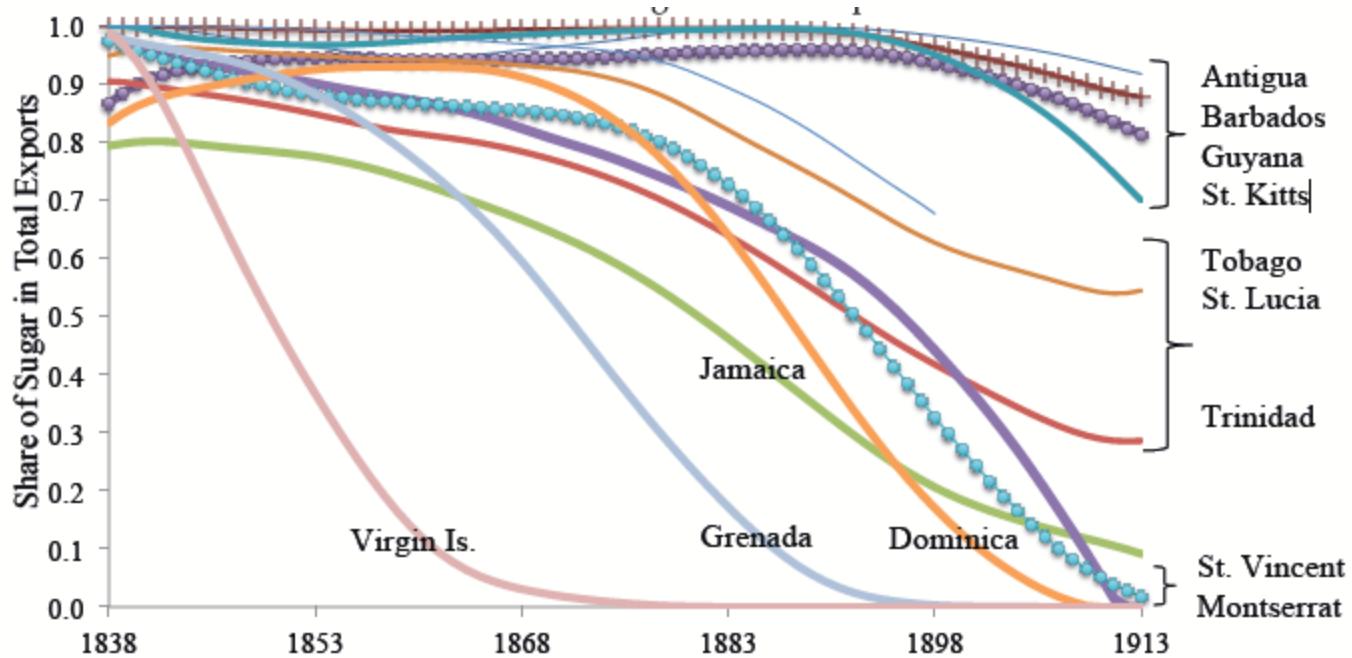
Dan Trefler[§]

June 25, 2016

Abstract

A sustained export price boom may not benefit workers if the resulting rents lead employers to invest in coercive activities that reduce wages. We formalize this idea in a simple model of an agricultural economy with exogenous export price fluctuations and plantation owners who mobilize the power of the state to coerce peasants. Coercion is any action that reduces the value to peasants of working in the non-plantation economy e.g., working as independent smallholders. Using unique data for 14 British West Indies sugar colonies from 1838 to 1913, a period in which sugar prices collapsed, we examine the impact of waning planter elite power on wages, incarceration rates, and peasant-biased taxes. In those colonies where the plantation system declined most, incarceration rates and peasant-biased taxes fell and, remarkably, wages rose.

End of slavery led to collapse of sugar production on some Caribbean islands, not others. Why?



Dark areas indicate areas suitable to and cultivated to sugar prior to abolition.



Island on left had interior mountain regions to which freed slaves could move. Plantation gang system harder to reconstitute in such places.

Island on left had few areas not already under cultivation. Fewer outside options for workers. Plantation system more likely to be continued.

Land Reform and the origins of the Sicilian Mafia

Bandiera, Oriana. 2003. "Land Reform, the Market for Protection, and the Origins of the Sicilian Mafia: Theory and Evidence." *The Journal of Law, Economics, and Organization* 19 (1):218–44.

<https://doi.org/10.1093/jleo/19.1.218>.

- Bourbon reforms 1816-1860 broke up feudalism estates in Italy.
- Divided immense estates into properties with modern property rights.
- But state protection of property rights weak. Banditry and predation. Externality in private enforcement of rights.
- Mafia sold what the state could not provide: protection
- Mafias in other countries similar origins in weak property rights environments, e.g. Japanese Yakusa, and more recently, Russian mafia during transition to capitalism (ex-KGB).

Dimico, Arcangelo, Alessia Isopi, and Ola Olsson. 2017. "Origins of the Sicilian Mafia: The Market for Lemons." *The Journal of Economic History* 77 (4):1083–1115.

- Similar to Bandiera, except finds rise to be particularly closely correlated to protection of citrus orchards following a boom in the sector..



FIGURE 3
MAFIA INTERPOLATED USING AN IDW

Note: Circles denote municipalities with high intensity of mafia (black circles), average intensity (greyish circles), and no mafia (white circles). The intensity of mafia after the interpolation is denoted on a same scale from 0 to 3 with white areas denoting towns with no mafia and black areas denoting regions with high intensity of mafia.

Source: Cutrera (1900).

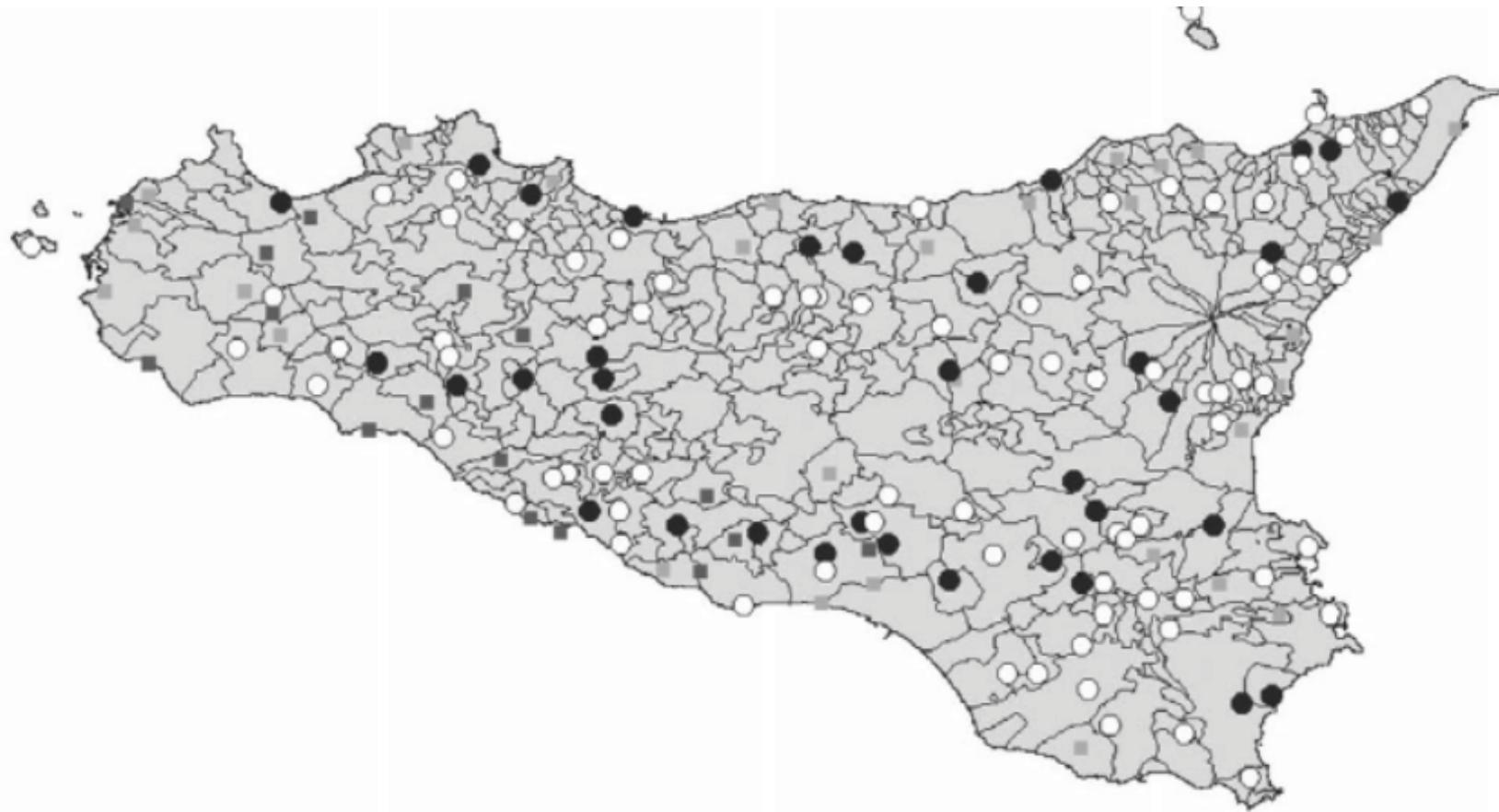


FIGURE 2
MAFIA AND NON-MAFIA TOWNS IN SICILY IN 1880S (DAMIANI SAMPLE)

Notes: Black circles represent municipalities with mafia and lemon production, white circles represent municipalities with no mafia and no lemon production, squares represents municipalities with no mafia and lemon production (light grey) and with mafia and no lemon production (dark grey).

Source: Damiani (1886).

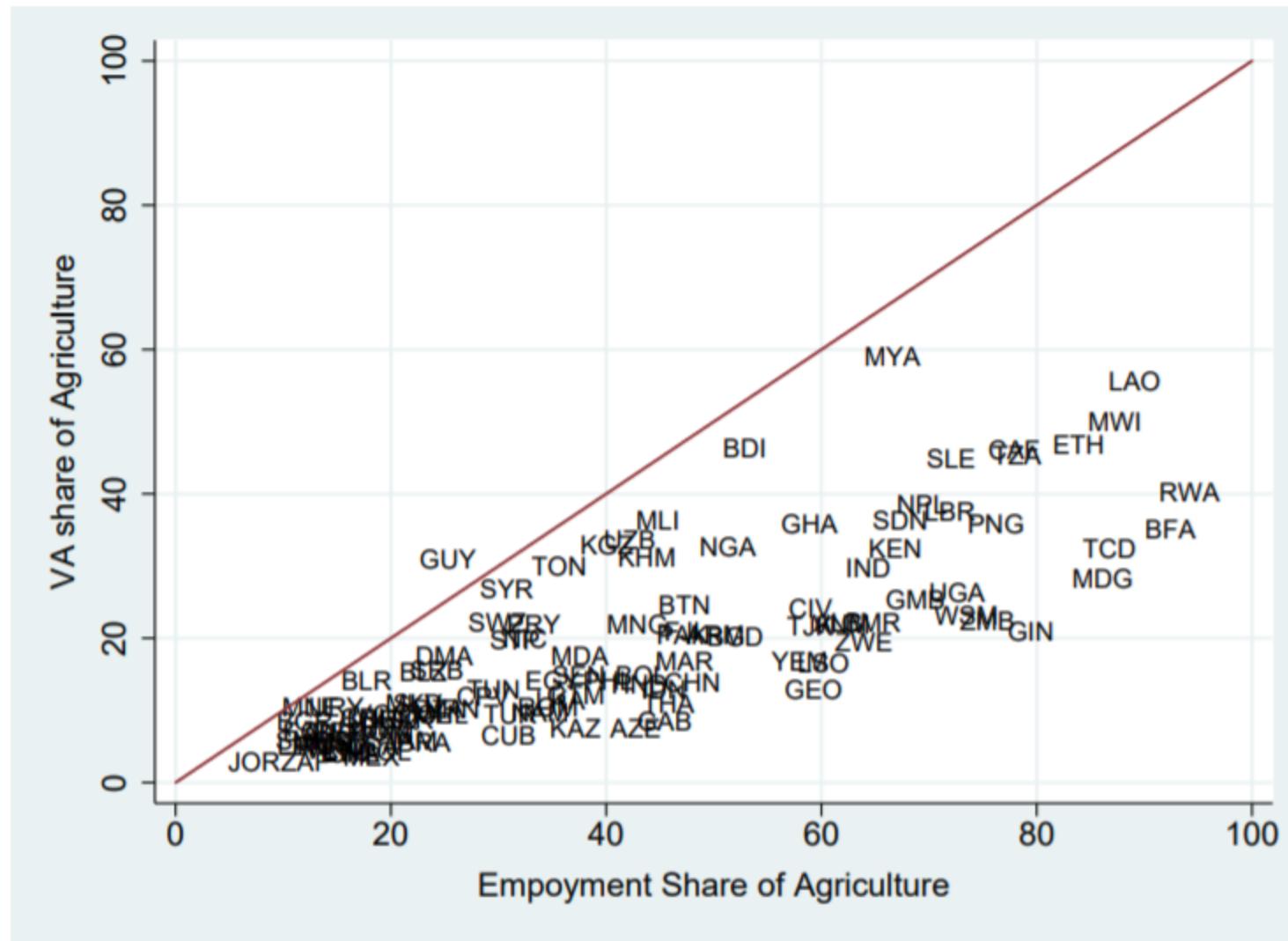
Misallocation studies

- Value added per worker is much higher in the nonagricultural sector than in agriculture in the typical country
- In most sub-Saharan countries, agriculture is a large sector in terms of employment and output. But typically agriculture's share of employment is much higher than its share of GDP.
- Large rural sectors but also some very large cities. These cities have less manufacturing than similar cities at same level of income per capita.
- Is this evidence of allocative inefficiency? Tied to property rights issues?

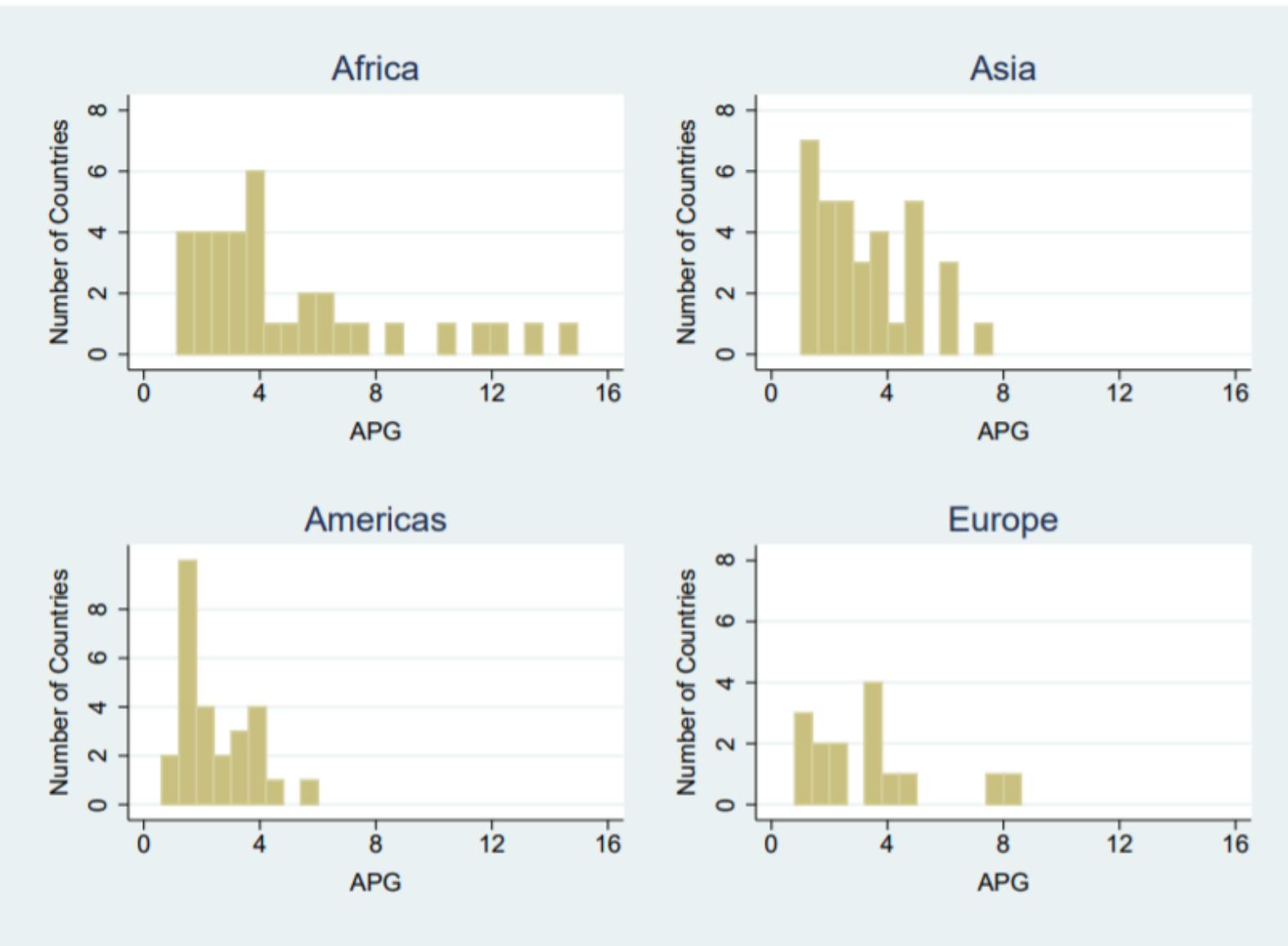
Agricultural Productivity Gaps (Gollin, Lagakos, Waugh)

Value added per worker in non-ag compared to in agriculture:

Figure: Agriculture shares in developing countries



"Raw" Agricultural Productivity Gaps



These APG's "explain" much of cross-country disparities in GDP per worker

Policy question: Encourage movement out of agriculture?

Practical question: Is mis-measurement an issue?

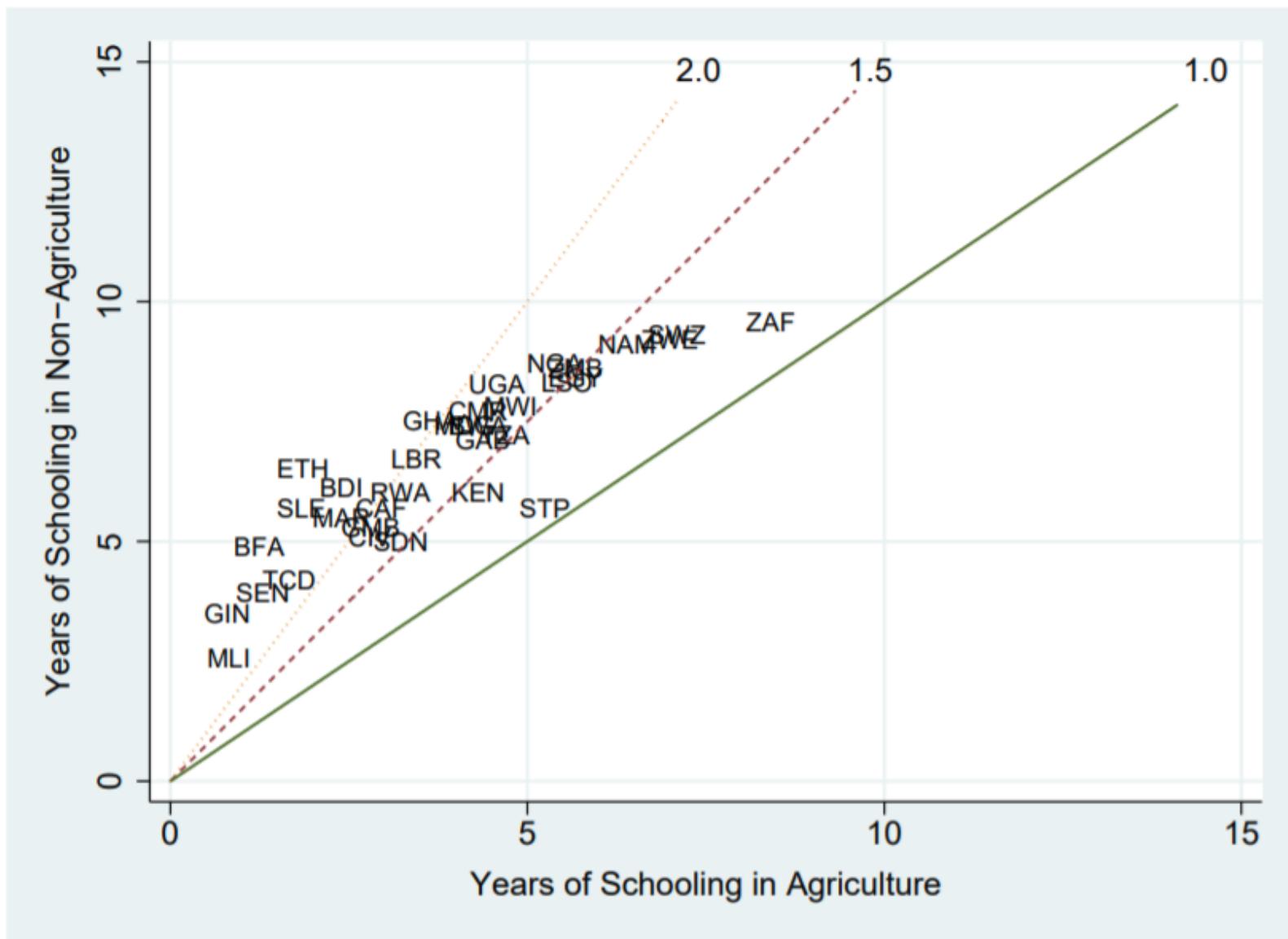
Gollin, Lagakos, Waugh (QJE 2013) make broad measurement adjustments

- adjust for human capital by sector
- adjust for hours worked by sector
- cost of living data
- check income/expenditure surveys to ask if national accounts mis-measured

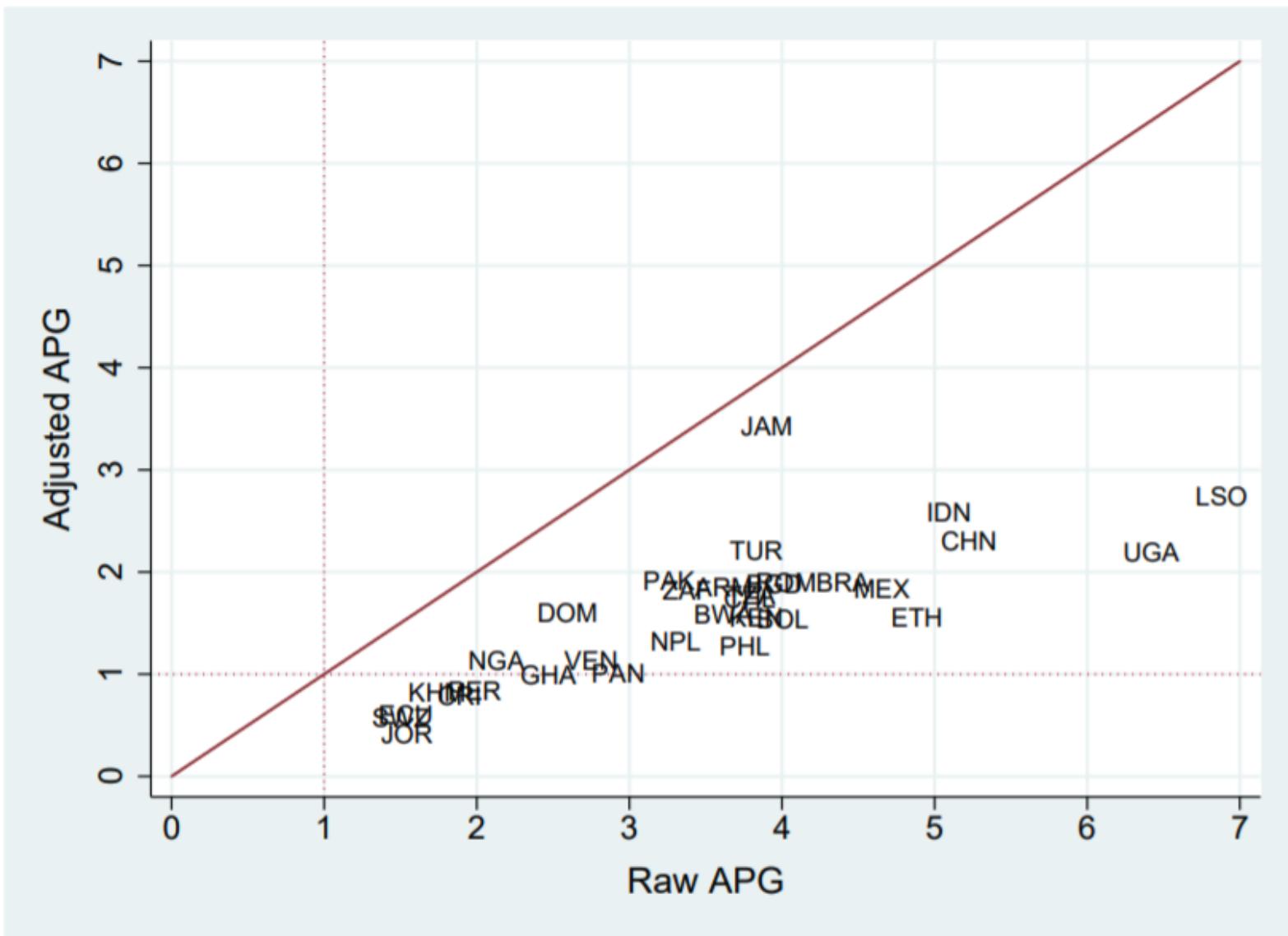
Adjustments lower world-average APG from 4 to 2.

Puzzlingly large gaps remain

Sector Differences in Years of Schooling: Just Africa



Raw vs Adjusted Gaps



One reason to study the benchmark models is because this is the broad framework used in these studies for thinking about misallocation

- Across countries
- Across sectors within a country
- Across firms within a sector
- Within the household

Property rights insecurity as migration distortion?

Simplest model: Rural wage w_A . Urban wage $w_N(s)$ rises with skill/education of worker. Each worker has one unit labor.

Rural income includes land endowment income $r \cdot \bar{T}$. Migrate if:

$$w_A + r \cdot \bar{T} < w_N(s_i) + r \cdot \bar{T}$$

Those with high enough skill who have $w_N(s_i) - w_A > 0$ migrate

If migration means losing land migrate only if:

$$w_A + r \cdot \bar{T} < w_N(s_i)$$

or $w_N(s_i) - w_A > r\bar{T}$ Less migration.

- Many studies find evidence of this effect
- Carter and Yao (2004) one of earliest. Studies effect of improved transferability of land in Chinese village collectives.
 - improved transferability also improves investment and specialization incentives (no regret if later migrate)
- Ejido reform in Mexico

Natural Experiment in Mexico

Delinking Land Rights from Land Use: Certification and Migration in Mexico[†]

By ALAIN DE JANVRY, KYLE EMERICK, MARCO GONZALEZ-NAVARRO,
AND ELISABETH SADOULET^{*}

In many developing countries property rights over rural land are maintained through continuous personal use instead of by land titles. We show that removing the link between land use and land rights through the issuance of ownership certificates can result in large-scale adjustments to labor and land allocations. Using the rollout of the Mexican land certification program from 1993 to 2006, we find that households obtaining certificates were subsequently 28 percent more likely to have a migrant member. We also show that even though land certification induced migration, it had little effect on cultivated area due to consolidation of farm units. (JEL O13, O17, P14, Q15, Q18, Q24, Q28)

- Mexican land reforms created Ejido communities
 - land use rights, but land had to be used personally and land not used for > 2 years reassigned.
 - Prohibited land rental or sales
- PROCEDE reforms rolled out 1993-2006
 - land certificate GIS-based, could be used for rental or sales within community. 3.6 million beneficiaries

Main findings. certification leads to:

- HH 28% more likely to have migrant member
- ejido population decline without fall in output. Average plot size increases 10-15%
- increased consumption of non-food items

Fixed effects specification compares changes in migration between HH in early-certified and later certified ejidos.

More recent paper by same lead authors finds evidence that it is most skilled or migrate

Other land and property rights topics

- Discriminatory land policies
- Models of Appropriation and Defense
- Squatters Rights around the world
- Why do property rights remain insecure?
- Impact evaluation challenges

Big farms and small farms

- Appropriation and defense
- Squatters' Rights
 - Latin America's squatter settlements
 - informal enforcement, 'dead capital'
 - USA: squatter nation
- Why do property rights remain insecure?
- Impact evaluation challenges

Why Big farms? (thus far)

- Maybe they just have better 'skill' S
- small farmers face different constraints, factor prices.
 - credit constraints
 - access to land for other reasons
 - marketing and support, roads, infrastructure
- Market power distortions
- Politically sustained discriminatory policies (land, labor)

Discriminatory Policies examples

Following the end of slavery in Caribbean & The Americas

- anti-vagrancy laws, recruitment restrictions
- Jim Crow, violence, paternalism and sharecropping
- Penal codes
- Limits on access to land ('40-acres and a mule')

Discriminatory Land Policies

- Frontier policies in new colonies often included attempts to limit worker access to land to limit outside opportunities

Colonial officer E.G. Wakefield:

The government should raise the price of lands so that only men of substance could afford the purchase price...The barrier of high land prices would thus force the pauper immigrants into combined and constant labour for wages.

- In Latin America, labor to 'reductions', vast encomienda land grants to conquistadores. Discriminatory frontier policies (e.g. minimum 5000 has property in Chile's southern frontier)
- Fundamental Constitutions of the Carolinas:
 - example of effort to build hierarchical social structure in land abundant Americas

South African Land Policies: suppression of African Agriculture

Deininger, Klaus, and Hans P. Binswanger. 1995. "Rent Seeking and the Development of Large-Scale Agriculture in Kenya, South Africa, and Zimbabwe." *Economic Development & Cultural Change* 43 (3):493–523.

- Land access restrictions through creation of 'reserves'.
 - Transvaal: 0.76 of 69 million hectares
- Tenant ('squatter') farming at first widespread:
 - Natal in 1882 55% of natives. Absentee landlords and large companies charged rent or sharecrop. Natal population tenants (35% on private lands, 2% on crown lands)
 - in 1904 Transvaal 900000 black farmers (14% own land, 20% crown land, 50% on white settlers land)
- Mining interests wanted low wage labor supply

South Africa

- "by 1890s European farmers in SA were suffering from serious competition from African farmers who could supply food at lower prices"
- Glen Grey Act 1894 restricts ownership in reserves to parcels <3has
- **Native Lands Act 1913 (1936)** limited black farming to reserves (<8% land). Imposed limits on max holding sizes, barred blacks from buying land from whites, prohibited sharecropping and cash rentals.
 - "the law made for the mining houses"
 - excessive restrictions on 'communal tenure'

European agriculture subsidized.

Property Rights on the Frontier

Hotte, Louis (2001). "Conflicts over Property Rights and Natural-Resource Exploitation at the Frontier." *Journal of Development Economics* 66 (1): 1–21.

see jupyter notebook

Player A claims frontier rights. Chooses to either:

- 'Strip mine' and abandon the site for reward y_M
- Attempt to defend and sustainably manage
 - extract $y_S < y_M$ immediately
 - make costly defensive investment x_A
 - in period 1 earns:
 - $y_S < y_M$ in perpetuity if defense works
 - 0 if defense fails.

Player B:

- If site is stripped, moves on, earns 0.
- If not stripped decides incursive investment x_B .
 - Earns y_S in period 1 if challenge succeeds
 - Earns 0 if challenge fails.

Contest success function (CSF)

$$\pi(x_A, x_B) = \frac{x_A}{x_A + x_B}$$

If A does not mine the site the players then enter a simultaneous move game,

Equilibrium in Nash Strategies

Payoffs

Sustainable use

$$V_A^s = p \cdot y_s + \pi(x_A, x_B) \frac{p \cdot y_s}{1+r} - x_A$$

$$V_B^s = (1 - \pi(x_A, x_B)) \frac{p \cdot y_s}{1+r} - x_B$$

Strip Mine

$$V_A^m = p \cdot y_m$$

$$V_B^m = 0$$

Reaction functions

$$\frac{\delta V_A^s}{\delta x_A} = \frac{\delta \pi(x_A, x_B)}{\delta x_A} \frac{p \cdot y_s}{1+r} - 1 = 0$$

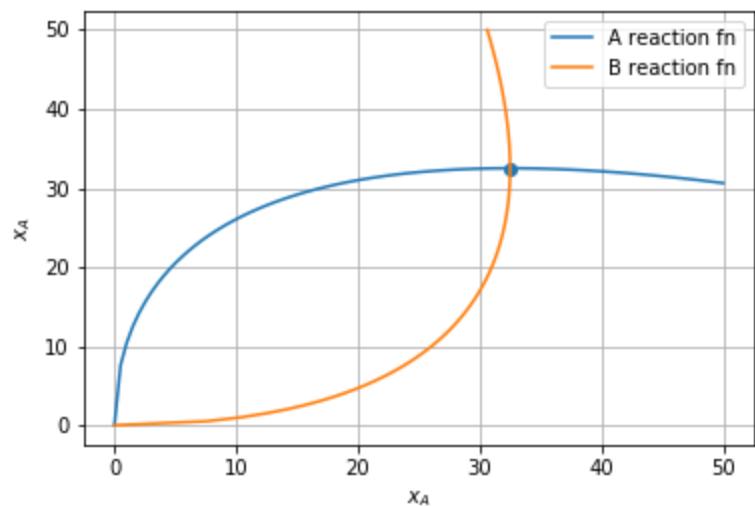
$$\frac{x_B}{(x_A + x_B)^2} \frac{p \cdot y_s}{1+r} = 1$$

Player A's reaction function

$$x_A(x_B) = \sqrt{\frac{x_B \cdot p y_s}{1+r}} - x_B$$

Player B's reaction is symmetrically similar

Reaction Function



Nash Equilibrium

$$x_A^* = x_B^* = p \cdot \frac{y_S}{4(1+r)}$$

Nash Equilibrium

$$x_A^* = x_B^* = \frac{p \cdot y_S}{4(1 + r)}$$

Eviction occurs with probability $\frac{1}{2}$

Conflict intensity

$$x_A^* + x_B^* = \frac{p \cdot y_s}{2(1 + r)}$$

Half of PV of value of resource is diverted into incursive or defensive activities.

Resource use decision

Expected payoff to A:

$$V_A^{S*} = \left(1 + \frac{1}{4(1+r)}\right) py_S$$

less than Potential Social Benefit

$$\left(1 + \frac{1}{1+r}\right) py_S$$

Lessons and Interpretations I:

- *shadow of conflict* makes inefficient mining more likely.
- absence of conflict not to be confused with absence of property rights problems.
 - resource mining leaves nothing worth fighting for.

Lessons and Interpretations II:

- The only social cost of confrontation is sum of efforts $x_A + x_B$
- No destruction in transfer: A's loss is B's gain.

USA: squatter nation

- Class discussion and chalkboard on squatters, claims clubs and frontier policy in the Americas.

Soto, Hernando de. 2001. "Citadels of Dead Capital: What the Third World Must Learn from U.S. History." *Reason* May. [link](#)

Murtazashvili, Ilia. 2013. *The Political Economy of the American Frontier*. Cambridge University Press.

Weak property rights as a political equilibrium

- " Land reform programs that ambitiously redistributed land and altered property rights frequently granted incomplete property rights to beneficiaries" [de Janvry, 2014]
- Why is land reform ill-used as a policy instrument in spite recognized potential to generate efficiency and welfare gains [Lipton 2009]
- Political Losers as a barrier to economic development [Acemoglu and Robinson]
 - commitment problems inherent in politics

Breaking Clientelism or Rewarding incumbents?

"Breaking Clientelism or Rewarding Incumbents? Evidence from an Urban Titling Program in Mexico."

[@LarreguyBreakingclientelismrewarding2015]

- Federal Land regularization program established 1973
- 2.16 million HH reached by 2008

... squatters' inability to provide proof of residence creates a host of other opportunities for political intermediation

...Political brokers and municipal government officials often offer squatters protection against eviction and the basic infrastructure that informal communal settlements lack in exchange for political support for the municipal incumbent party.

(...politicians or brokers....encouraged individuals to illegally take possession of land or illegally purchase land while offering protection against municipal intervention...)

...focus on informal settlements located on communal urban land belonging to an ejido or agrarian community

...the establishment of land property rights has the potential to substantially diminish the dependency of squatters upon incumbent political parties, particularly at the municipal level, and thus break down clientelistic ties

...we use a difference-in-differences design to identify the effect of land titling on the precinct-level vote share of municipal and federal incumbent parties.

we find that land titling significantly decreases the municipal incumbent party's vote share [by 6.8% of their vote tally]

Onoma, Ato Kwamena. 2009. *The Politics of Property Rights Institutions in Africa*. Cambridge University Press.

cases are drawn from Botswana, Ghana, and Kenya.

Form	Functions
Laws, norms, rules, and policies	State proper ways of transacting
Registries, survey departments, councils of elders, land overseers	Keep information on interests, dimensions, and locations
Courts, tribunals	Adjudicate land disputes
Police, task forces, village committees, boards	Enforce and monitor compliance with rules concerning rights

the ways in which leaders extract value from land and the extent of their capacity explains variations in their treatment of institutions that govern land rights.

Leaders who accrue gains from land indirectly through the productive exploitation of land for agriculture or real estate development, for instance, have a preference for strong institutions that secure rights. Whether or not they create such institutions depends on the extent of their influence.

Leaders whose gains from land are accrued directly and are not mediated by the productive use of land have no such interest in securing property rights.

Impact evaluation for property rights reforms

