18. The Institutions of Property Rights

Consider the following postulate: Institutions of property rights develop, usually by the force of government, in order to solve a common property resource problem. In the case of the California gold rush of 1848, the miners themselves created governmental units called mining districts. The organization of these groups varied predictably. The Montagnais Indians of Canada apparently adopted a system of land ownership in response to the common access problems created by the booming fur trade spurred by European settlers. Finally, there is the case of grazing among the Indians of the southwest. In this case, over grazing which caused total herd weight to fall was resolved by land rights created by the U.S. Bureau of Indian Affairs.

California Gold Rush[1]

The gold rush was an interesting event in the economic study of the history of property rights because it occurred at a time when there was no property rights enforcement agent and no property rights definition. California was governed by Mexican laws until the U.S. declared war on Mexico. California was occupied by U.S. troops and was under military rule from 1846 to 1848. In 1848 a peace treaty was signed. The peace treaty continued Mexican laws not in conflict with U.S. laws and all non-owned land became the property of the U.S. government.

Nine days before the signing of the peace treaty, gold was found on the American River near what is now Sacramento. The military governor pronounced that Mexican law concerning the acquisition of mineral rights were abolished. This meant that the gold land, which was not owned, became the property of the U.S. There was no federal law concerning the mining of gold on federal lands. Hence, gold became a common property resource. Even in the face of an alternative private property system, there was probably no way that it could have been enforced. There were 1059 troops in Calif. at the time of the discovery. The number promptly fell to 660 due to desertion.

Unlike the common fictional depiction of the gold rush period, which features shoot 'em ups and claim jumping in frightful frequency, the real miners of the period quickly adopted and adapted a property rights system to impose a privateness that permitted the mining of gold with maximum efficiency.

We can break the outline of property rights into two levels: 1) The definition of a viable group. 2) The internal organization of the group.

The group defined a measure of exclusion between one set of miners and other competing sets over a parcel of land. A viable group is large enough to enforce by means of violence if required the exclusion of other parties. These groups were called mining districts. There were as many as 500 formed between 1848 and 1866. Their sizes ranged from 4 to 8000 people. Obviously the viability of the group depends on its size relative to the size of competing groups. Many districts were reformed with more people as population grew.

Population did grow. May '48—800; June—2000; July—4000. The region of the gold find expanded somewhat between May and December '48, after which it was relatively stable. The population in December '48 was 10,000. From Dec. '48 to April '49 around 20,000 miners came from the eastern U.S. overland and 40,000 came in through San Francisco. By December '49 the population was around 100,000. By 1851 it reached 264,000.

[1] John Umbeck, "The California Gold Rush: A Study of Emerging Property Rights," *Explorations in Economic History*, 1977, 197.

At the second level of property rights definition, the group had to choose between A) Sharing and B) Land Allotment contracts. Sharing meant that the group worked the claim and each day pooled their production. At some interval, the common pool was split equally. In the Land Allotment scheme each person in the group was assigned a specific piece of the parcel of land claimed by the group. Each group member then worked his own piece of the claim and kept all the gold found on that piece. There was no sharing and gold taken from one piece was the rightful property of the group member assigned that piece.

What are the property right issues involved in the choice of the second Level property rights scheme?

Initial Agreement:

The viability of the group depended on keeping people in the group. That is, if the minimum viable size of a group claiming parcel *i* was 4 and one person decided that he could make more as a member of another group, then district *i* had to recruit another miner. This meant redefining the initial or baseline agreement among the group members.

Generally speaking, redefining the baseline agreement, is a form of sharing contract. (Law firms) In land allotment, it takes the form of redefining the boundaries of the pieces of the district.

Measurement:

Both sharing and land allotment require measurement. In sharing the gold is measured. In land allotment, the land is marked off. The gold measurement has to be done everyday. Land is remarked whenever the group decides to change the boundaries.

Enforcement:

Land allotment requires enforcement against trespass.

Sharing requires enforcement against skimming and shirking.

Technology has an impact on contract choice. Initially, gold mining involved panning which was an individual activity. However, early on the *cradle* method was invented. This required two boxes in sequence and a water supply flowing through each. The second box was rocked like a cradle. It captured the gold dust in cleats. The method required continuous rocking.

In general, land allotment is the superior contract form when enforcement against trespass is cheap and when technology does not require sharing. This is because skimming and shirking are difficult to prohibit. Either contract structure must allow for redefinition of the contract in order to maintain a viable group.

When population is small sharing is efficient. When population grows the cost of trespass enforcement falls and land allotment becomes efficient. Recognize that land allotment still allows for sub-groups within which sharing can occur so long as it is efficient.

The California gold rush offers an interesting contrast in the nature of contracting. Starting from a situation where there were no property rights, a natural evolution of a ownership system unfolded. The two main structures were a sharing contract and an individual ownership relation among the people party to the system. A fair assessment of the evolution is that the individual ownership approach ultimately dominated the sharing contract just like it seems to in most legal systems that we observe in the world around us.

An important aspect of the system that may be overlooked by the casual reader is that the apparent dominance of individual ownership over the sharing contract is just that—apparent. Simply because assets become well defined in ownership terms, that is, claims are staked and trespass is sanctioned, does not mean that sharing contracts go away. We expect that on many of

these individually owned claim sites, sharing contracts were engaged in by the owner(s). The point is that the costs of sharing contracts become large in large number settings and the benefits small. However, in small number problems the sharing contract is a viable organizational arrangement.

In fact, there is a enormous number of sharing contracts that we observe in everyday life. For instance, all law partnerships are sharing contracts. The partners agree to share the profits of the firm. That is, the revenues from all the clients are pooled and the expenses of the office are taken off the top. This includes the salaries of the associate partners. The rest is split among the full partners. There is an important difference between the law firm and the gold sharing arrangements described by Umbeck. In the law firm, the partners shares are not uniform. The partner that brings in the most cases negotiates a larger share than the most junior full partner. In fact, we expect that the contracts in the gold rush were much like this and the recorded arrangements simply over simplify. The most profitable partner always has the option of going to another firm or starting a new firm taking clients along. The rest of the partners are faced with the option of disproportionate shares or losing a team member. This is just like the problem faced by the gold panners.

Law firms might possibly be an anomaly. Law firms are not allowed to be corporations. But before we jump to conclusions, recognize that corporations are sharing contracts.

In the corporation, the capital investors, who have the rights to the uncertain residual profits of the company, agree to pay the salaries of the other "team" members up front. When the corporation is founded, the capital investors put up money to hire workers, order supplies, lease buildings, etc., all of which are used to produce output that generates revenues. When the cash comes in the investors' capital is returned. If the revenues are vast, the investors get their money back and out of the company immediately. More commonly, the roll-over continues for many years.

The corporation or in fact any firm is a team. The team is a sharing contract. Contrast the sharing contract that defines the team with the alternative which is an open market exchange. The firm involves something different from an exchange that defines the quid pro quo completely at the moment of execution. The firm implies an agreement among individual resource suppliers to pool their efforts and share in the outcome.

The Development of Property Rights

Harold Demsetz describes the story of the Montagnais Indians as developed by a number of different sources including leading anthropologists and the Jesuit missionaries of the time.[2] The story is fairly succinct. The earliest record of the culture and institutions of the Indians indicates that they held land in common as did all the other Indians of North America before the arrival of European settlers. However, over a period of 50 or so years, the Montagnais adopted a system of land rights. Families held specific parcels of land marked by boundaries. Beaver dams were also owned. On these owned parcels, hunting by anyone other than the owner was prohibited except in dire need. If starving, a non-owner was allowed to kill a beaver so long as he left the pelt and tail.

Demsetz links this emergence of a land-owning institution to the economic development of the fur trade in Quebec. Over the period that the Montagnais adopted their private property system, the fur trade increased dramatically. This undoubtedly caused the common ownership of

[2] Harold Demsetz, "Toward a Theory of Property Rights," American Economic Review, May 1967, 347-. Demsetz apparently misspells Montagnais as Montagnes. Maybe there are two spellings, but the Webster's 2nd International only lists Montagnais.

the land and animals on it to suffer the problem of over-exploitation. Demsetz argues that the emergence of the private property rights system was a response to the common access problem and a way to maximize the value of the animal population given their value in the fur market.

Property Rights in Among the Indians of the Southwest

Common access resources, or property to which exclusive rights do not exist, frequently fall prey to exploitation and overuse. In the case of wild animals, exploitation can mean extinction. There are two key points. First, when property rights to a resource are clearly defined, fully enforced, and cheaply transferable, the resource owner has an incentive to protect the asset so that it can provide a future stream of benefits. And second, in the case of wild animals, for example bison, property rights to the live (as opposed to dead) animal must be established, otherwise incentives may exist for the resource's extinction.

The common access resource of grazing land on Indian reservations is an important case study.[3] There are numerous sheepherders on a given reservation. Ostensibly, because property rights were not defined grazing lands were over-used, output per herder was diminishing and the BIA was "needed" to establish rights and enhance output. Let's step back and look at the problems associated with common access resources:

To better understand why property rights play an essential role in the management and conservation of wild animal resources, we draw on Garrett Hardin's "The Tragedy of the Commons."[4] Hardin describes a village *commons*, or common-access pasture, used by villagers for cattle grazing. In Hardin's story, villagers cannot exclude one another from the common pasture, and do not have to pay a positive price to graze their cattle on the commons. Overgrazing results because property rights to the commons are not defined in a way that leads to efficient use, and thus self-interested villagers lack the incentive to protect the commons from degradation.

A simple analysis illustrates the tragedy of the commons. Assume that cattle are the only animals to use the commons and that they gain weight from grazing. Let the opportunity cost to a villager of moving his herd from this commons to the next best alternative grazing land be a constant. As the number of cattle in the commons increases, the weight gained by the incremental steer is a downward sloping average product curve, while the extra weight gained by the herd is a marginal product curve which lies below the AP curve. The discrepancy between AP and MP arises because some of the grass eaten by the extra steer would have been eaten by the other animals had the incremental steer not been added to the herd.

The private return to a villager who grazes his cattle on the commons is the average product (for example, in dollars per steer) he receives when he sells his animals. Because AP > MP, villagers will continue to add cattle to the commons until the average product per steer just equals the marginal cost, or a point M^*. With common property, then, conditions for market equilibrium are AP = MC; however, economic efficiency conditions require that MP = MC, or a point C^* which is less than M*. In other words, the gain (in weight) from adding one more steer to the pasture should just equal the cost of doing so. The total weight of all cattle, those grazed on this commons as well as those moved to another, is maximized when MP = MC. However, common access will not achieve this result.

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[3] Johnson, R. N. and G.D. Libecap, Agency Costs and the Assignment of Property Rights: The Case of Southwestern Indian Reservations. *Southern Economic Journal*. v47 no.2 (1980): 332-47.

[4] Hardin, Garrett, "The Tragedy of the Commons," *Science*, 13 December 1968, pp. 1243-1248.

The discussion of over-grazing illustrated in this way is applicable to the problem of extinction. Instead of the resource in question being a grazing pasture, the common access resource is an animal species. In the absence of property rights to live animals, hunters will kill the animals to the point where the cost of doing so exactly equals the payoff received. The cost to the hunter of killing the animal is the opportunity cost of his time. From society's standpoint, however, a live animal capable of reproduction embodies future generations of descendants. When the animal is killed, the potential offspring are given up, and so the cost to society of killing the animal *exceeds* the cost to the hunter. Since the hunter does not own rights to live animals (including future offspring), he will not take the full (social) cost of killing animals into account, and thus will kill too many of them. The result is a threat of extinction. To avoid this problem, either private ownership of live animals or government regulation must be introduced. Either solution can potentially lead to the efficient outcome and alleviate the threat of extinction.

Under a private ownership system, owners of a resource have the incentive to maintain the asset such that the maximum value of benefits is realized. An unbiased government, or a court of law, can define and enforce private property rights, providing incentives for good stewardship of property. (It should be noted, however, that economic efficiency does not necessarily prevent extinction. The species may well be worth more to society dead than alive.)

In a sense, wild animals are all "commons." Humans hunt and kill them, but cannot establish property rights to them until they are dead. Consequently, many animals have been hunted extensively, some to extinction, while other species are now in danger of becoming extinct. Establishing clearly defined, enforceable, and transferable property rights to such animals while they are living will provide humans with the proper incentive to use them in a manner that yields the maximum social benefit.[5]

Johnson and Liebcap look at the evolution of property rights. Take a situation where property rights have developed privately among participants, e.g., Umbeck's miners, the value of the resource(s) rises, government is introduced, and situations develop from here. That is, does government respect previously defined property rights claims? If not, how does this affect the effectiveness and efficiency of the new structure? Is compensation offered?

Johnson and Libecap couch the game in terms of the Bureau of Indian Affairs (BIA) and Indian sheepherders who desire the use of reservation land that is managed by the BIA. J&L argue that the BIA redistributes or implements rights structures based upon the transaction costs of doing so.

Obviously, when an authority steps into a situation and redistributes property rights, transaction costs of assigning and enforcing the rights will increase, especially in the absence of compensation. Someone will challenge the redistribution. For example, a federal bureau (the BIA) is likely to incur higher costs of arbitrating, defining, and enforcing property rights when redistributing rights with disregard for prior claims. Management within the bureau is self-interested/rent-seeking. Thus, there would seem to be an incentive for rights to go to the highest

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[5] An interesting situation occurred at Yellowstone National Park during the summer of 1991. It is a typical story of pollution versus economic prosperity, except for an odd role-reversal. Bison roam free throughout the park and, not surprisingly, are oblivious to political boundaries. As such, they may move to non-park lands in Montana, Wyoming, Utah, and Idaho. Many bison are infected with a virus called brucellosis that has little effect on them, but can cause sterility in cattle. As a result, cattle ranchers that border Yellowstone kill bison that roam on to their property. A heated political debate ensued between cattle ranchers and environmentalists, who wanted the shooting stopped. Ironically, in this case industry called for zero pollution (no virus), while environmentalists argued that a little pollution was acceptable.

bidder.[6] Yet, Congress controls the bureau's budget. Congress does not like to see certain groups displeased. Congress has incentive to monitor the bureau, much to the bureau's chagrin. The bureau then has an incentive to minimize political pressure raised by potential property rights claimants. And the game goes on.

Common Access Resources and Public Goods

Common access resources are productive goods that are overused because there is no restriction on their use. In the common access problem, the actions of one individual impose costs on other individuals who try to use the resource and there is no institutional mechanism to make the first individual feel the cost imposed on other. There is a kind of *free rider* problem on the cost side. Examples: hunting wild animals, fishing, ground water, oil reserves, nuisance problems like noise, air and water pollution.[7]

The problem of common access is usually solved by the adoption of some government institution that limits access to the resource. The most basic government institution that limits access is the institution of private property, especially private property claims to land. There may be other types of restrictions instituted by government or private associations. However, these are typically less efficient. Private property results in a price being charged for the use of the resource such that the price is exactly equal to the marginal value of resource and at the same time equal to the marginal cost of exploiting the resource including any costs that one user imposes on the productivity of another user.

Public goods are goods that are exactly opposite to common access resources. Public goods have the characteristic that the consumption by one person does not diminish the amount or value of the resource available to other people. Take the case of people who pick up stray animals along the road. No one likes to see dead dogs in the road. People who pick up stray animals do all of us a favor. Everyone who is spared the sight of a dead dog benefits from their actions.

However, there is a free-rider problem on the positive side in public goods. When we benefit from the fact that someone picks up stray dogs on the side of the road, there is no institutional mechanism to make us pay for this service.[8] We may not even know how often it happens.

Public goods require some institutional mechanism to ensure that they are produced in efficient quantities. Quite often government produces public goods in an effort to achieve efficiency. Hence, government exists to solve common access problems and to solve the problem of public goods. Both call out for government intervention because of a free-rider problem. However, government is rarely efficient in solving either problem, but the inefficiencies of government are themselves explicable.

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[6]The objective of the BIA was not to auction the land to the highest bidder, but to initiate cultural pluralism, a communal indian society, and an equitable distribution of land holdings. Note that this is what a few select individuals thought to be best, not n

[7] Theft can be thought of as a common access problem.

[8] It is worth noting that stray dogs are a case of a common access resource as well as a public good. The people who dump dogs on the road are inefficiently exploiting the commonly held lands.

Lighthouses

Coase's lighthouse paper is an interesting blend of economic history and the history of economic thought. He tells his little tale from the perspective of the Eighteenth and Nineteenth Century economists who used the lighthouse as an example of a public good.

The problem of the lighthouse appears as two-fold. The first is that it seems to be a good for which it is impossible to collect a fee from the users. The lighthouse sits on the shore. It is most useful at night when there is no moon and signals to the passing ship not to come too close. It seems that when its usefulness is greatest, the inability to identify the user is also the greatest.

This, however, turns out to be plain wrong, verging on silly. The fact is that ships come to port. In port it is easy to know where they have been. Thus, it is easy to know whether they have passed the lighthouse. As Coase chronicles the story, the private market for lighthouses was a viable enterprise. Entrepreneurs contracted with shippers and harbor masters to collect fees from ships that were known to have passed by the lighthouses. The shippers would only support a lighthouse when they felt that it provided a valuable device for attracting shipping to their port. In other words, if a proposed lighthouse was superfluous or not worth its cost, the shippers would not be willing to collect fees. In this way a complex set of tariffs naturally developed that reflected the value received by the ship from the various lighthouses.

The lighthouse franchise had been given by the crown to an institution called the Trinity House. Trinity House had developed as a benevolent society that provided income for orphans and widows of seamen. Trinity House was not very interested in building or operating lighthouses. However, it gradually took over the chore of franchising them, that is, approving their construction and sanctioning the collection of fees for their operation. Trinity House became the central contracting agent that gave its seal of approval to the agreements between shippers and lighthouse entrepreneurs. As the franchising agent, Trinity House collected a franchise fee. The case of Eddystone Rock is instructive.

In spite of the reasonable degree of efficiency that existed in lighthouse construction and operation in the late 18*th* and early 19*th* centuries, Parliament began to pressure Trinity House to take over the construction and operation of all lighthouses. At first the lobbying attempt seemed to be that the government should pay for the construction and operation. However, this faded into a demand by Parliament that Trinity House should stop subsidizing its benevolent causes out of the franchising fees it collected from lighthouse entrepreneurs. Instead, these profits should be plowed back into the construction of even more lighthouses. Ultimately, Parliament prevailed.

As Coase points out in his particularly pithy way, the operation of lighthouses is a public good in the sense that once a lighthouse is built, its use by one ship does not diminish the value of the lighthouse to another ship. However, this does not mean that the marginal cost is zero nor that the price should necessarily be zero. Moreover, even though the use of the lighthouse has potential common access characteristics, ways around this problem can and were found. The users of the good were made to pay for it and in some vague fashion in proportion to their use.

Ships share the use of the lighthouse. In the early stages of the industry, the sharing occurred only among ships. That is, entrepreneurs convinced shippers that a lighthouse was necessary, raised capital for the lighthouses, built the lighthouse and then collected the fees from the ships. There was a sharing contract enforced on the ships. However, there was no sharing among harbors. Trinity House acted as a middleman between shippers and entrepreneurs. After the Parliamentary decree, the sharing contract extended across all harbors. Trinity House was directed to assess the need for

additional lighthouses and contract for their construction. They levied fees across the board to pay for the facilities. The private property arrangements (like land allotment in the gold rush case) that existed in the entrepreneurial era were replaced by sharing arrangements organized by the national government through the auspices of Trinity House.

***The Optimal Supply of the Public Good*:**

Coase's lighthouse problem is an example of a public good (among the ships) that can and was provided by the private market. Demsetz formalizes the problem and discusses the issues in some detail. The model can be applied to the lighthouse problem and some additional insight gained in the process.

Demsetz argues that the public good is analytically identical to the case of joint products. In the normal private market it often happens that two or more goods are produced simultaneously. The classic example is in the slaughtering of steers both meat and hides are produced. In this case there is little tradeoff between the two products. From each steer comes a fixed amount of meat and a fixed size of the hide. In this way we can normalize the unit of measure to a standard steer. The demands of hide buyers and meat buyers can then be graphed in the same picture. We expect that meat buyers have larger demands. But for each steer the total demand is the *vertical* summation of the demand for hides and the demand for meat. The competitive equilibrium in the steer market derives from the intersection of the vertically summed demands and the supply of steers.

Public goods are no different in principle. Figure 1 shows the case of a public good in which all demanders are the same. Assume that there are n demanders. The vertical sum of their demands gives the aggregate demand. The supply side of the market is constructed to be identical to the competitive case. There are a perfectly elastic number of suppliers that all have cost conditions that resemble the average and marginal cost functions shown in Figure 1. Given this assumption, the industry supply is horizontal at the level of minimum average cost. The public good analog to the competitive joint products case occurs where the aggregate supply of the public good is q_s. The supply price of P^* is spread among the n demanders evenly. They all pay p^*. There are multiple suppliers each producing at minimum average cost and each providing q_f units.

As Demsetz says, an equilibrium is characterized by four conditions. (1) All firms are capitalizing on all potential profits given the price condition they face. (2) There is no incentive for more firms to enter the market. (3) No demander has the incentive to consume more or less. (4) The market clears, i.e., quantity supplied by the firms is exactly equal to quantity demanded by the buyers. The situation depicted in Figure 1 satisfies these conditions.

Consider what happens when the number of buyers increases. Figure 2 shows the shift in the aggregate demand when the number of buyers expands by k. The aggregate demand gets bigger. This causes the intersection of aggregate demand and supply to move to the right. The result is that move of the good is produced and each person pays less.

Now lets consider the case of Coase's lighthouse within the Demsetz framework. The simple model Demsetz has formulated needs some fine tuning to fit the lighthouse case. The problem it that with lighthouses there are different kinds of buyers. Fortunately Demsetz addresses this issue as well. Figure 3 shows the picture. Assume that there are three groups of buyers. The demand groups are labeled in the rank order of their intensity. That is, Demand Group 1 has the largest demand, group 2 is second, and group 3 has the smallest demand. Again the aggregate demand is the vertical summation of the different individual demanders. In this case the aggregate

demand has kinks at the points where one group and then another fall out of the aggregate. As shown in the graph, group 3 falls out of the aggregate demand at 3 lighthouses. This means that the marginal valuation of the third lighthouse for group 3 is zero. Similarly, group 2 falls out of the aggregate demand at 5 lighthouses.

Again assume that the supply curve is flat. The intersection of the supply and aggregate demand represents the efficient point. This point occurs at an output level of 4 lighthouses in Figure 3. The supply price of *MC* is split among the various groups as follows: group 1 pays *p'* and group 2 pays *p''*, while group 3 pays nothing. There is nothing magic about the allocation of the prices. That is the cost could be spread among the demanders in a different fashion. However, there is an efficiency characteristic associated with the production of 4 lighthouses. At that level of lighthouses, the marginal cost and aggregate marginal benefit of lighthouses is exactly equal.

While there is no efficiency characteristic of the pricing scheme, there is an equilibrium quality to it. Recall that an equilibrium condition is that each buyer should have no incentive to demand more given the price that each faces. Given that group 1 demanders pay *p'* for the last lighthouse built, they have no interest in demanding more lighthouses. Their marginal value is exactly equal to their marginal cost. The same is true for group 2 demanders paying *p''*. In this sense, if group 3 demanders were forced to pay for the last lighthouse, they would react negatively. They do not want that many lighthouses. On the other hand, they are willing to pay something for some lighthouses. The question of equilibrium rests on the issue of the marginal price paid in this case. As an aside, if Figure 3 represented a competitive market for a joint product spread across three groups, competition would result in group 1 getting the good for nothing.

Finally let's consider what happens in the case of heterogeneous demands when the market expands. Figure 4 shows the effect of a new group of demanders entering the market. The demand curve shifts up. The intersection of the supply and aggregate demand moves to the right. *L** is now the efficient number of lighthouses. Note that in this picture, the new group is a large demand group surpassing the old group 1 in intensity. This causes group 2 to become inframarginal. That is, group 2 demanders have no value for the last lighthouse demanded by groups 1 and 2. Because of this, an equilibrium pricing scheme says that they should not pay for it.

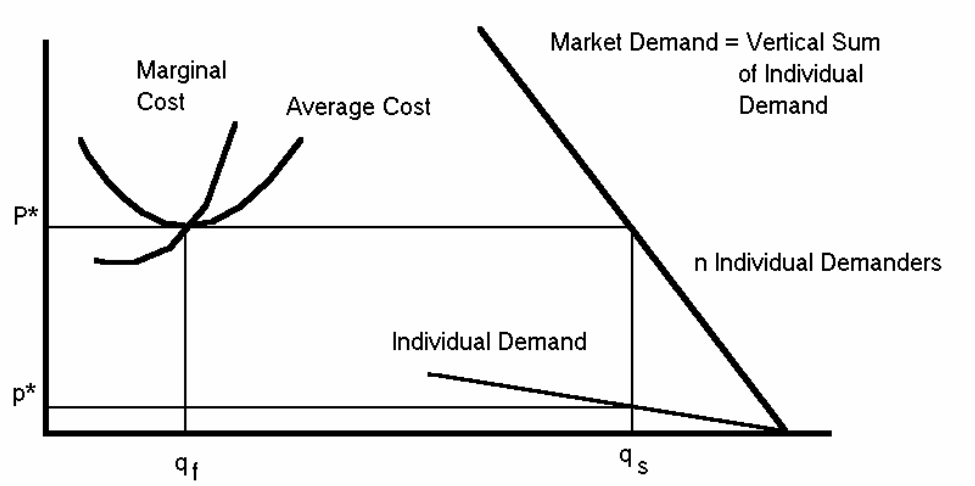
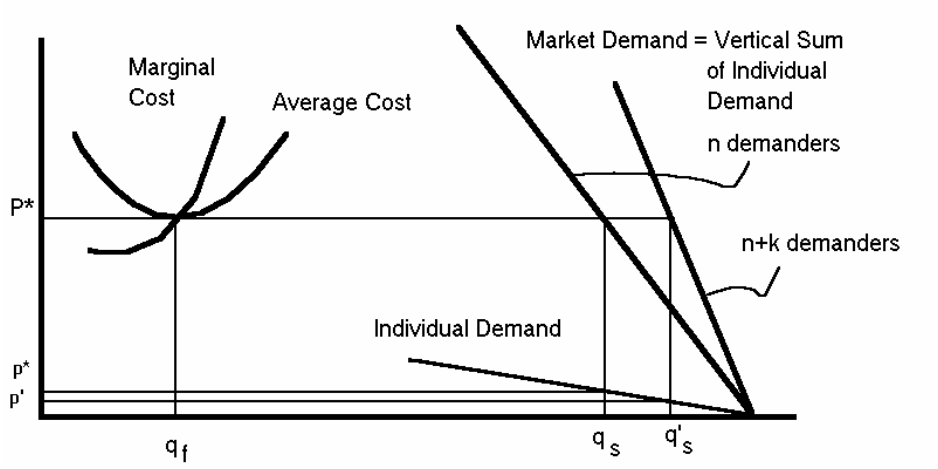


Figure 1


Marginal
Cost
Average Cost
Market Demand = Vertical Sum
of Individual
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Individual Demand
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Figure 2

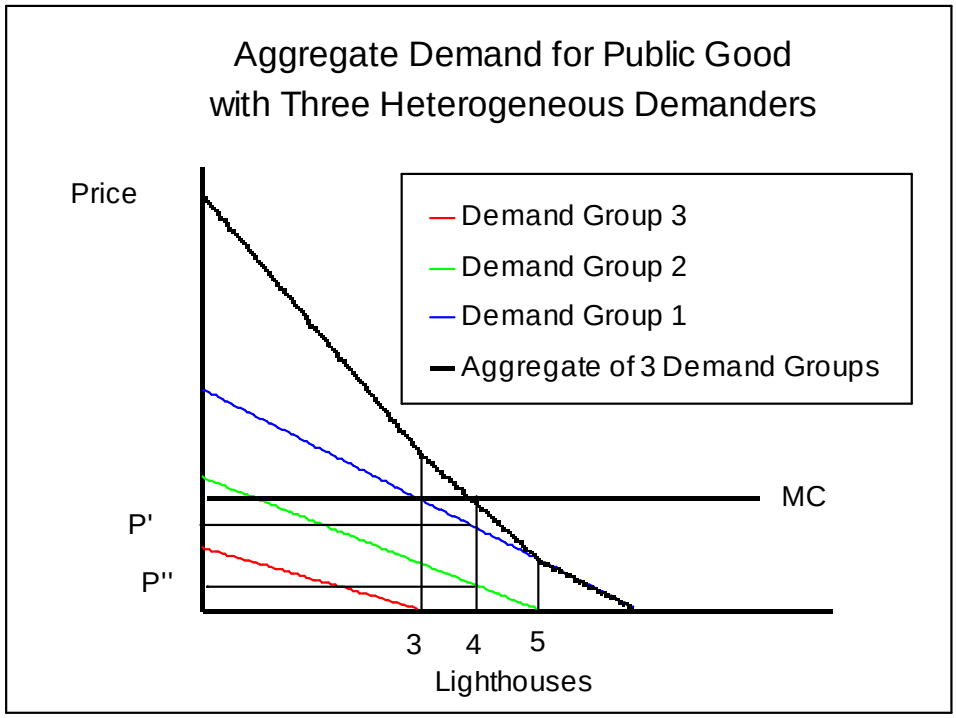

Figure 3

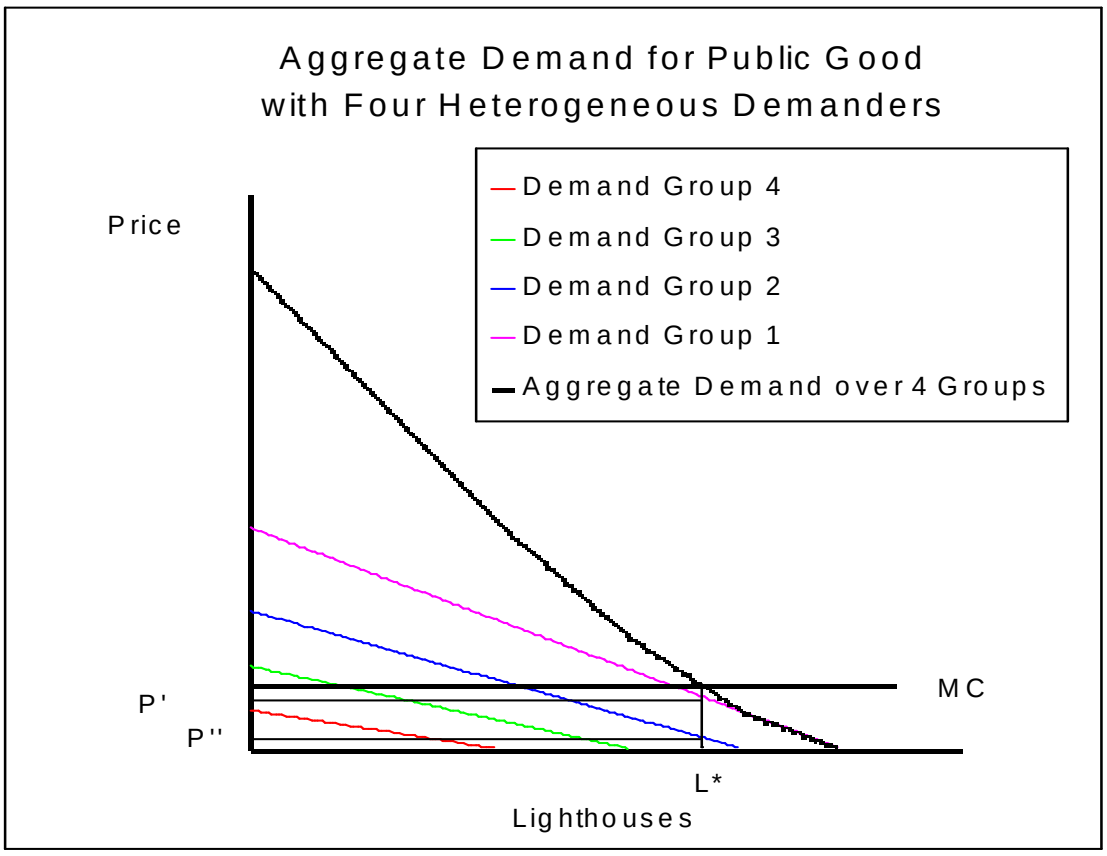

Figure 4