Lectures in Growth and Development

(M. Ghatak, LSE, 2018-19)

Ec428

Topic 7: Land & Property Rights - Theory

These notes are not guaranteed to be error free. If you spot one, please let me know.

Also material marked with ** means optional material.

Theory

- The term *property right* refers to an owner's right to use a good or asset for consumption and/or income generation (referred to as "use rights"). It can also include the right to transfer it to another party, in the form of a sale, gift or bequest (referred to as "transer rights").

- A property right also typically conveys the right to contract with other parties by renting, pledging, or mortgaging a good or asset, or by allowing other parties to use it, for example, in an employment relationship

- By property rights economists typically refer to *private* property rights a key feature of which is being able legally to exclude others from using a good or asset.

- This affects resource allocation by shaping the incentives of individuals to carry out productive activities involving the use of the good or asset, undertake investments that maintain or enhance its value, and also, to trade or lease the it for other uses

- However, other forms of property rights, such as communal property rights, are important in many societies

- In this lecture we discuss what are the mechanisms through which property rights affect economic activity

- We draw on the first half of Besley-Ghatak (2009) and the tenancy model of Banerjee, Gertler, and Ghatak (2002)

- Main effects
  - The first is expropriation risk – insecure property rights imply that individuals may fail to realize the fruits of their investment and efforts.
  - Second, insecure property rights lead to costs that individuals have to incur to defend their property which, from the economic point of view, is unproductive, and this may tie people down to land which may prevent efficient labour allocation
  - The third is failure to facilitate gains from trade – a productive economy requires that assets are used by those who can do so most productively and improvements in property rights facilitate this (e.g., via a rental market).

- The fourth is the use of property in supporting other transactions, e.g. collateral, advocated by Hernando de Soto as a key channel to develop capital markets

- The fifth are agency costs that arise if distribution of property rights is inefficient due to market frictions, as in tenancy

- Empirically the first is the most classic link, and empirically the estimated effects tend to be large (see Besely and Ghatak, 2010 and Galiani and Schargrodsky, 2011 for reviews of the literature)

- There is some recent work on the second channel. In many developing countries property rights over rural land are maintained through continuous personal use instead of by land titles.

  - Field (2007) finds that property-titles issued in Peru starting in the mid-nineties led to a significant increase in labor supply by urban slum dwellers.

  - A recent paper (de Janvry et al, AER, 2015) shows 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, de Janvry et al find that households obtaining certificates were subsequently 28 percent more likely to have a migrant member.

- There isn't that much empirical work on the third channel.
- Limited evidence on the importance of the fourth channel.
- In this lecture we talk about a few studies focusing largely urban settings.
- In the next lecture, we look at some empirical studies that study the effect of property rights on agriculture

Property Rights and Productivity - Different Channels

- Decision problem of a producer in a single-agent economy.
- For the moment, we assume there are no markets or for that matter, any form of exchange.
- The farmer usses labour (e) to produce output (y), say, food.
- The production function is:

$$y = A\sqrt{e}.$$

- e is a variable input with linear cost $c(e) = e$

- This formulation is equivalent to one where output is stochastic and takes the value A with probability $\sqrt{e}$ and 0 with probability $1 - \sqrt{e}$ and the producer is risk neutral.

- We will focus on this interpretation as it facilitates our discussion of agency costs.

- The farmer's decision is to choose the optimal level of e.

- We assume that property rights are imperfect in the sense that there is an exogenously given probability $\tau \in [0, 1]$ of expropriation faced by a farmer in a single-agent economy.

- This could apply to the output that is produced or the land which is needed to produce output.

- These are equivalent, so long as labour is sunk before the producer finds out whether there is going to be expropriation or not.

- Notice that we do not make a distinction between expropriation and taxation and do not consider the choice of τ by the "expropriator".

- We asusme there is some actor in the economy with coercive power – this could be the power to tax or confiscate or to rob or steal.

- The producer will choose e to maximize:

$$\max_{e} \pi(e) = (1-\tau)\, A\sqrt{e} - e.$$

- Notice that production in this formulation is deterministic.

- The optimal choice of labour of the producer is given by:

$$e^* = \left[\frac{(1-\tau)\, A}{2}\right]^2.$$

- Correspondingly, gross output is $A\sqrt{e^*}$, consumption is $(1-\tau)\, A\sqrt{e^*}$, and net surplus is given by $\left[\frac{(1-\tau)A}{2}\right]^2$.

- Using this, we have the following observation: *Labor supply, output and profits are strictly decreasing in* τ.

- This is the standard disincentive effect of any form of "outcome"-based or contingent transfer policy.

Guard Labour

- Suppose labour can also used to reduce the risk of expropriation.

- This potentially creates an additional margin of distortion caused by imperfect property rights: it not only reduces incentives to supply productive labour, it diverts resources (here labour) from productive to unproductive uses.

- Consider the following simple extension of the model: suppose e_1 is productive labour and e_2 is "guard" labour that reduces the probability of expropriation.

- If there is a resource constraint (e.g., labor endowment $\overline{e}$ such that $e_1 + e_2 \leq \overline{e}$) that is binding then naturally e_2 will be always increasing in τ and e_1 will be always decreasing in τ

- Then an improvement in property rights will always raise e_1 and reduce e_2

- However, these efforts can also be complementary: more effort to protect property rights will raise the marginal returns from efforts to produce more output.

- To see this channel, we use a simple technology to describe the probability of expropriation: $\tau(1 - \gamma\sqrt{e_2})$, where $\tau \in [0, 1]$ and $\gamma \in [0, 1]$.

- Otherwise the model is the same as the basic model, with $A\sqrt{e_1}$ denoting expected output.

- Now the producer's decision problem is:

$$\max_{e_1,e_2} \left(1-\tau(1-\gamma\sqrt{e_2})\right) A\sqrt{e_1} - e_1 - e_2. \tag{1}$$

- Solving the first order conditions for both effort choices yields:

$$e_1 = \left(\frac{2(1-\tau)A}{4-(\tau\gamma A)^2}\right)^2 \text{ and } e_2 = \left(\frac{\gamma\tau(1-\tau)A^2}{4-(\tau\gamma A)^2}\right)^2. \tag{2}$$

- *Improved property rights (lower τ) always increases productive labor e_1*

- *However, there exists* $\overline{\tau} \leq 1$ *such that guard labor is increasing in* τ *so long as* $\tau \leq \overline{\tau}$ *and decreasing otherwise*.

- This is a non-monotonic effect that is not captured by the standard argument focusing on binding resource constraints

- An increase in τ raises the expected marginal return from guard labor while lowering e_1.

- The complementarity between e_1 and e_2 means that this tends to reduce the expected marginal return from guard labor.

- For small values of τ the first effect dominates and for larger values of τ, the second effect dominates.

- However, as one would expect, economic efficiency increases when property rights are more secure following the logic

- *However, overall economic efficiency is increasing in improved property rights (lower τ).*

- This is for the same reason as in the previous section: namely, because it is a first-order "tax" on output.

- You can apply the envelope theorem to see that an increase in τ always reduces the producer's expected surplus.

Insecure Property Rights as Barriers to Trade

- Economic efficiency is enhanced by having assets managed by those who can use them most productively.

- But this depends on being able to write efficient contracts to trade.

- In our basic model everyone has the same amount of land, and also, everyone has the same skill level.

- As a result, so long as there is a competitive labour market, there are no efficiency gains from having a land market.

- Now we relax this assumption and allow some agent's to have more land than they want to optimally cultivate themselves, and some agents to have less.

- This creates potential gains from trade via a rental or sales market in land.

- But a necessary (but not sufficient) condition for this to take place is to have well defined property rights in land.

- Otherwise, land will not be offered for rental or sale driven by the fear that they could lose the land with some probability, or equivalently, receive only a fraction of the market returns to land due to imperfect property rights in land.

- This will create an additional margin of distortion due to imperfect property rights: potentially gainful trades will be lost.

- This is consistent with the fact that in the developing world assets are often kept undeveloped or idle due to insecure property rights.

Property Rights and Agency Costs (The de Soto Effect)

- Influential work by de Soto - the Problem of "Dead Capital":

  "What the poor lack is easy access to the property mechanisms that could legally fix the economic potential of their assets so that they could be used to produce, secure, or guarantee greater value in the expanded market...Just as a lake needs hydroelectric plant to produce usable energy, assets need a formal property system to produce significant surplus value." Hernando de Soto, *The Mystery of Capital* (2001)

- This is a very specific story about institutional failure which limits trading possibilities.

- We use the same basic model as above

- This is a simpler version of Besley, Burchardi, Ghatak QJE 2013

- Now, $\sqrt{e}$ is the probability that output is A

- We now assume explicitly that $e \in [0, 1]$ is private information to the producer (borrower)

- Standard model of moral hazard in the credit market, exactly like the one we saw in Topics 5 & 6

- In addition to committing effort, we now allow the producer to use capital to enhance productivity.

- For simplicity, capital x is a discrete variable that takes on the values 0 and 1.

- When $x = 1$, output is $A(1 + \triangle)$ with probability $\sqrt{e}$ and 0 with probability $1 - \sqrt{e}$.

- Thus, expected output is $A(1 + \triangle)\sqrt{e}$.

- The cost of a unit of capital is ρ, which for now is exogenously given.

- Given this, and absent any frictions, the producer's decision problem is:

$$\max_{e\in(0,1),x\in\{0,1\}} A(1+\triangle x)\sqrt{e}-e-\rho x. \tag{3}$$

- The optimal choice of effort, e, is given by:

$$e=\left(\frac{A\left(1+\triangle x\right)}{2}\right)^2. \tag{4}$$

- We assume $\frac{A(1+\triangle)}{2}<1$ so that e is less than 1, as it should be, being a probability

- We will refer to $e^* = \left[\frac{A(1+\triangle)}{2}\right]^2$ as the first-best level of effort.

- The capital good x and effort are complements

- The expected surplus at the optimal effort level is

$$\frac{1}{4}A^2(1+\triangle x)^2 \ - \rho x. \tag{5}$$

- We assume

$$\frac{1}{4}\left[A(1+\triangle)\right]^2 \ - \rho > \frac{1}{4}A^2 \tag{6}$$

- This condition ensures that under the first-best (where effort is observable), it is profitable to use the capital good

- We make two key assumptions: (i) effort is unobservable and hence cannot be specified in lending contracts (moral hazard) and (ii) the producer has insufficient wealth to post as a bond in the event that he defaults (limited-liability).

- To capture the latter, we suppose that the producer has an illiquid asset whose value is w.

- Limited liability implies that he can pay only up to $A(1 + \triangle) + w$, when output is high and w when output is low.

- Due toimperfect property rights the collateral value of wealth is $(1 - \tau)w$

- In concrete terms, the parameter τ reflects that in many countries registering assets as property is time consuming and costly.

- We now solve for the optimal debt contract as a function of τ.

- A debt contract is an interest (plus principal) payment on a successful project, denoted by r, and a level of collateral, denoted by c, to be paid if the project is unsuccessful

- The expected payoff of the producer with a contract (r, c) is:

$$\sqrt{e}\left\{A(1+\triangle)-r\right\}-\left(1-\sqrt{e}\right)c-e \tag{7}$$

- That of a lender is:

$$\sqrt{e}r+\left(1-\sqrt{e}\right)c-\rho. \tag{8}$$

- The producer always has the option of not borrowing x.

- This creates an outside option equal to $u=\frac{1}{4}A^2$

- Given r and c the producer chooses her effort to maximize her expected payoff, which yields the first-order condition:

$$\frac{1}{2\sqrt{e}}\{A(1+\triangle)-(r-c)\}=1. \tag{9}$$

- Solving this yields an optimal effort level:

$$e=\left[\frac{A(1+\triangle)-(r-c)}{2}\right]^2. \tag{10}$$

- Observe that e and r are negatively related, while e and c are positively related as we saw in the model of credit markets with moral hazard in Topic 5

- In addition , the contract also has to satisfy the limited liability constraint:

$$(1-\tau)\,w \geq c. \tag{11}$$

- It is possible to achieve the first-best effort level by setting $r = c$.

- However, since c cannot exceed $(1-\tau)\,w$ this might not be enough for the lender to recover the opportunity cost of capital (ρ).

- If that is the case, then the lender will need to set $r > \rho > c$.

- This will imply that effort will fall below the efficient level.

- Substituting (10) and (11) into the lender's payoff function yields:

$$\max_r \frac{A(1+\triangle) - (r - w(1-\tau))}{2}(r - w(1-\tau)) + w(1-\tau) - \rho. \quad (12)$$

- Solving this yields:

$$r = \frac{A(1+\triangle)}{2} + w(1-\tau). \quad (13)$$

- In this case, the lender takes one half the return from a successful project in addition to the value of the pledged collateral.

- The effort level that the producer puts in is therefore:

$$e = \left[\frac{A(1+\triangle)}{4}\right]^2 \quad (14)$$

- It is below the first best level.

- Notice that e does not depend on τ in this case

- The borrower's and the lender's expected payoffs are, respectively: $u \equiv \left\{\frac{A(1+\triangle)}{4}\right\}^2 - w(1-\tau)$ and $\pi \equiv \frac{1}{2}\left\{\frac{A(1+\triangle)}{2}\right\}^2 + w(1-\tau) - \rho$.

- For trade to take place on these terms, we require that $u \geq \frac{1}{4}A^2$.

- This will happen when $w(1-\tau) \leq \frac{A^2}{4}\left[\frac{(1+\triangle)^2}{4} - 1\right] \equiv \underline{\omega}$.

- That is, for very poor borrowers an improvement in property rights will not affect effort

- When the outside option is a binding constraint, then r will be determined by:

$$\left\{\frac{A(1+\triangle)-(r-w(1-\tau))}{2}\right\}^2 - w(1-\tau) = \frac{1}{4}A^2. \qquad (15)$$

- This yields

$$r = A(1+\triangle) - 2\sqrt{\frac{A^2}{4} + w(1-\tau)} + w(1-\tau), \qquad (16)$$

- Effort is equal to $\frac{A^2}{4} + w(1-\tau)$.

- Now effort is a (decreasing) in τ and so improvement in property rights will raise e

- We can now define precisely when pledgeable wealth is a constraint on economic efficiency.

- This will be the case if wealth is insufficient for the first best effort level to be attainable, i.e. $\sqrt{\frac{A^2}{4} + w(1-\tau)} \leq \frac{A(1+\triangle)}{2}$ or,

$$w(1-\tau) \leq \frac{A^2}{4}\left[(1+\triangle)^2 - 1\right] \equiv \overline{\omega}. \tag{17}$$

- If $w(1-\tau) > \overline{\omega}$ then we have a first best outcome.

- Evidently, this requires that the availability of illiquid assets (w) has to be large enough.

- However, this is not sufficient – τ must also be far enough away from one.

- An economy is constrained by property rights when $w \geq \overline{\omega} > w(1-\tau)$.

- For $\overline{\omega} > w$ imperfect property rights increase the existing level of inefficiency, while for $w \geq \overline{\omega} > w(1-\tau)$ imperfect property rights create new inefficiencies.

- Therefore, we conclude that

  - *For poor or rich borrowers, i.e.,* $w(1-\tau) < \underline{\omega}$, or $w(1-\tau) > \overline{\omega}$, *marginal improvements in the security of collateral do not affect resource allocation (i.e., loan size and effort) in the credit market. However, in the former case, it has a redistributive effect with lenders gaining relative to borrowers.*

  - *However, for borrowers with wealth in the middle-range* $w(1-\tau) \in [\underline{\omega}, \overline{\omega}]$, *the interest payment,* r, *is lower and producer effort is greater after a marginal increase in the security of collateral which increases the level of pledgeable wealth,* $w(1-\tau)$.

- The result captures the mechanism suggested by de Soto (2000) linking property rights that increase the use of collateral and efficiency.

- However, it also makes precise the range of illiquid wealth for which this argument is relevant.

- If wealth is very low, i.e., $w(1-\tau) < \underline{\omega}$, then the outside option constraint is not binding.

- In this case, the terms of the contract are affected by improvements in property rights, but there is no increase in effort conditional on credit being granted.

- However, improvement in property rights eases the constraint of transferring resources from the borrower to the lender, and this benefits the lender at the expense of the rent that the borrower gets.

- Improving property rights have a purely redistributive effect in this case.

- Similarly, if wealth is very high, the resource allocation is already efficient at the first-best level, and therefore, marginal improvements in property rights will not have any effect.

- Loan size was 0 or 1 here, but in a more general setting it would be continuous. Then effort and loan size would move together due to complementarity.

- The upshot of this discussion is that even where there is a "de Soto effect" on effort observed (or, loan size), we would expect that effect to be heterogeneous with $\partial e/\partial \tau$ being proportional to illiquid wealth w.

- There is also the possibility that improving property rights increases competition.

- High cost lenders can survive because they have low levels of τ (loan sharks)

- Improving property rights will level the playing field

- See the Appendix for more details on the intuition behind the main result

Tenancy and Productivity

- Key questions
  - What drives choice of agricultural organization/contracts?
  - Does it affect productivity?
  - If it does, why doesn't everyone choose the most efficient organization?

Model 1: Principal-Agent Model with Limited Liability (Banerjee, Gertler, Ghatak, JPE 2002)

- Both landlord and tenant risk neutral
- Same as credit model with moral hazard that you have seen before.
- Now call the principal the landlord (not lender) and the agent the tenant (not borrower)
- Output is high ($Y = 1$) or low($Y = 0$) .

- The probability of high output is the effort supplied by tenant, e, at a cost $c(e) = ce^2/2$.

- Effort is unobservable and hence non-contractible.

- The tenant has no wealth

- Minimum consumption constraint of $\underline{w} \geq 0$ every period.

- The agent has a reservation payoff $u \geq 0$

- The principal must earn a non-negative payoff.

First-best (effort contractible)

- Solve

$$\max_e e - \frac{1}{2}ce^2.$$

  - effort: $e = \frac{1}{c}$.
  - expected joint surplus: $\frac{1}{c} - \frac{1}{2}\frac{1}{c} = \frac{1}{2c}$.

Second best (effort non-contractible)

- Two outcomes so a contract can be described by two components w (fixed wage) & s (share)

- Principal solves:

$$\max_{s,w} u^p = (1-s)\, e - w$$

subject to:

  - *limited liability constraint* (LLC):

$$s + w \geq \underline{w}, w \geq \underline{w}.$$

  - *participation constraint* (PC):

$$u^a = es + w - \frac{1}{2}ce^2 \geq u.$$

  - *incentive-compatibility constraint* (ICC):

$$e = \arg \max_{e \in [0,1]} \left(es + w - \frac{1}{2}ce^2 \right) = \frac{s}{c}.$$

- Can achieve first-best by setting $s = 1$ but that implies non-positive expected profits as $\underline{w} \geq 0$.

- Trade-off between efficiency (setting s high) and rent extraction (setting s low).

- If agent had wealth or limited liability constraint was absent, the principal could have "sold off" the firm to the agent by setting $s = 1$

- Then $w = u - \frac{1}{2c} < 0$ (because $\frac{1}{2c}$ is first-best level of surplus, and so u has to be less than that)

- So set w as low as possible (no risk-sharing issues), i.e., $w = \underline{w}$ and choose s to balance incentive provision & rent extraction.

- Case 1 (PC does not bind as u low)
  - Principal maximizes $(1-s)\frac{s}{c} - \underline{w}$
  - Bonus is $s^* = \frac{1}{2}$ and so effort is $\frac{1}{2c}$
  - Agent's payoff is $\frac{1}{8c}$ independent of actual value of u for $u \leq \frac{1}{8c}$
- Case 2 (PC binds as u high, namely, $\geq \frac{1}{8c}$)
  - Agent's binding PC: $\frac{1}{2c}s^2 + \underline{w} = u$.
  - Yields $s^* = \sqrt{2c\,(u - \underline{w})}$
- Figure displays s and expected joint surplus (S) against reservation payoff.

- Share first flat (reservation payoff low, PC doesn't bind) and then increases with u.

- Implications: contractual choice is driven by tenant's outside option (more generally, wealth as well)

- Fixed rent tenancy is associated with highest productivity, but its not in the landlord's interest to choose

- Tension between rent extraction & incentive provision because of the presence of moral hazard & limited liability

- Policy implications: land reform or tenancy reform can improve productivity without any technological change.

- If due to land or tenancy reform the landlord is eliminated from the scene, productivity will go up.

- However, note that:
  - If the landlord is eliminated the tenant's welfare will in fact go down since he may be receiving credit or insurance from the landlord & so if given the opportunity, would want to continue to borrow or buy insurance from the landlord or someone else.
  - This is in contrast to the model above where eliminating the landlord will improve effort but also make the tenant better off since the tenant does not borrow and does not need insurance
- More general point: sometimes people loosely say sharecropping is inefficient.

- Economists interpret efficiency in the Pareto-sense: something is inefficient if someone could be made better off without making the other person worse off.

- In both the models we saw, sharecropping emerges when we maximize the landlord's expected payoff subject to providing the tenant with a given level of payoff

- But then by construction they are Pareto-efficient

- However, because of incentive problems due to lack of perfect monitoring, the allocation is *constrained* Pareto-efficient

- Still, no policy maker can make one party better off without making the other worse off.

- However, you can raise productivity & make one party better off - we know the other party must be worse off in this case

Other Theoretical Issues

- Dynamic issues
  - It is possible to improve efficiency using dynamic contracting
  - One simple story (see Banerjee, Gertler, Ghatak, 2002) is an efficiency-wage like story
  - If the tenant's reservation payoff is very low, he earns rents
  - That means firing threats if output is low can be added as an incentive device

- Investment Incentives
  - Suppose investment is contractible, i.e., something like an irrigation equipment
  - To the extent it is complementary with e, it will be under-supplied (even if the landlord has enough money) because e is undersupplied
  - Suppose investment is non-contractible (say, care & maintenance of land)
  - Then an additional argument in favour of sharecropping - under fixed rent, tenant will over-exploit the land (multi-tasking argument - otherwise fixed wage the best)
  - Also, now eviction threats can harm investment incentives by raising the tenant's effective discount rate

- Alternative Models of Agricultural Organization:
  - Risk sharing vs incentive provision (Stiglitz, 1974)
  - Pure risk sharing: both landlord & tenant are risk averse & there is no moral hazard (Cheung, 1969)
  - No direct implication for productivity under sharecropping but other predictions similar to model 2
  - Partnership or double moral hazard: both landlord & tenant provide unobservable inputs & sharecropping gives both parties incentives as opposed to just one (Eswaran & Kotwal, 1984)

Concluding Comments on Future Research

- Greater focus on heterogeneous treatment effects in evaluating impact of property rights interventions
  - Heterogeneity across producers in characteristics such as wealth, access to other inputs and/or markets will tend to affect the marginal effect of an improvement in property rights. Besley et al (2012) shows that for low and high wealth individuals, the effect of improved property rights on improving access to credit will be limited: for the former, since they have very little wealth anyway and the for the latter, since they will have other means of accessing credit.
  - Goldstein et al (2015) find that female-managed landholdings in treated villages are more likely to be left fallow which is an important investment in long-term fertility of the soil.

- Greater emphasis on complementary reforms
  - Like any other intervention, in the presence of multiple distortions, reforming just property rights may not be effective at best, and can be counter-productive at worst.
  - Besley et al, 2012 give an illustration of how very poor borrowers may become worse off due to greater threat of dispossession, without a sufficiently compensating increase in credit supply.
  - The study by Bandiera et al (2017) we saw earlier shows that asset transfer to the very poor is most effective when combined with training.

- Paying greater attention to property rights relating to natural and common property resources

  - Across the developing world, often conflicts over property rights take place over the attempt of businesses to use natural resources (e.g., forests, minerals) that clash with traditional livelihoods of communities.

  - In this setting, from the political point of view, "property rights" often seems like a technical term for dispossession of poor people.

  - While economic development does require a move way from low return to high return activities, one has to take into account traditional rights of communities over common property resources and think of designing appropriate compensation mechanisms

- Property rights and gender
  - Property rights for women is clearly one of the most important factors in economic empowerment of women.
  - Gender discrimination is not just ethically undesirable, it also prevents efficient allocation of resources by depriving half the population from developing and utilizing their productive potential.

Appendix - Intuition for the de Soto Effect

- Consider the problem of a perfectly discriminating monopolist who charges a per unit price p and a lump-sum initial fee F to a single buyer. Quantity demanded is given by $q(p) = a - bp$ which has the standard properties of a demand function

- Suppose the buyer's outside option is 0, since there are no substitutes of this product

- However, the buyer is liquidity constrained and the seller can charge only a maximum amount $\underline{w}$

- Assume the marginal cost of production is γ

- Then the monopolist's problem is to:

$$\begin{aligned} & \max_{p} (p-\gamma)(a-bp) \; - F \\ \text{subject to } F \; & \leq \; \underline{w} \end{aligned}$$

- The first-order condition is

$$p^* = \frac{a + b\gamma}{2b}.$$

- From the demand function

$$q^* = \frac{a - b\gamma}{2}$$

- If we plot the the deman curve with q on the horizontal axis and p on the vertical axis, by a standard argument, consumer surplus can be calculated as area under the demand curve between $q = 0$ and $q = q^*$ minus the revenue paid to the monopolist, p^*q^*

- Given the linear demand curve, this just happens to be the triangle below the demand curve and above the rectangle representing the revenue

- This is easily calculated as $\frac{1}{8b}(a - b\gamma)^2$

- So if $\underline{w} > \frac{1}{8b}(a - b\gamma)^2$ then the monopolist would charge $F = \frac{1}{8b}(a - b\gamma)^2$ and extract all the surplus.

- If it is not, then F is bound above by $\underline{w}$

- Then if $\underline{w}$ goes up, p will not change but the monopolist will be better off, while the buyer will be worse off.

- How does this help us understand the case in the de Soto model where improvements in property rights have no effect on resource allocation but make the borrower worse off and the lender better off in a zero-sum sense?

- We can see that q is like effort in the de Soto model, p is like $r - c$, and F is like c.

- Basically, when the lender has market power and the borrower is poor, the lender does not want to change the package it is offering to the borrower and reacts to any small changes in borrower's wealth by adjusting the collateral

- The main reason is, p is already high and any further increase is not profitable as it will choke off demand (lower effort in the de Soto model)

- If the participation constraint is binding then the choice of p will be determined from an equation where the consumer surplus from a given p

- In particular, consumer surplus net of the fixed fee is $S = \frac{1}{b}(a - bp)^2 - F$ and this expression has to equal the reservation payoff $\overline{u}$

- Now increases in $\underline{w}$ will tend to reduce p which will raise efficiency, which is the standard de Soto effect - lowering τ raises e