

Week 1

Day 1: Introduction. Coase and more

Day 2

Day 3

Day 4

Day 5

Week 1

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

("Landownership as determinant of economic structure and political economy")

Jonathan Conning

Hunter College and The Graduate Center*

City University of New York

Day 1

5-week outline

1. Property Rights, contracts, structure and performance (J.Conning)
2. Factor markets and structural transformation (M.Carter)
3. Economics of urban land use and policy (R. Jedwab)
4. Survey and spatial data methods ()
5. Impact evaluation of land interventions (A. Coville and D.Ali)

Week 1 outline

1. Intro. Land tenure, origins, heterogeneity, change. North/Coase
2. Land and other factor markets and resource (mis)allocation.
Malawi study.
3. Production and contract structure. Appropriation, conflict and the state.
4. Power, distortions and persistence of inefficient institutions
5. Property Rights reforms, policy and impacts

- models and applications
- liven with economic history and history of ideas
- tour of interesting natural experiments and empirical studies
- discussion and debate

Labs

1. Problem set 1 distributed
2. Problem Set 1 due
3. Groups for research proposal outlines
4. Problem Set
5. Research Proposal Presentations

Problem dig deeper into topics described in class. Write up answers, work in groups.

Douglas North on 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

Land tenure and production relations trajectories

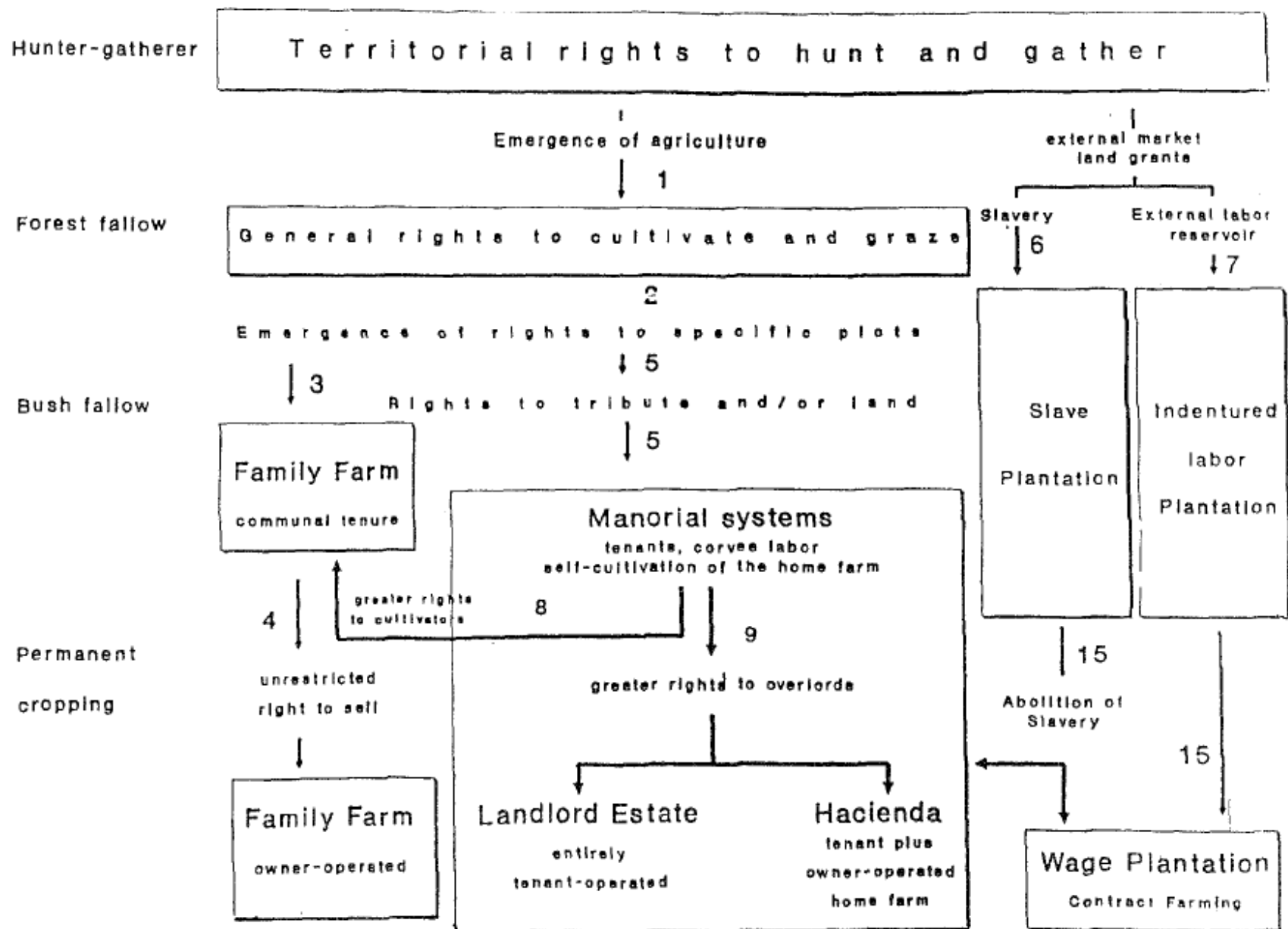
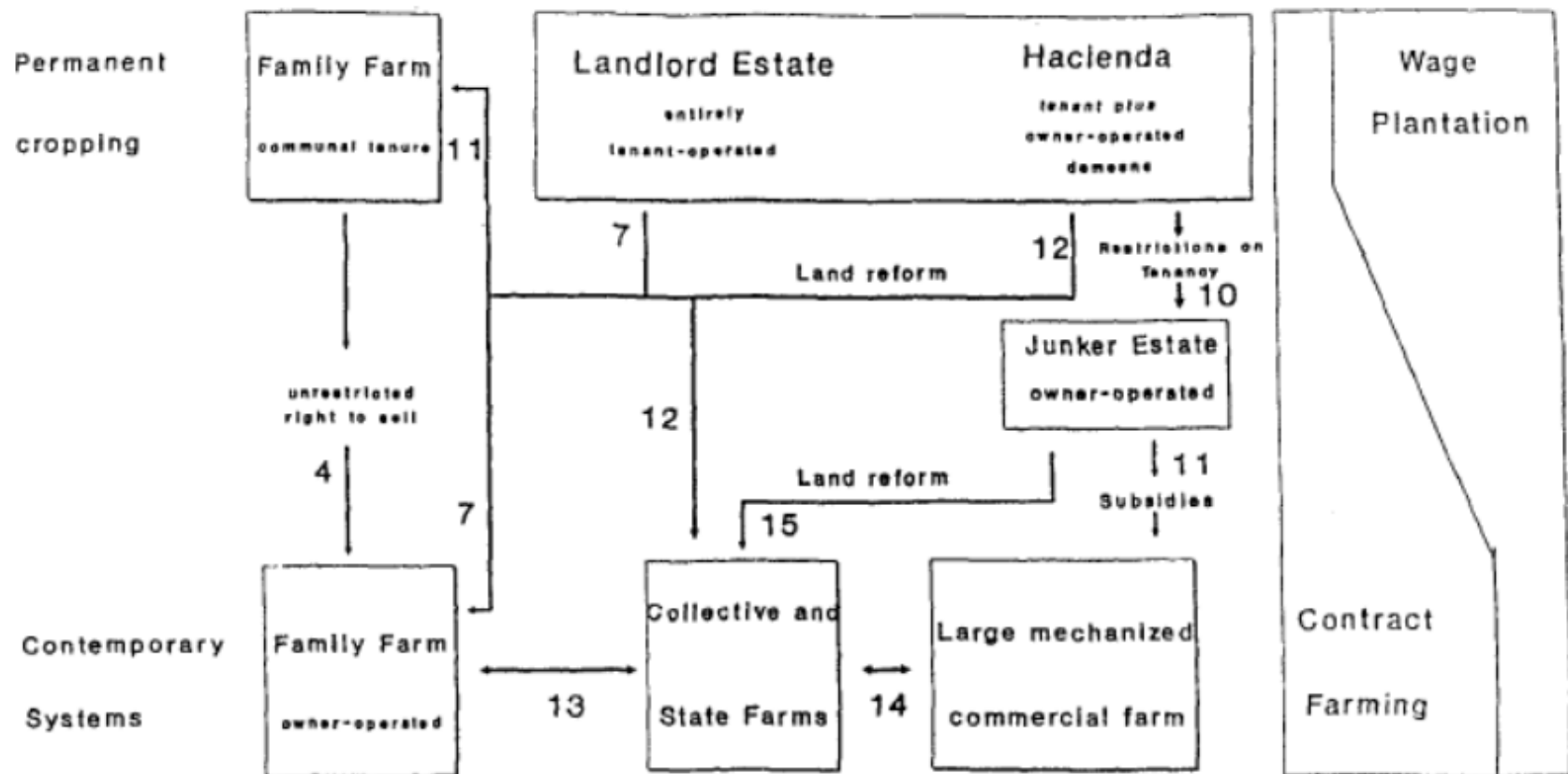


Figure 42.1. Evolution of production relations & property rights.



What drives institutional change?

In most accounts:

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

What drives the direction of institutional change?

- Evolutionary adaptations/innovations to take advantage of new opportunities. Emergent, spontaneous.
- Purposefully imposed reforms
- Balance of power between those who want to impose their interests and those who resist

Introductions

- Your name, place of study, country of origin
- Research topics or experience on land or land-related topics
- Special training (e.g. law, GIS..)
- Small land-related anecdote in your life

Approaches to the of study land institutions and institutional change

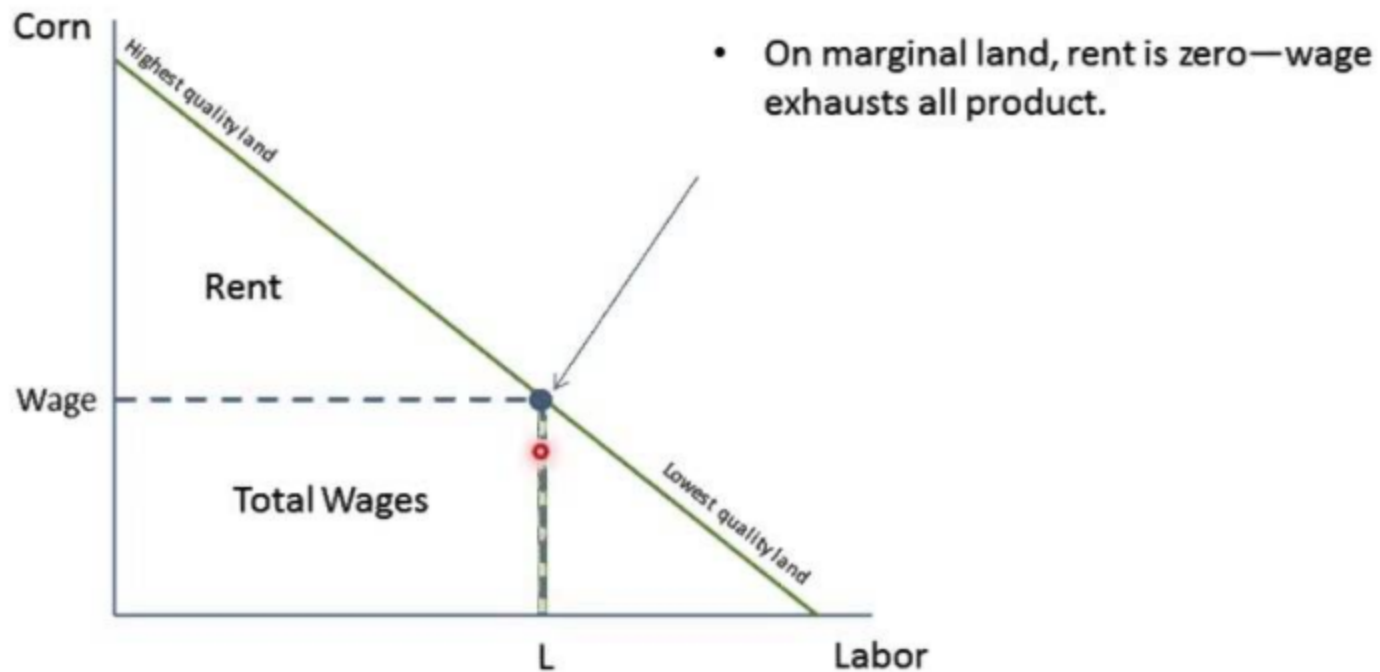
- **Classical** (Smith, Ricardo, Say, Mill, George)
- **Neo-classical** (marginalist revolution)
- **New-institutional** (transactions costs; CDAWN -Coase, Demsetz, Alchian, Williamson, North)
- **Marxian**
- **Modern contracting** (Stiglitz, Holmstrom, Tirole, Hart)
- **Modern political economy** (later North, Acemoglu/Robinson, Engerman/Sokoloff and others)

Classical economists on landlords, land rents and incentives

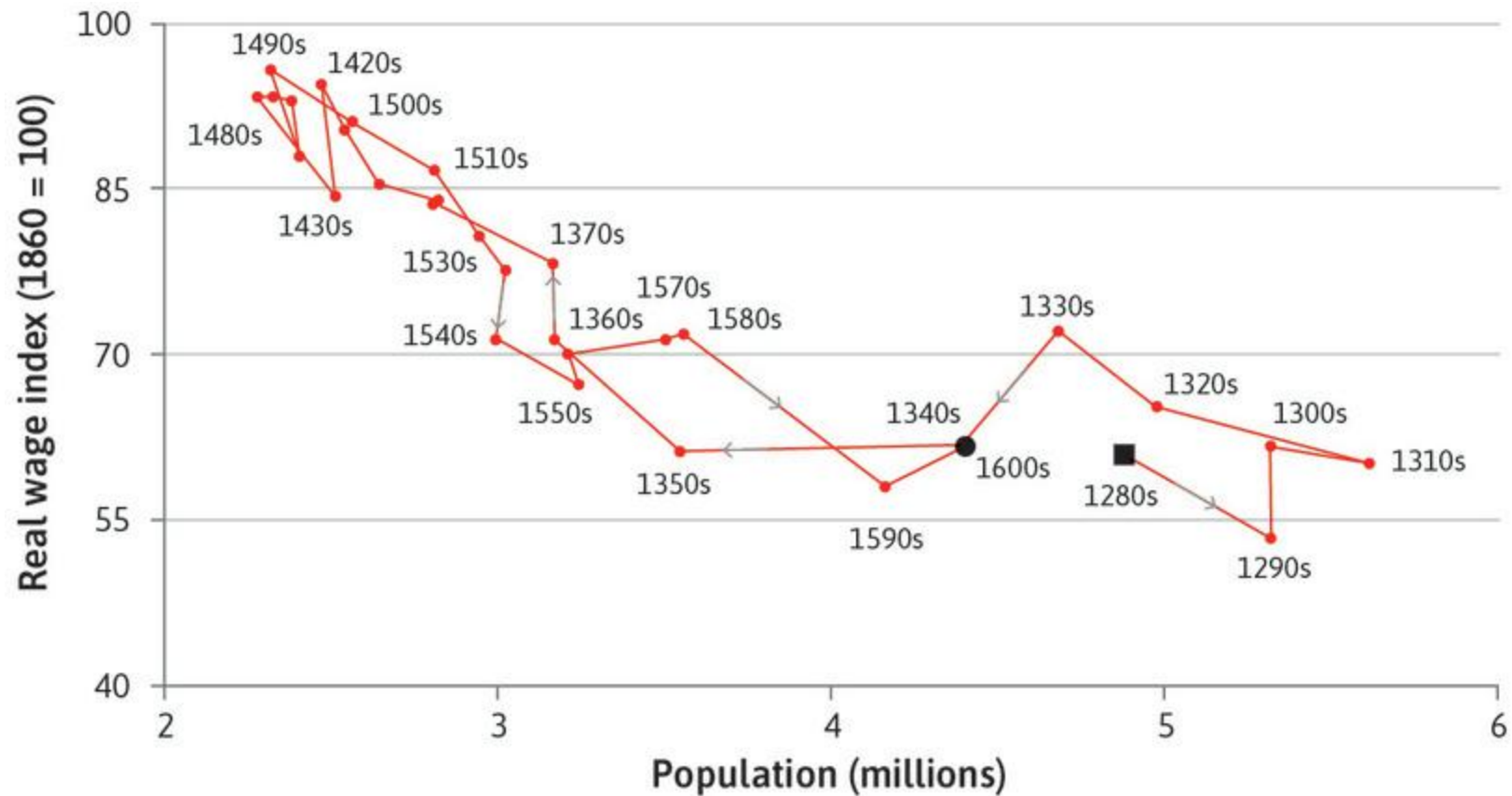
Writing in 18th and 19th centuries:

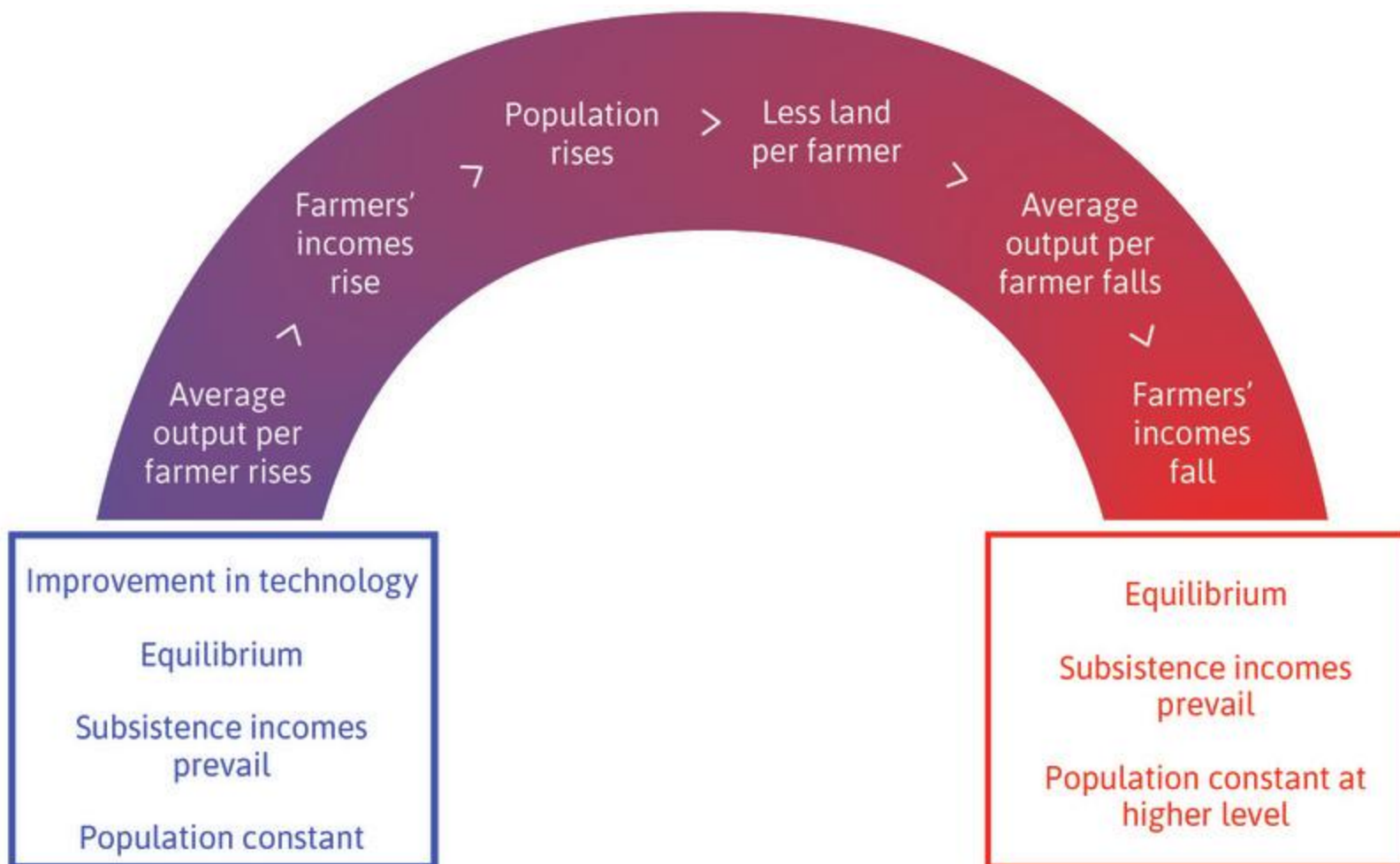
- "landlords' right has its origin in robbery (Say)"
- "landlords...love to reap where they never sowed... demands a rent even for unimproved land... when the lease comes to be renewed.. the landlord commonly demands augmentation of rent [made by the tenant] (Smith)"
- "Those laws and customs so favorable 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)"

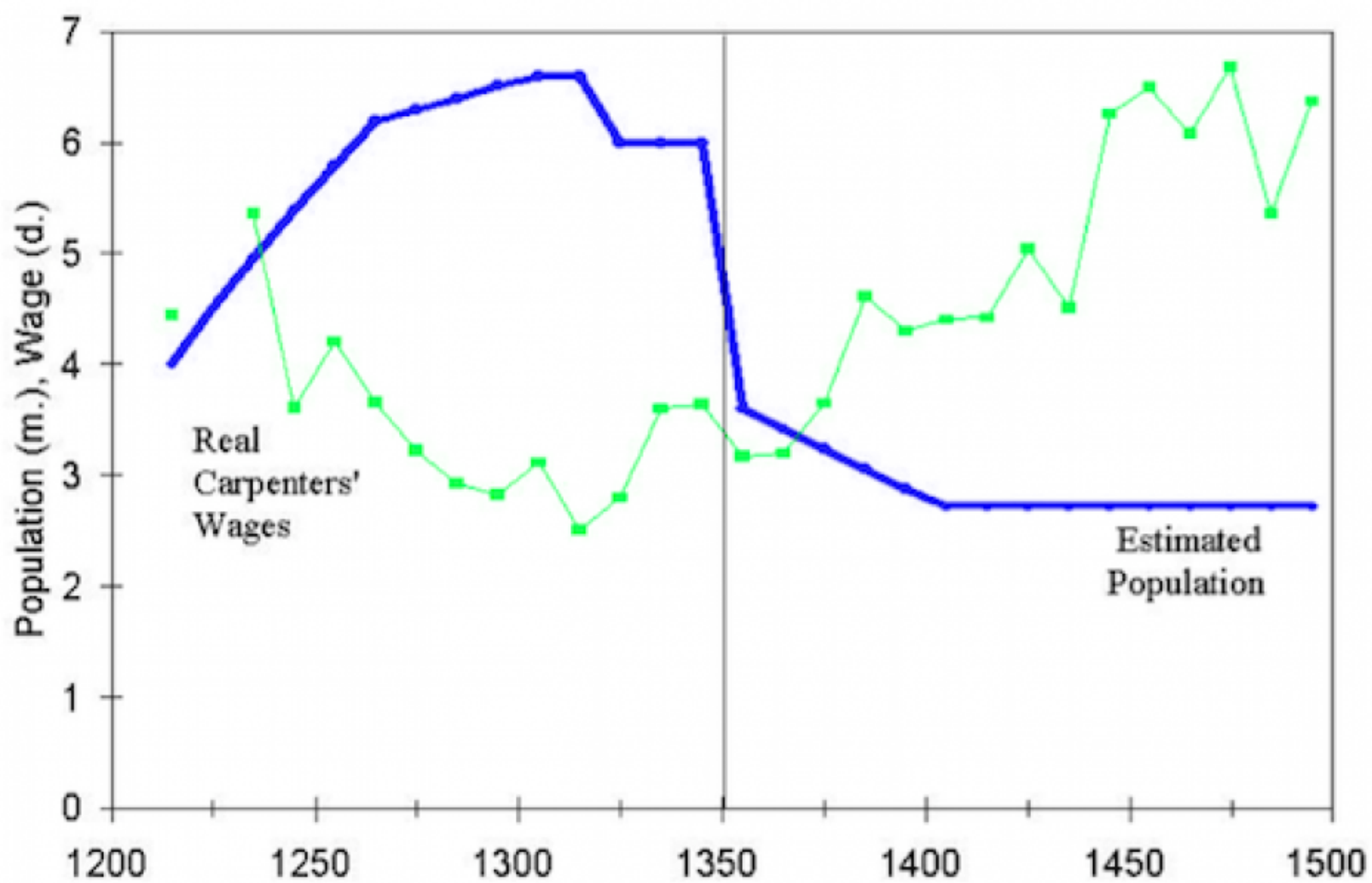
Ricardian Rent

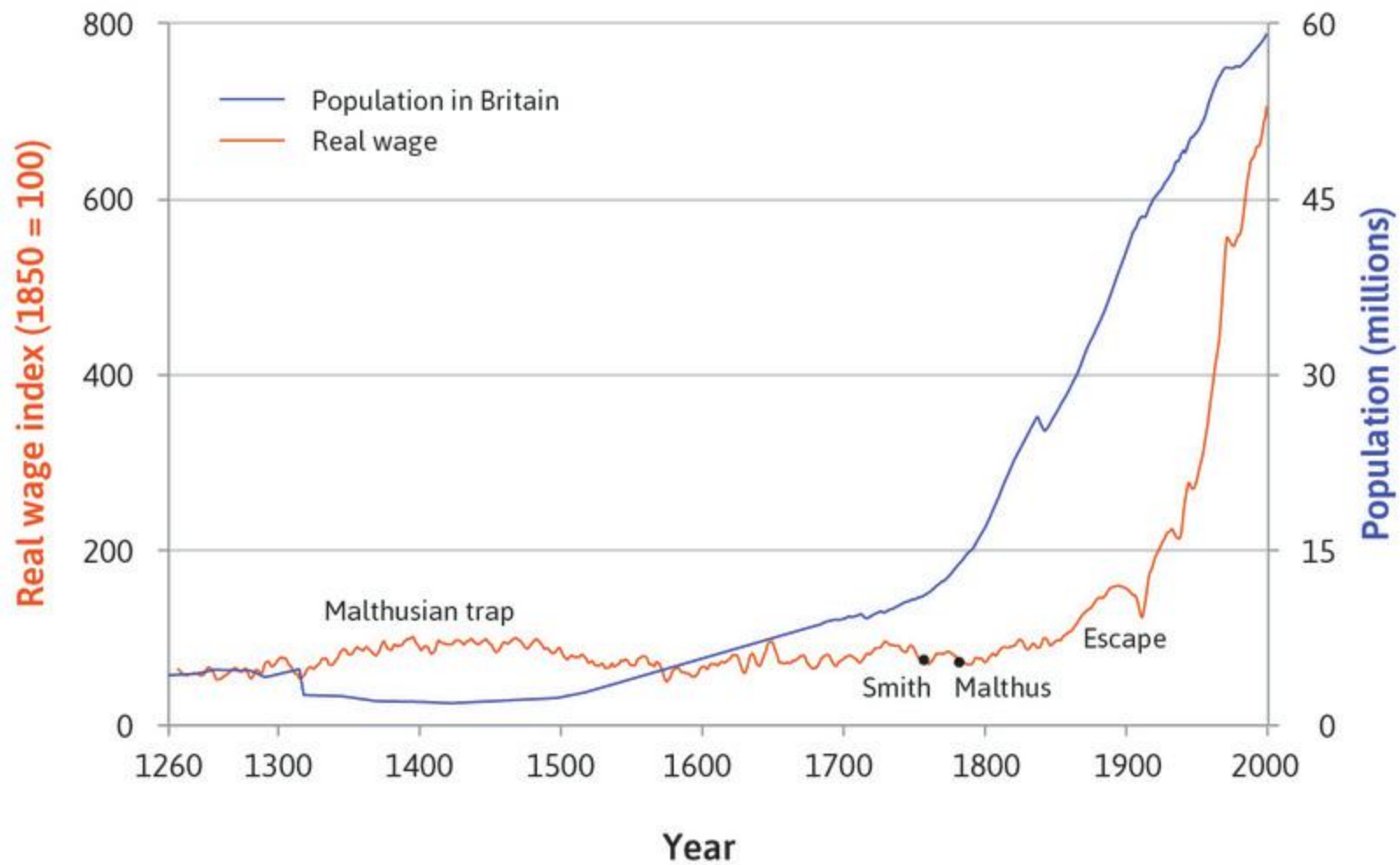


Ricardo, Malthus and diminishing returns









Much more later on landlords, customary land tenure and enclosures 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 nature of technology and preferences and costless enforcement of property rights, complete markets.
- **First-welfare Theorem** (Smith's 'invisible hand'): competitive market equilibria will be Pareto efficient (*regardless of the initial distribution of property rights*).
- Abstracts away from (assumes too much about) property rights and markets. Secure and perfectly and costlessly enforced.
- Institutional and organizational detail erased

“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.

The appeal to Hayek, libertarians and anarchists

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 in Land

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.

Land abundant settings

- Critical issue is access to labor, not land.
- No 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 (Boserup, 1965)... [m]arginal lands ...brought under cultivation requiring higher investments... Only now, ownership security becomes and important incentive

Esther 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...

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 and induced technical change

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.
- Does not imply private property preferable (e.g. negative externalities like soil erosion may intensify, inequity may rise, costly defense)

Model elements (problem set 1)

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.

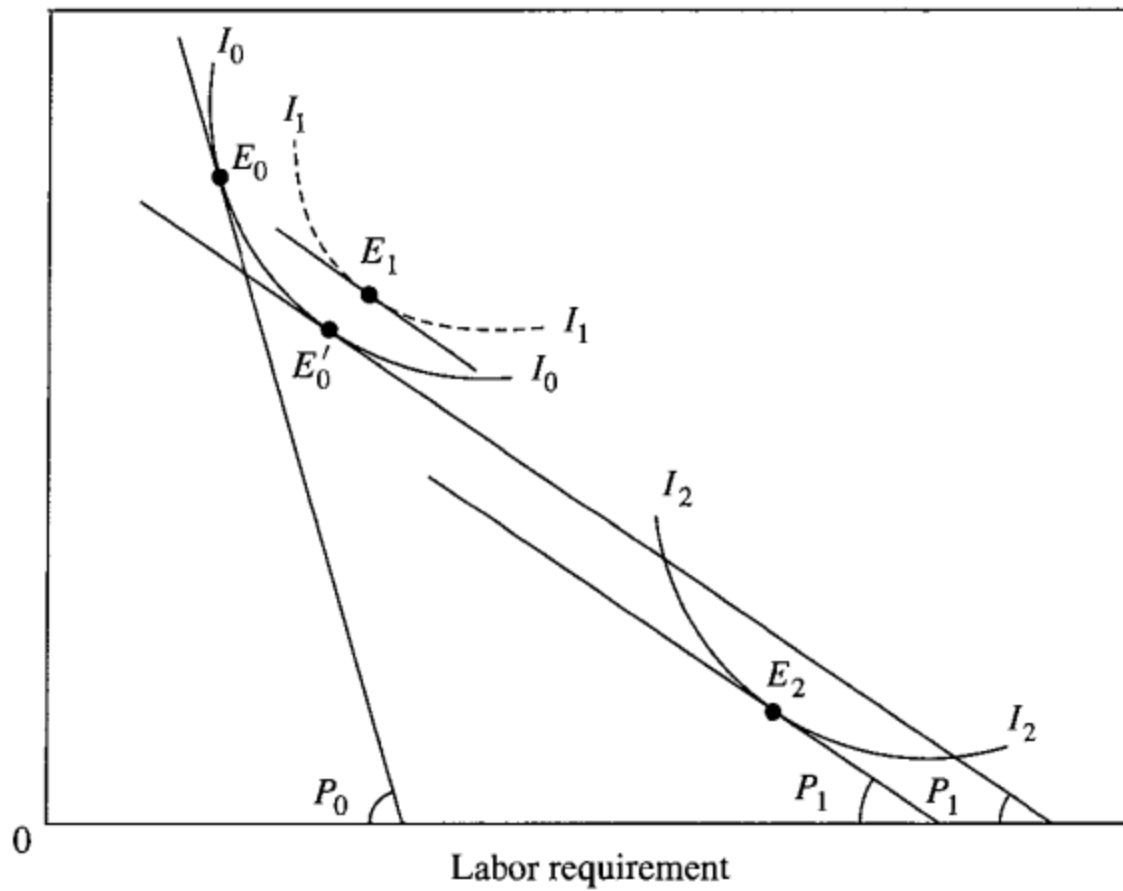
Usufruct rights of individual members are well establish for cultivated fields but less so for fallow. Community chief may determine its allocation

On Chalkboard

- Homogenous production functions, properties.
- Cobb-Douglas properties
- Isoquant and isocost lines
- A as total factor productivity and land quality parameter
- Planner and competitive market first order necessary conditions 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 \rightarrow declining land productivity

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

On Chalkboard

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

Changes in land tenure system 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

Induced institutional change?

Demand driven process toward greater individualization or 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.

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

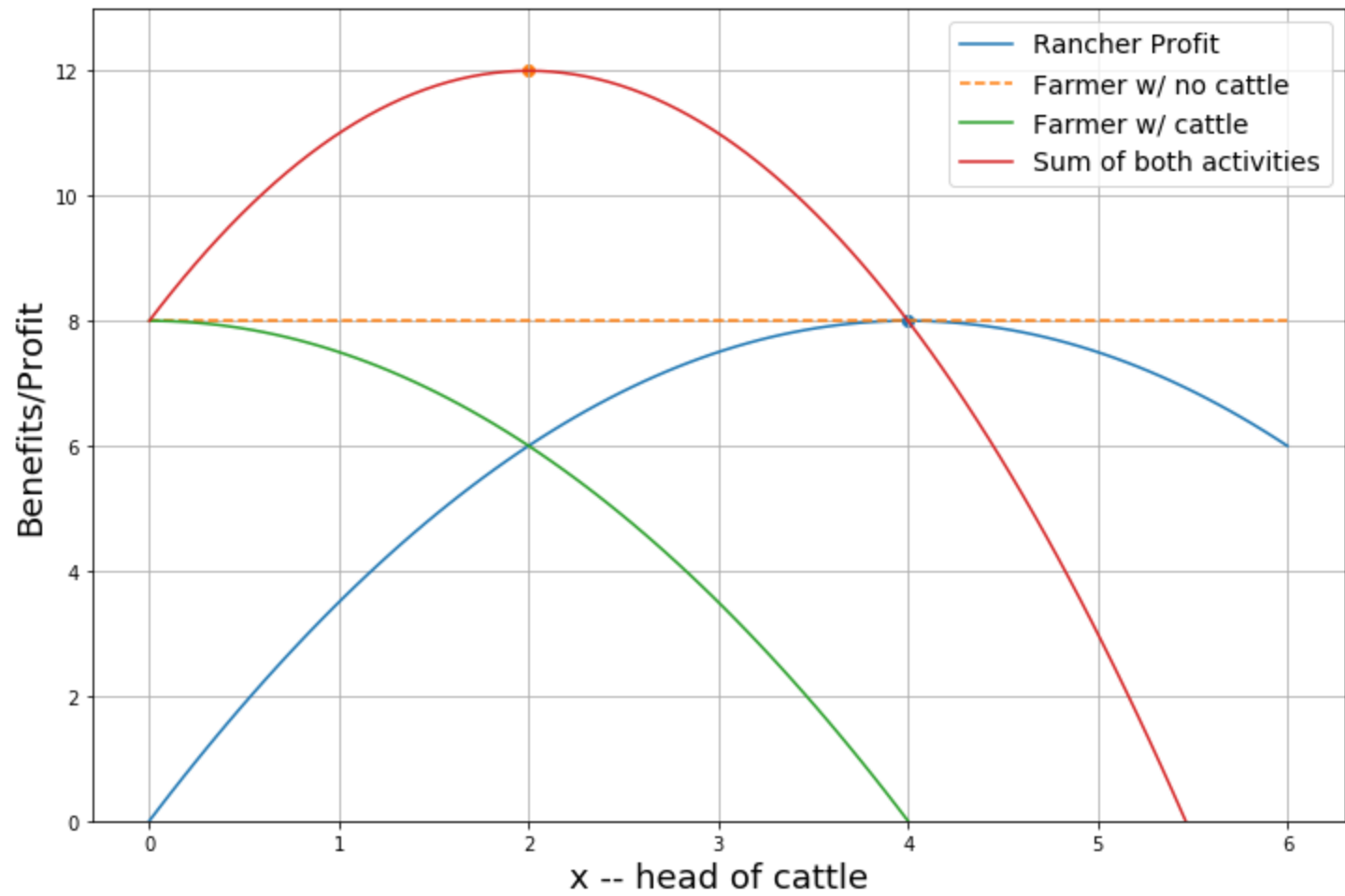
No effective barrier between fields so cattle can stray into wheat farmer's fields, damaging crops and profits.

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

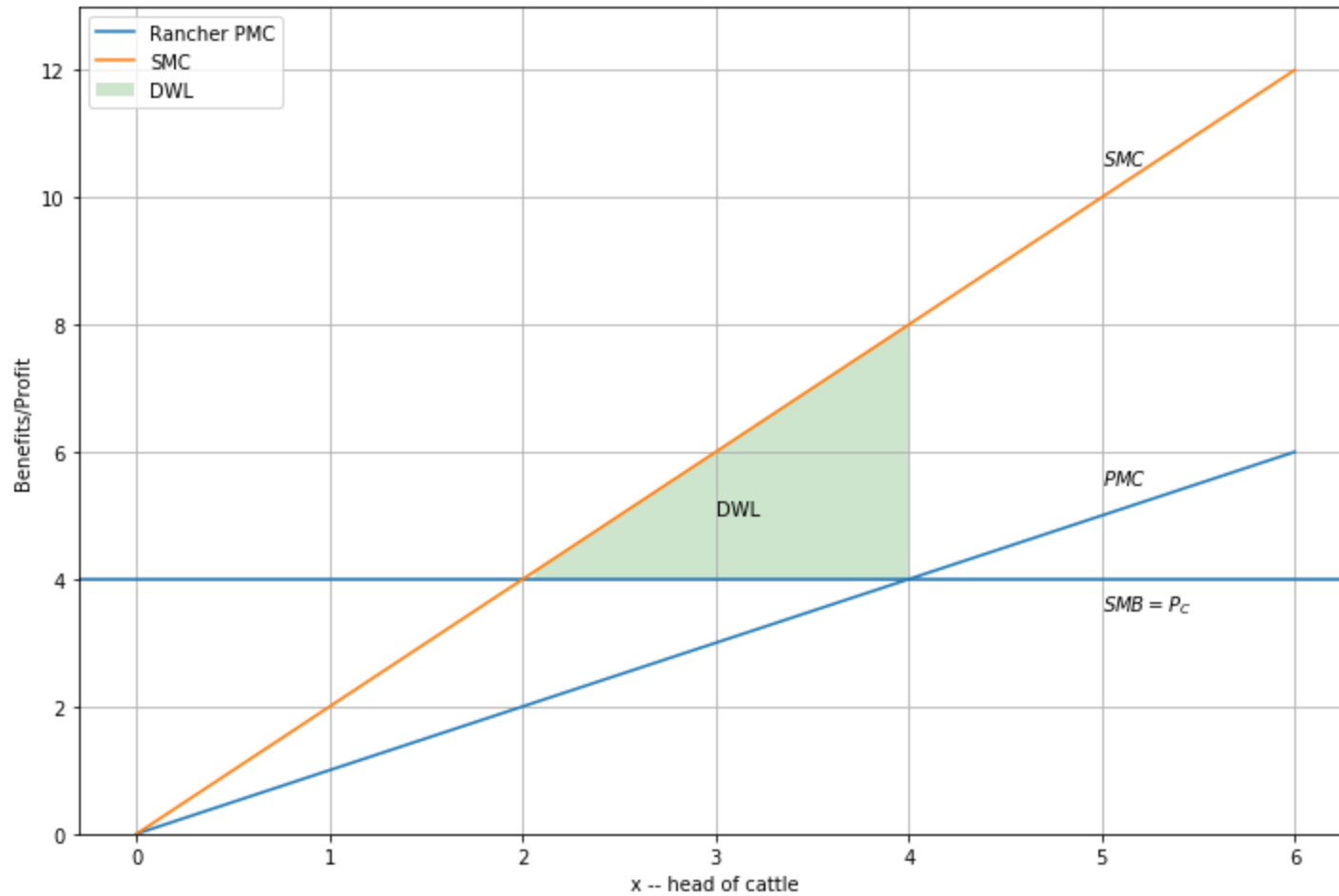
$$\Pi_W(x) = \Pi_W - d \cdot x^2$$

Suppose $d = 1$.

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



As private social marginal benefits and costs to see DWL:



Who is causing harm?

Cattle damage crops but if we prohibit cattle then rancher is harmed.

Assignment of liability, assigns property rights

Think: the right to graze up to 4 head of cattle (permits)

Scenario 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.

Scenario 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 emergence of property rights:** Even there were no initial assignment of property rights the parties would create them by negotiating to establish an efficient outcome.
- The farmer might 'buy out the rancher" (or vice-versa) to create a larger single firm that internalizes the costs.

With positive transactions costs

- 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

An open field and no land market. Land allocated to person with more status in village, allows them to clear as much land as possibly can. Second farmer gets the smaller of remaining land or as much land as they can profitably use:

- (1) Open frontier: where land is still abundant
- (2) Land Scarcity.

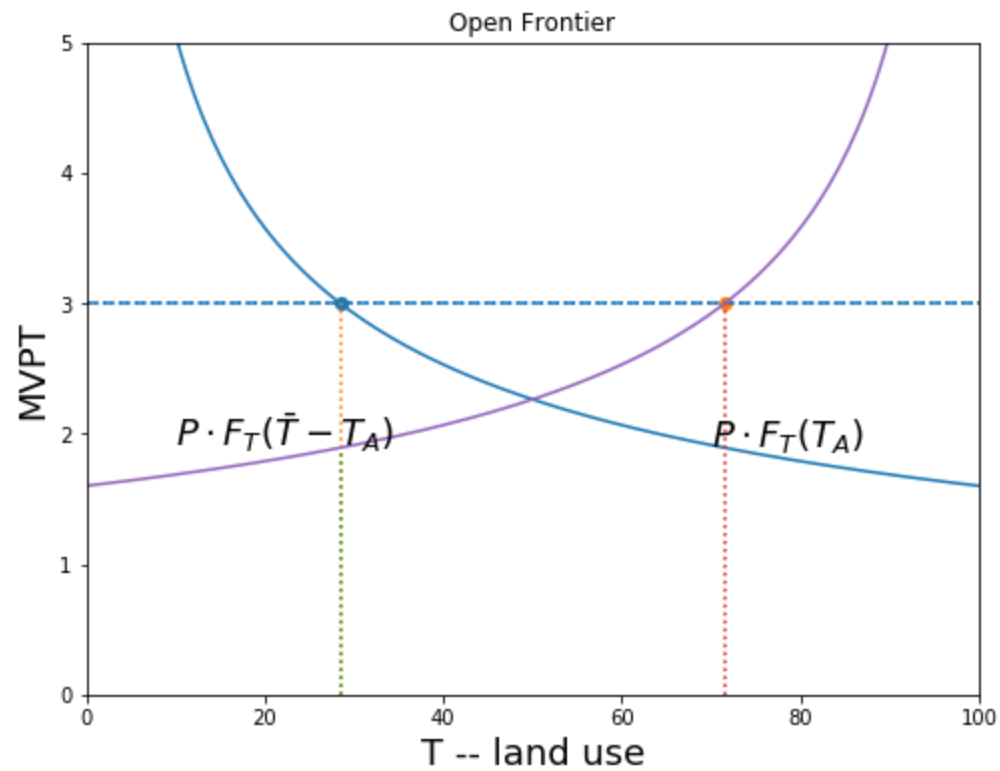
Abundant land environment

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

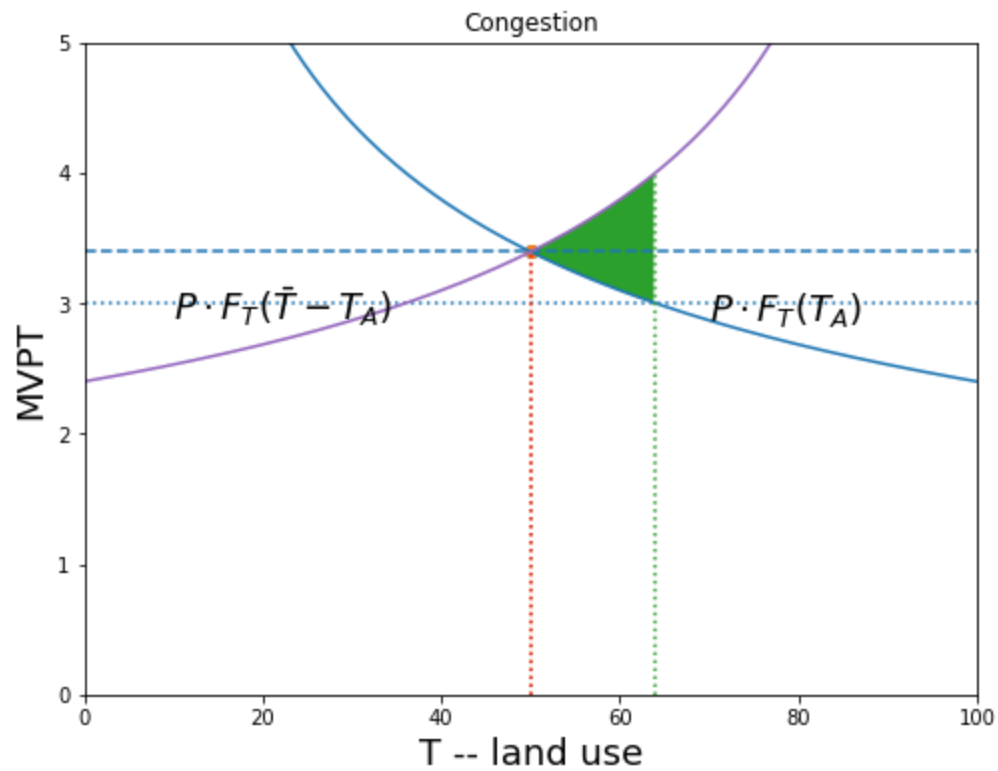
Land clearing cost c . Frontier land not yet exhausted.

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

Land Abundance



Land scarcity (congestion)



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.

Coase when transactions costs 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)

Do initial land assignments matter?

- Plenty of evidence (studied later) says yes.
- Purposeful 'market Design' mechanisms used how to allocate initial property rights (e.g. spectrum auction in USA, 19th century debates over how to allocate public lands)
- Evidence from natural experiments and field experiments suggest that even in environments with functioning land markets trading to efficient farm size/shape can be difficult
 - hard to consolidate fragmented holdings, move boundaries

A Natural Experiment

Libecap, Gary D., and Dean Lueck. 2011. "The Demarcation of Land and the Role of Coordinating Property Institutions." *Journal of Political Economy* 119 (3):426–467.

19th century state of Ohio. Two different land demarcation systems:

- Metes and bounds (MB) : decentralized plot shapes and alignment (e.g. follow topography). Most prevalent world wide.
- Rectangular system (RS): centralized grid with uniform square plots that does not vary with topography.
- In low transactions costs world Coase Theorem states property rights will be re-arranged for efficiency either way.
- Study finds RS leads to better outcomes on variety of measures

Research Discontinuity Design

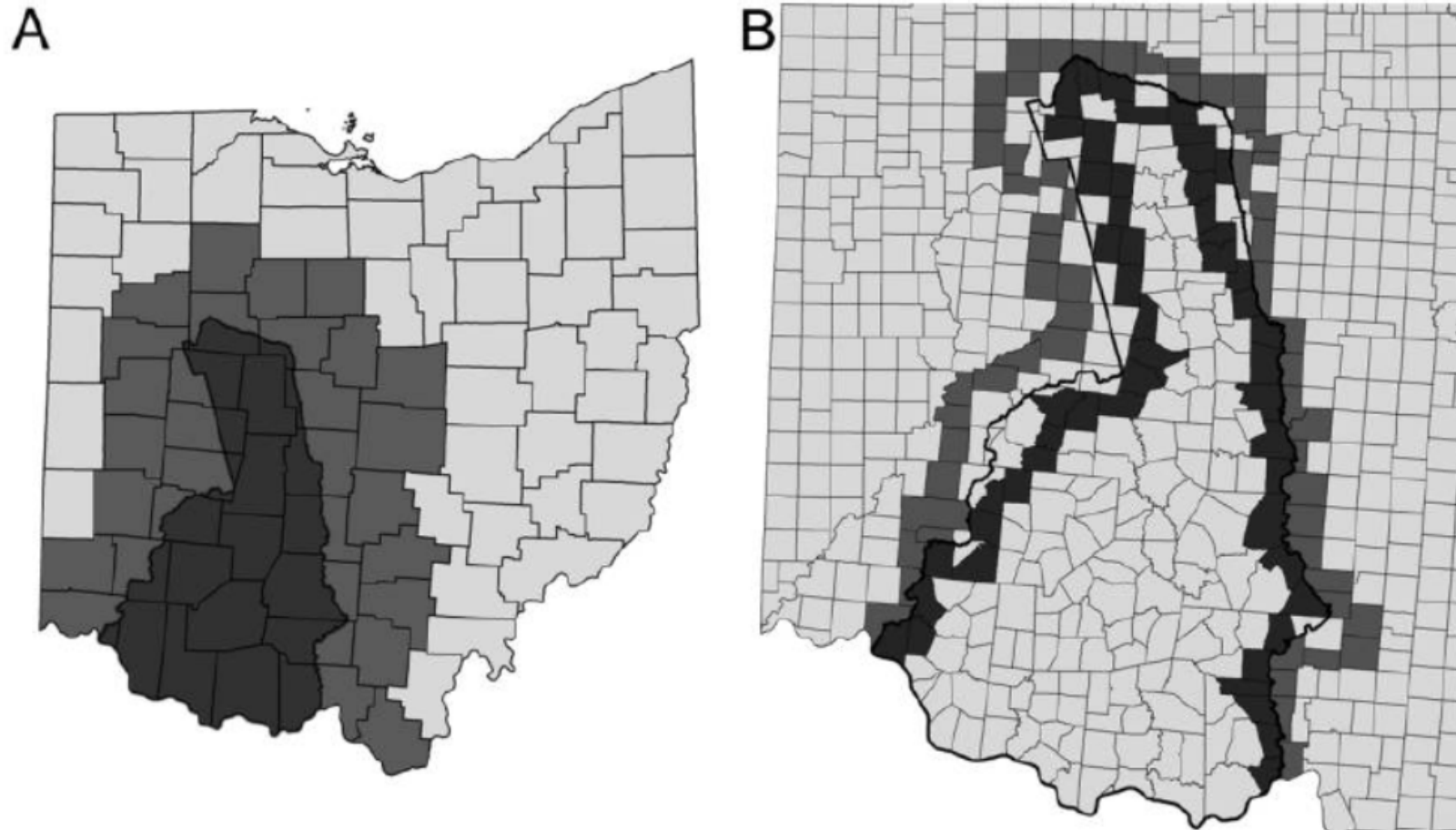


FIG. 3.—Ohio and the Virginia Military District. *A*, 39-county region: metes and bounds (MB) is dark shaded; rectangular system (RS) is lighter shaded. *B*, Border townships: MB is darker; RS is lighter. Source: Calculated by authors.

A



B

Research design

- Check for balance: Properties on either side of the boundary dividing MB and RS have similar characteristics (soil, terrain ruggedness, stream density, etc)
- Sample rectangular blocks either side of border but not bisected by it
- regress measure of impact (land value) on a number of controls and dummy for RS

Findings

RS system associated with:

- 31 percent higher land values in flat land (in sufficiently rugged MB better, but only 5% of sample)
- More land market activity, population density, farmland in use
- less property disputes
 - multiple claims
 - uncertainty about location (deed says boundary runs 'from the white Oak 338 poles to a Gum'... but Oak is now gone). Some disputes lasting >60 years.

A Framed Field experiment

Bryan, Gharad, De Quidt, Jonathan, Tom Wilkenning, and Nitin Yadav. 2017. "Land Trade and Development: A Market Design Approach." SSRN Scholarly Paper**

- Field fragmentation. Difficult to consolidate scattered plots into contiguous, larger plots.
- Requires willing buyer/seller, coordination, financing
- Farmer A may not be able to buy plot X from farmer B until can first sell another plot, farmer B may not be willing to sell X until can find another suitable plot Z.

Land Fragmentation and Consolidation

- Evidence that it doesn't happen easily by itself.
- Some countries run explicit programs. 4-year Danish consolidation plan:



Figure 1: Agricultural Plots in Oster Stillinge Village, Denmark Before and After Land Consolidation. Image taken from [Hartvigsen \(2014\)](#).

Framed Field Experiment

- Compared performance of different continuous-time land exchanges
- Kenyan Farmers were able to understand experiment and achieve high degrees of efficiency
- Higher efficiency however needed support for more complicated contingent 'package trades' (e.g. bidder can specify that is willing to sell a specific plot if and only if she is able to buy another specific plot)
- All simulated trades. Farmers assigned different abilities and endowments of 3 types of land. Complementarity between ability and endowment allows farmers to increase values via trade.

Manorial Estates, open field system and customary tenure

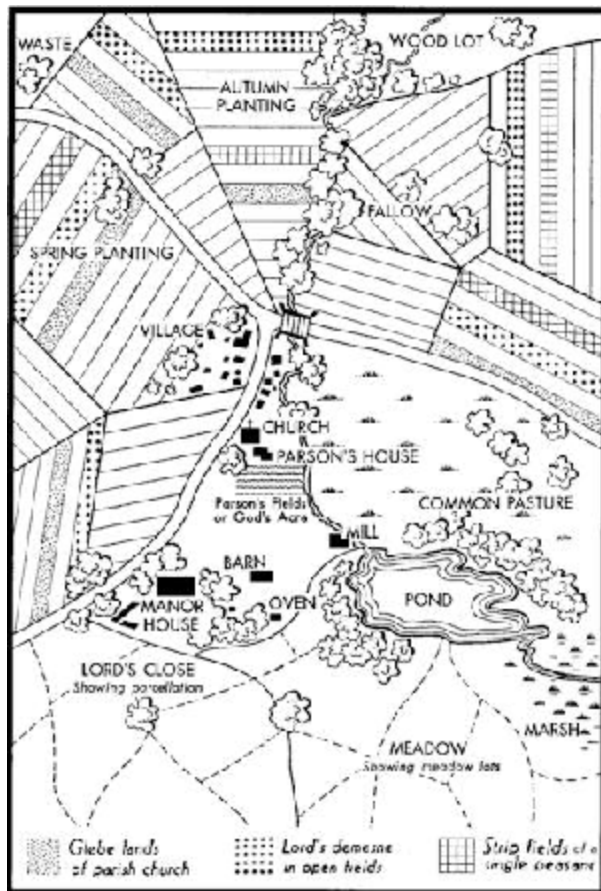
- Open-field system prevalent throughout Europe during middle age. Up to 20th century in many parts of Western Europe, Turkey, Iran.



source

Land tenure 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 of enclosures impact

- 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

A natural Experiment

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)

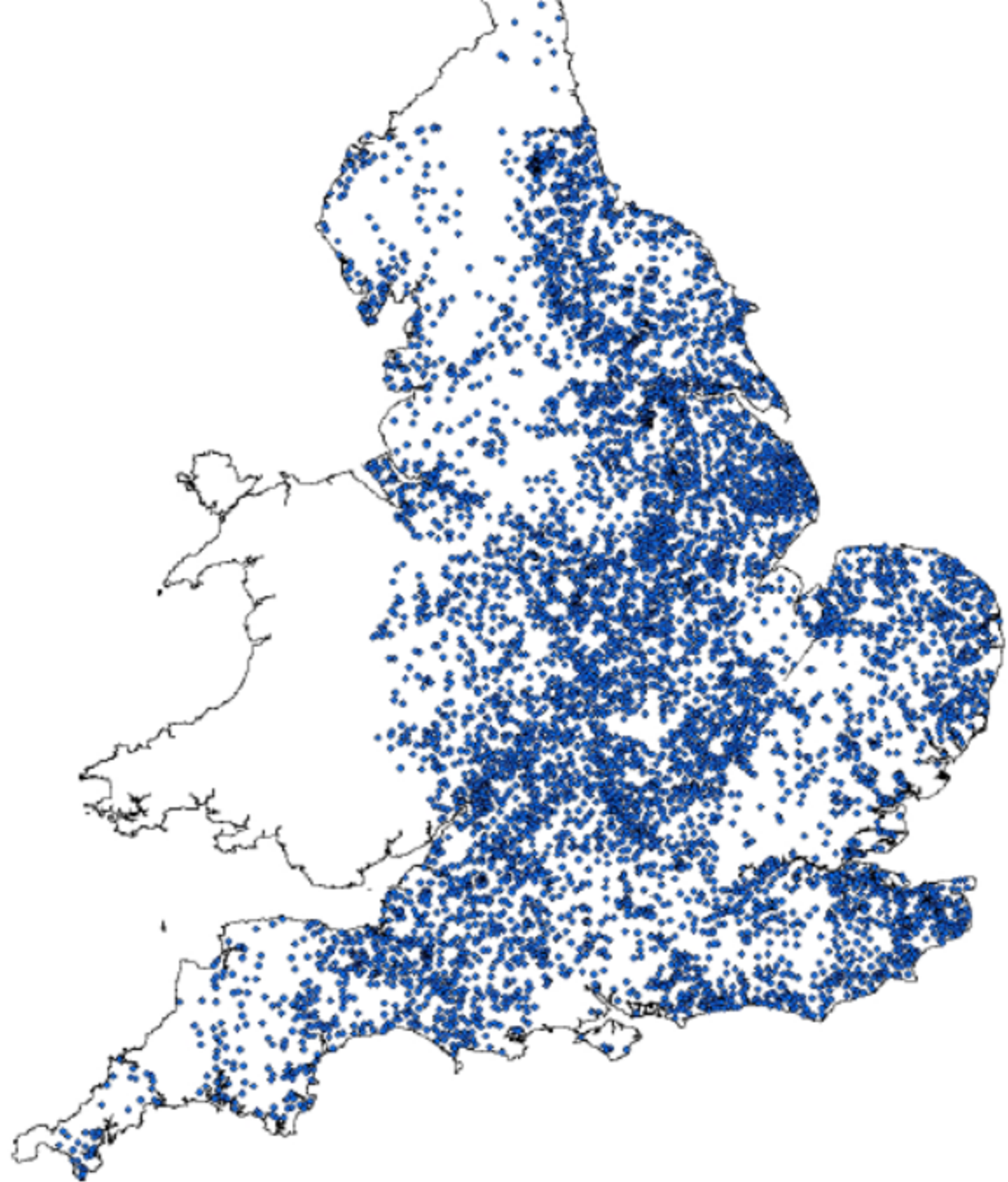


Figure 3: Spatial distribution of Monastic property. One dot indicates at least one monastic property in 1535.

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

- 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)

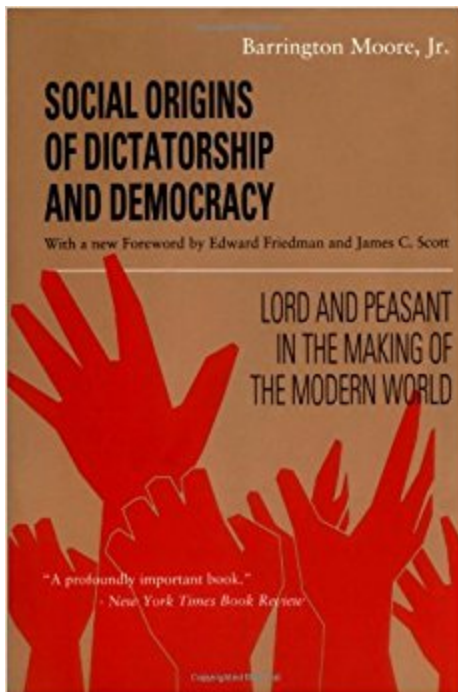
Less Triumphant assessment of enclosure movements

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



Marxian model of institutional change

- Views changes in 'relations of production' (institutions/property rights) as driven by 'changes in material forces of production (new technological opportunities)'

In the social production of their existence, men inevitably enter into definite relations, which are independent of their will, namely relations of production appropriate to a given stage in the development of their material forces of production. The totality of these relations of production constitutes the economic structure of society, the real foundation, on which arises a legal and political superstructure and to which correspond definite forms of social consciousness. ..

- Old institutional order becomes a 'fetter' or barrier for rising group to capture new benefits.
- Changes through conflict/revolution

...At a certain stage of development, the material productive forces of society come into conflict with the existing relations of production or – this merely expresses the same thing in legal terms – with the property relations within the framework of which they have operated hitherto. From forms of development of the productive forces these relations turn into their fetters. Then begins an era of social revolution.

Preface to A Contribution of the Critique of Political Economy, 1859

- Marx looking back on collapse of feudalism/manorialism, enclosures, and the rising industry and urban bourgeoisie
- 'Primitive accumulation' (land grabbing) and monopoly view of things. Enclosure movements broke customary tenure, releasing new landless labor force
- Sees new property forms as expanding production possibilities but benefits being captured by rising capitalist class
- Contrast to Adam Smith who feared monopoly but saw competitive free movement and gains to trade as potentially raising all incomes.

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, and in effect creating larger landlords!

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

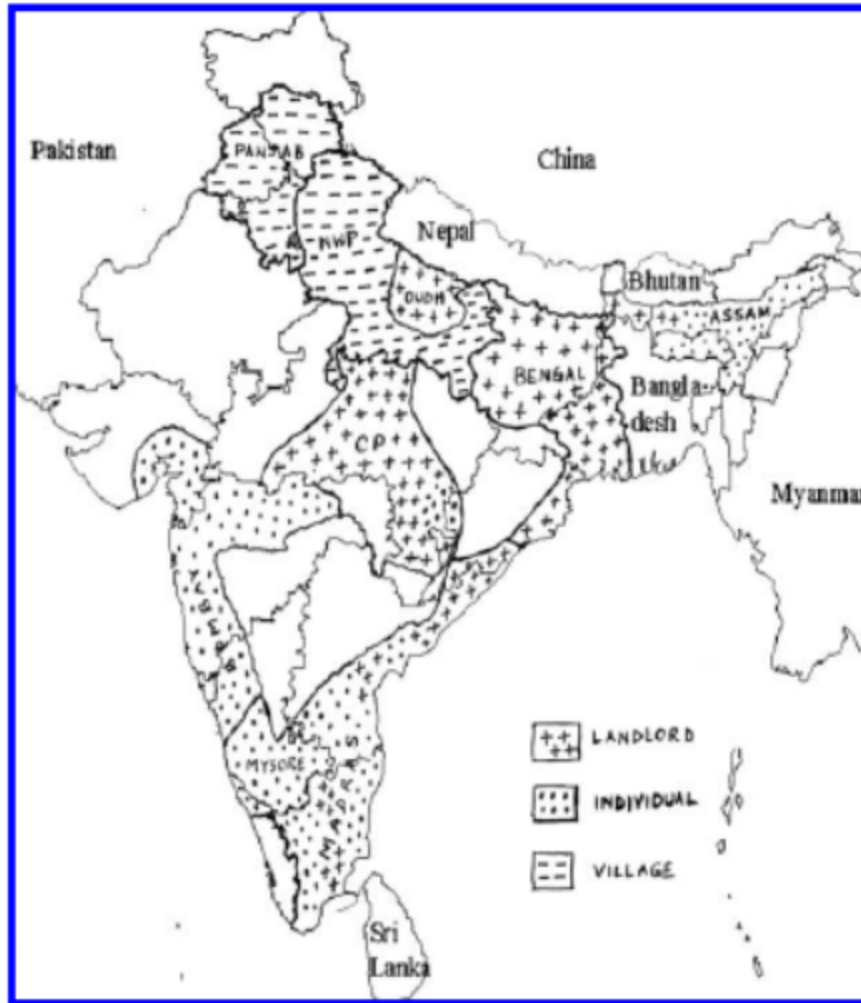


FIGURE 1. MAP OF INDIA

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 so far

- Simple benchmark models of efficient resource allocation and induced innovation
 - Effects of rising population pressure on optimal choice of technique and mix of production technologies
 - brief and broad discussion of farming tenure adaptations needed to support such adaptations.
 - the 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

Next steps

- Sketch of channels through which unclear, insecure and non-marketable land property rights may affect resource allocation efficiency.
- Extend benchmark model to include not only land but also labor and farming skill
 - Models of the equilibrium size distribution of farms (efficient operational farm size)
 - Evidence from Malawi of misallocation. Challenges to the methods and interpretations.

continued

- Evidence and debate on farm-size productivity
- Evidence on land rental markets in Africa.
- Credit and Risk Market failures as additional constraints
- Asymmetric contracting models (Day 3)

Claimed Impacts of more clear & secure property rights

- Investment Demand
- Less diversion of resources to appropriation and conflict
- Credit Supply
- Gains to Trade

Figure 1a: standard presentation of expected impacts from titling

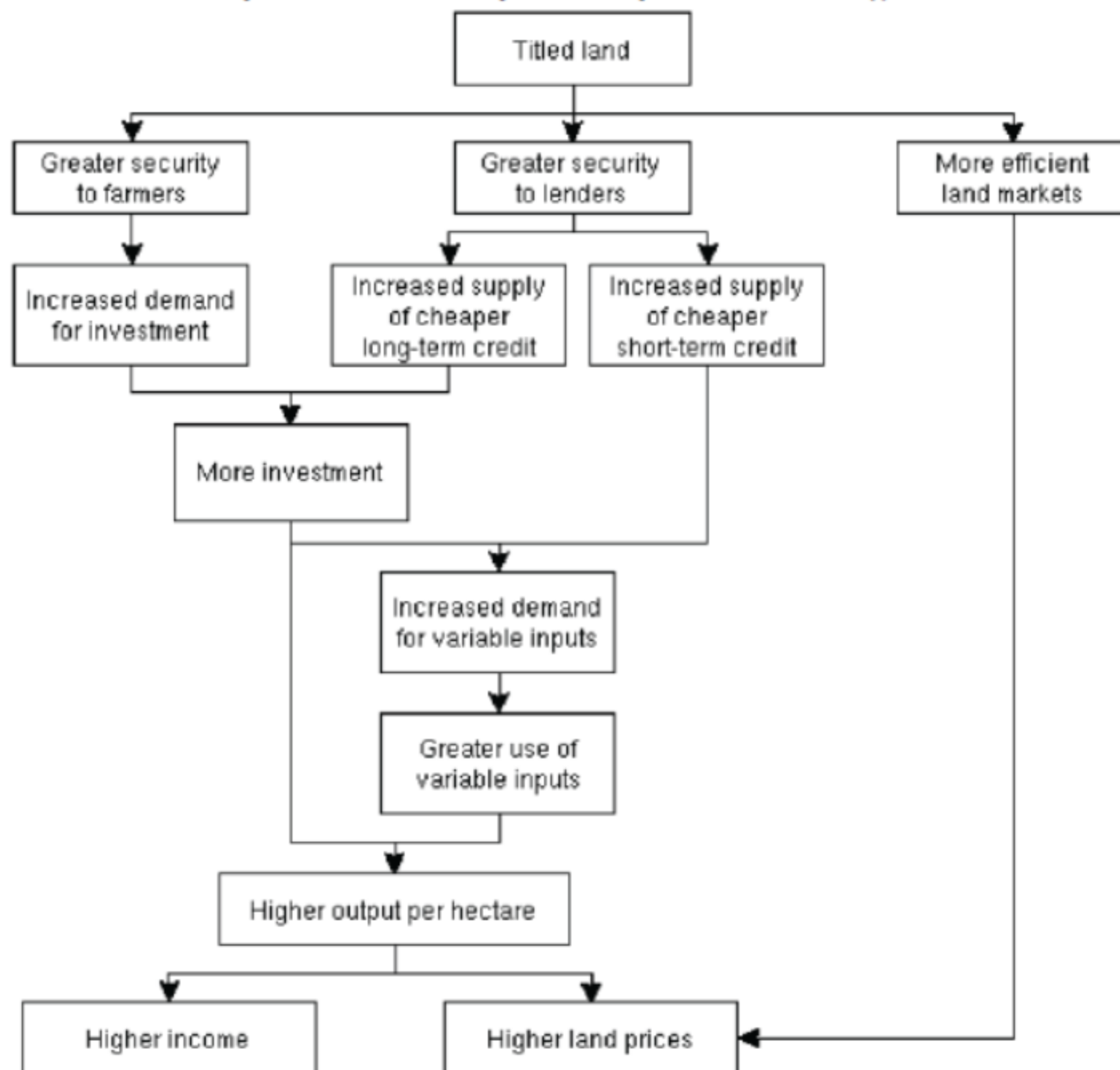
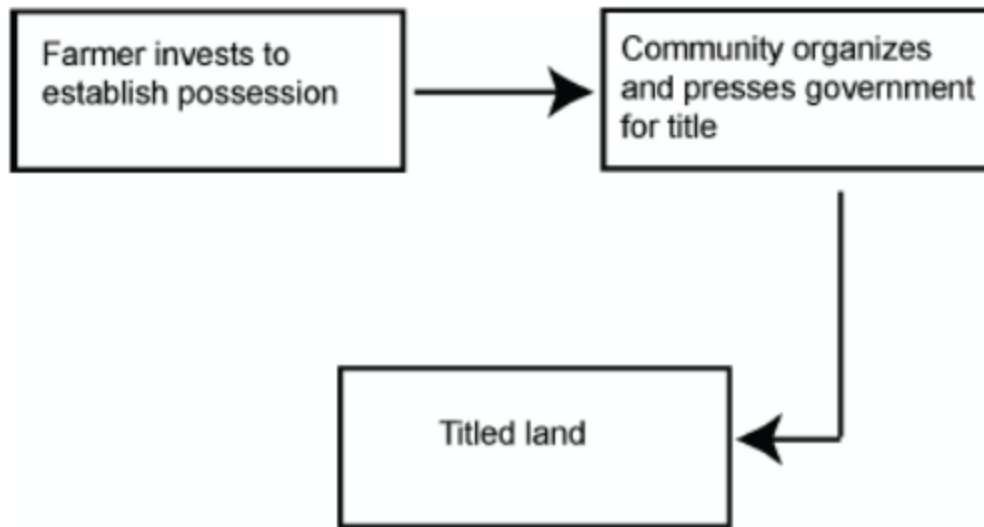


Figure 1b: The likely endogeneity of title placement



- productive and unproductive investments to establish and defend claims

Investment Demand

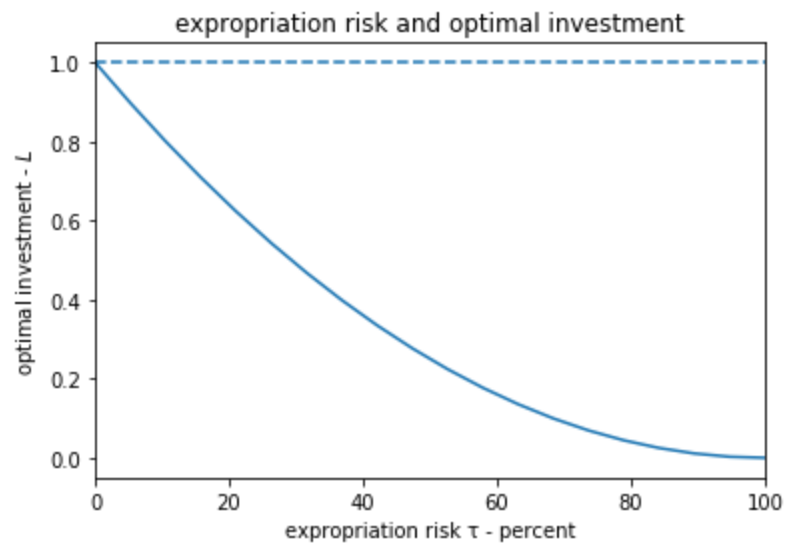
Greater incentive to invest if can appropriate full returns of investment without fear of challenge or expropriation.

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 diversion of 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

- 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 now work off-site, migrate)

Evaluation of impacts plagued by identification issues

- 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

More on this topic later and in week 5.

Equilibrium 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?

What determines the pattern of activity on Land and Labor markets?

- 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

Additional considerations

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

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 functions are homothetic

- 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 ($k = 1$) efficient scale of farm is indeterminate

- Can only establish efficient factor proportions $\frac{T}{L}$

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

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

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

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

Marginal Cost curves

Competition means $P = MC(q)$

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

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

Factor Market equilibrium with $k = 1$

Suppose there are N farmers each with access to 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 so choose same T/L

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?

CRS allows 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: $L_i = \frac{T_i}{\bar{T}} \cdot \bar{L}$

Farming skill and its distribution

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

- Span of control production function. Farm i :

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

- 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 the 3 arguments. We can only determine optimum $\frac{T}{L}, \frac{T}{S}, \frac{L}{S}$

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

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

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

The Efficient Size Distribution of Farms?

We start with a very simple and barren neo-classical model.

- Production requires each of these three factors
 - Land T
 - Labor L
 - Farming skill S

The Planner's Problem

No markets or property rights.

A social planner (e.g. village council chief) decides how to allocate available land \bar{T} and available labor \bar{L} across farms to produce output that is then redistributed, all in order to maximize 'social welfare' (weighted sum of consumption utilities).

Planner will want efficiency in production.

To focus attention on key tradeoffs as simply as possible, assume households supply labor inelastically (i.e. no leisure in the utility function) and

Planner's problem:

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

subject to

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

FOC:

equate marginal products of land and labor across farms.

Efficient allocation

- 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:

$$T_i^e = \frac{z_i}{\sum s_i} \bar{T} \quad L_i^e = \frac{z_i}{\sum s_i} \bar{L}$$

where $z_i = s_i^{\frac{1}{1-\gamma}}$

Firms choose optimum input mix to maximize profits.
For any given output level q the firm minimizes costs:

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

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

FOC:

$$\hat{F}_L(T_i, L_i) = w$$

$$\hat{F}_T(T_i, L_i) = r$$

In equilibrium all firms use same land-labor ratio

$$\hat{F}_L(T_i, L_i) = w = \hat{F}_L(T_i, L_i)$$

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

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

Evidence on Land Misallocation in Malawi.

Restuccia, D. and Santaebulalia-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	World Census of Agriculture 1990		
	Malawi	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

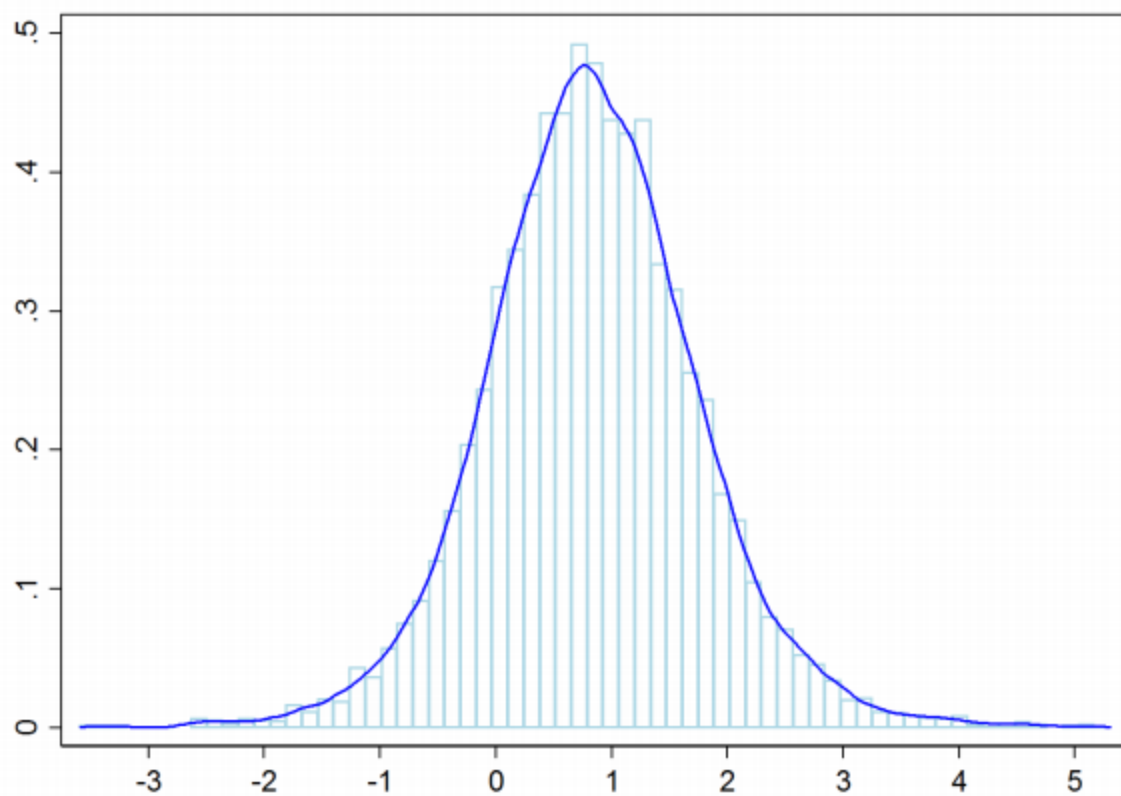
Farm production function

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

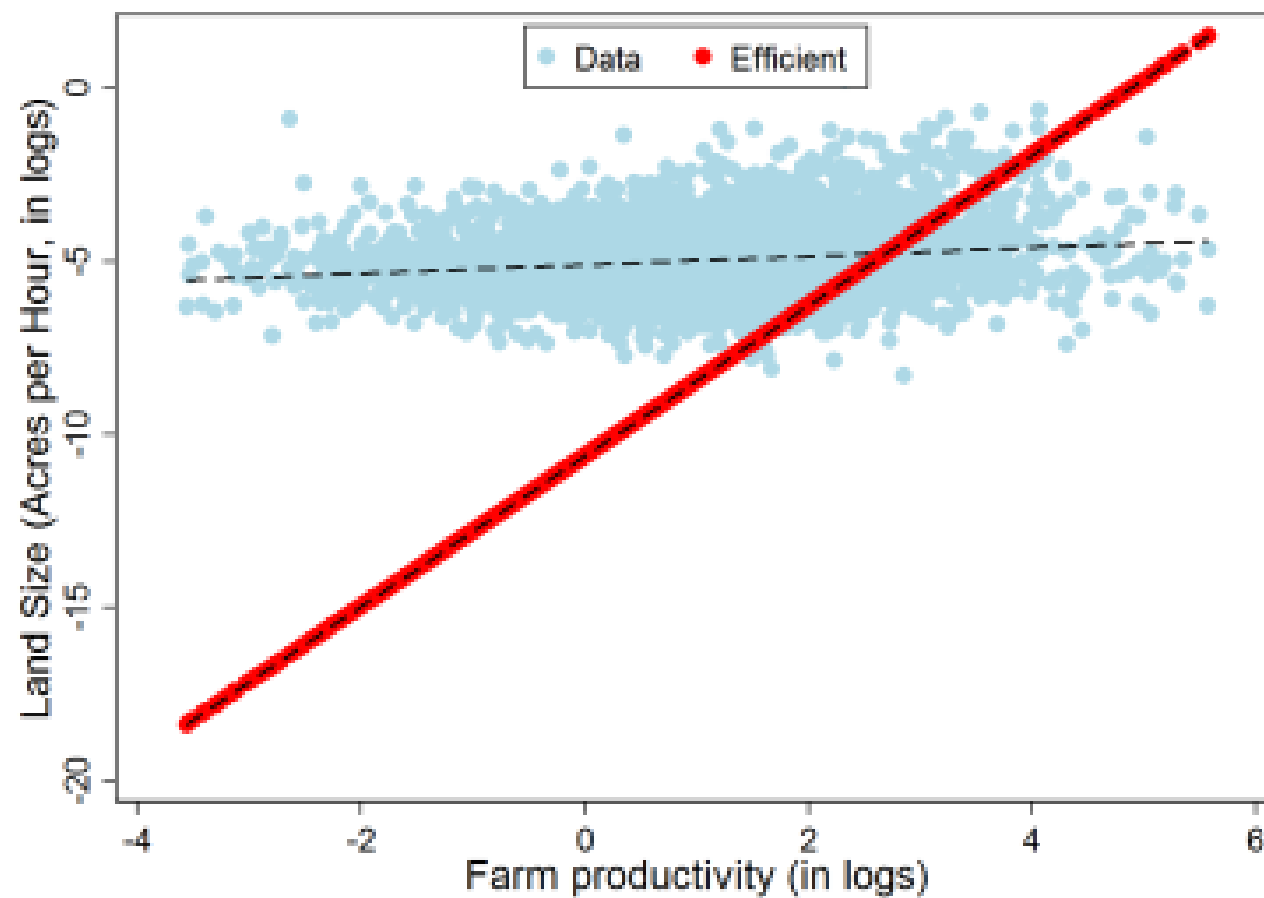
- y_i is real value added, k_i is capital, l_i is land in operation, q_i is a measure of land quality, ς_i is a rain shock.
- all measured in per total labor hour terms.
- set input elasticities $\theta_l = 0.18$ and $\theta_k = 0.36$ from US parameter estimates (note $\theta_l + \theta_k < 1$)

Obtain measure of 'TFP' s_i as a residual.

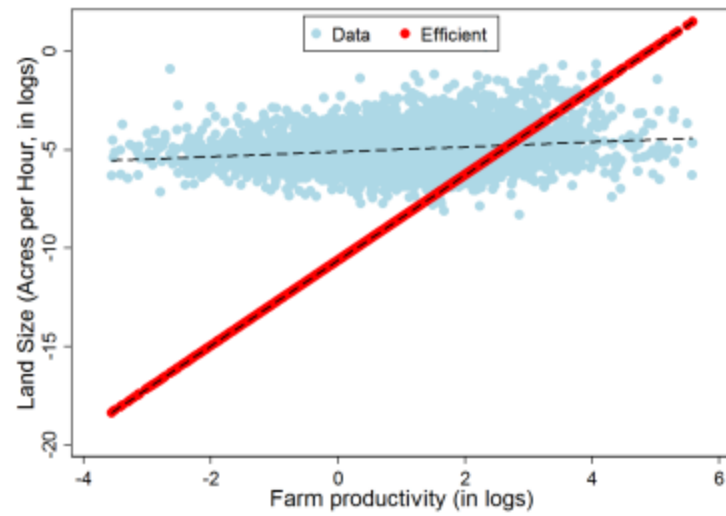
Figure 2: Density of Farm Productivity s_i (in logs), Malawi ISA 2010/11



(a) Land Size vs. Farm Productivity



(a) Land Size vs. Farm Productivity



(b) MPL vs. Farm Productivity

