CHAPTER 1

THE EVOLUTION OF AGRICULTURE AND AGRICULTURAL MARKETS

1.1) THE BEGINNING OF AGRICULTURE AND THE NEOLITHIC REVOLUTION

The story of human progress is long, but progressive. That is, it took a long time for humans to evolve and begin making discoveries that led to today’s high standard of living, but we are progressing faster and faster. Our planet was formed 4.5 billion years ago. Life began 3.5 billion years ago. Animals appeared one billion years ago. Five million years ago, one colony of apes began to evolve in ways that would eventually lead to homo sapiens—humans; you and I. These apelike creatures were the first, and only, animal on earth to develop sophisticated languages. They made a variety of tools, and possessed a seemingly unlimited imagination. They could count. They could plan ahead. They could imagine scenarios and strategies that have never been tried but could potentially improve their lot. For example, at some point in history someone wondered whether if they chiseled away at rock if it would produce a tool that could increase animal kills. Do not underestimate what a feat this simple thought experiment was.

Humans first appeared five million years ago, but agriculture only began 10,000-15,000 years ago. Compared to the age of the universe (10 to 15 billion years), earth, or humans, we could say agriculture essentially appeared yesterday. But look at what progress we have made since then! Instead of spending all our time gathering and hunting food, we choose amongst thousands of possible jobs, restaurants, and recreational activities. To our ancestors, each day presented a question of survival. To many of us, our greatest concern is whether our alma mater will make it to a bowl game. The point is that, although our high standard of living required many steps, each step is easier to climb than the last. This progression is the result of collaboration, or human’s willingness to work together to improve one another’s lot. This coordination is the very topic we will study this semester.

Let’s first begin with this “discovery” of agriculture. Agriculture was not so much of a discovery as it was a choice. Our ancestors did not “discovery” or “invent” a new method of providing food, after which everyone automatically switched from hunting / gathering to farming. Agriculture evolved. It was initially adopted by a few, competed for many years against the hunting / gathering lifestyle, and eventually became the dominate form of food production, and here are the reasons why.

You have probably been taught that the first civilization was in Mesopotamia (modern-day Iraq), by the Tigris and Euphrates Rivers, but were never taught why. The reason is that Agriculture essentially started here. The area in the map below called Mesopotamia is often referred to as the Fertile Crescent because that is where agriculture began. Why in the Fertile Crescent? Humans were located all around the globe in 8,000 B.C., and all humans at that time were hunters and gatherers. Why, then, did the transformation of hunters / gatherers begin the Fertile Crescent and not South Africa, China, or Eurasia?
1.1.1) Plant domestication

Civilization began in the fertile crescent because of climate. Think about what crop farming entails. You take seeds from a plant, store it, plant it later, and after it grows you harvest whatever it is on the plant that you desire. For soybeans and corn, this would be the seed. For lettuce, the leaves, and for cotton, well, the cotton. So for agriculture to begin, there had to be a plant that produced a seed that could be stored for an extended period of time without germinating or rotting, but once adequate conditions (soil, water, warmth, light, etc.) were available would immediately begin forming a plant.

The Fertile Crescent had the perfect climate for producing such a seed. Stated more accurately, it had the perfect climate for causing such seeds to evolve. The Fertile Crescent had mild, wet winters and long, hot and dry summers. For their species to survive, plants had to produce seeds that could remain dormant during the dry summers, and then sprout quickly once the winter rains arrived. In essence, the seeds had to be storable. Lucky for us, these seeds were edible as well. The gatherers learned they could collect these seeds and, so long as they kept it dry, they would have a food source to last them throughout the dry summers. Now, people did not have to wander place to place searching for food. They could remain right by these plants, collecting seeds, storing them, and consume them throughout the year. These seeds would later constitute six of the world’s twelve major crops.

This is not agriculture, yet. The only thing the Fertile Crescent did was produce a seed that allowed people to remain sedentary. Agriculture evolved from there, by the domestication of plants, and it evolved gradually. The domestication of plants essentially means that the genetic makeup of plants were brought under the control of humans. Since 8,000 B.C. crops have been genetically modified. Today, we intentionally influence the genetic makeup of crops and livestock. We understand how genes work, we know what we want out of crops and livestock, so we rearrange those genes according to our desires. The first farmers did the exact same thing, without any knowledge of genes, only what they wanted out of crops.

For a plant to survive, it must pass its genes onto its offspring. The plants that exist today are alive solely because they have become so good reproducing. Since plants cannot walk or fly,
they had to develop other means of spreading their seed. Those that didn’t, perished. Some plants had seeds that could be carried by the wind or float on water, and survived because of this. Other plants’ seeds did not have this capability, so another method was sought. Many plants learned to wrap their seed up in a tasty fruit and advertise that fruit by color or smell. Animals then come by and eat the fruit, carrying the seeds with them as they travel along.

Then the seeds would either be spit out (like we do watermelons) locations, thus propagating the plants’ population. Other seeds are made such that they can resist digestion and be defecated fully intact, and later germinate. An example is corn. If you have horses, you probably know that you must break the corn into smaller pieces before the horse cannot digest it. Whole corn will pass right through a horse, protected from digestive enzymes by its out layer. In fact, some seeds must pass through an animal’s gut before they can germinate. One African melon species is particularly adapted to being eaten and defecated by aardwolves, which are a hyena-like species, and is almost exclusively found at aardwolf latrine sites.

Plants did not intentionally develop this method of disseminating its seeds. That is, plants did not think ahead and say, “why don’t I make a tasty fruit around my seed, so that animals passing by will carry it away with them.” Instead, natural selection caused it to happen. The plants that did wrap its seeds in fruit flourished, passing its genes to generation after generation. Plants that didn’t, unless they could find another way to disseminate their seeds, became extinct. In these cases, plants produced a fruit that animals found desirable because otherwise it would perish.

Man has been genetically modifying plant genes even before they learned to store seeds in the exact same way. The fruits they like, they take. The fruits they don’t like, they don’t take. Thus, plants’ genes begin to change to humans’ (and other animals’) liking, because doing so helped their survival.

This process of selecting genes we like increased dramatically after we began storing seeds and leading sedentary lives. Humans became much more closer to their plants, both in emotional and physical terms. If sedentary, civilizations would construct latrines. As mentioned earlier, many plants thrive by defecation of their seeds. Latrines became a hot-bed of plant growth. But what is particularly interesting here is that the latrines essentially became the first “farm plots.” They were places where the same seeds were [unintentionally] planted year after year. Maybe this is where humans first learned that you could take seeds, place them in or near the ground, and crops would grow.

As time went on, human farmers completely changed the genetic makeup of plants from what they would be under natural selection. Consider wheat and barley. With wild wheat and barley, when the seeds growing at the top of the plant are fully formed, the stalk shatters dropping the seeds onto the ground. Genetic mutations that prevent this shattering are lethal—the seed will remain suspended in air and never germinate. However, seeds growing at the top of plants are easier for humans to pick than seeds on the ground. Now, plants with nonshattering stalks will produce seeds more desirable to humans. They are more likely to be picked and planted on farm plots. Over time, plants with this genetic mutation will begin to dominate. The genetic mutation that was once lethal now becomes favorable. It has been said that this unconscious selection for nonshattering wheat and barely 10,000 years ago in the Fertile Crescent was the first major human “improvement” in any plant.

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[1] Natural selection here means the evolution of plants in response to environmental stimuli other than humans.
Most of this description of agriculture’s evolution takes place in the Fertile Crescent in 8,500 B.C., producing what we now know as wheat, barley, peas, and lentils, but similar developments took place during the years 3,500-7,500 B.C. in China (rice), Mesoamerica (corn, beans, and squash), Andes (potatoes), and Eastern United States (sunflowers). Seeds were then transported to and adopted by other regions. Crops tended to be adopted East-to-West as opposed to North-to-South, and for good reason. Crops evolved in a particular habitat, and have a higher chance of survival in habitats that are similar. Regions of similar latitudes tend to have similar habitats, thus, crops tend to spread East-to-West quite easily. Temperatures and seasons vary dramatically traveling North-to-South though, and therefore crops spread slowly or not at all across different latitudes, but easily across different longitudes.

1.1.2) Animal Domestication

We should not focus our attention on crops only. Livestock is a major form of agriculture, and the dominate form in some areas. Humans have always been omnivorous. We began strictly as herbivores, but as we started to include meat in our diets the higher protein meat provides gave us the needed proteins to build bigger brains. Without meat, some scientists argue we would have remained more apelike than human.

Man has domesticated many small mammals; such as duck, geese, wolves (dogs), rodents (rabbit), honeybees, and China’s silkworm moth. By far, the bigger domesticated animals have played a more important role in human society though, so our discussion will focus on the big mammals. Most of today’s livestock centers on five domesticated mammals; cattle, sheep, goats, pigs, and horses. These are only a few of the many creatures; why were they domesticated and not the others?

The reason is that for an animal to be domesticated, it must be “just the right kind of animal.” It must pass the Anna Karenina principle. Anna Karenina is a novel by Tolstoy, and is known for the famous line “Happy families are all alike; every unhappy family is unhappy in its own way.” What Tolstoy was saying was that for a family to be happy, everything must be “just right.” There must be sexual attraction, agreement about money and raising children, religion, etc. Failure in just one of these respects is sufficient for ending a marriage. Similarly, for an animal to be domesticated, it must possess several qualities.

First, it must have a natural diet that produces food efficiently. Every time one animals eats another, the conversion of food biomass is less than 100%, and closer to 10%. This means that it takes about 10,000 lbs of corn to produce one 1,000 pound cow. If instead of raising cattle we decided to raise carnivores, to grow a 1,000 pound carnivore you must feed it 10,000 pounds of a herbivore that was grown on 100,000 lbs of corn. It takes ninety more pounds of corn to produce one pound of carnivore meat than herbivore meat. This is why, in general, we domesticated herbivores instead of carnivores.2

Second, for efficient food production, the animal must grow quickly. This is why we did not domesticate gorillas or elephants.3 Our ancestors simply did not want to wait years and years until the meat could be harvested. They had to be willing to breed under captivity. Egyptians and Indians tried desperately to domesticate cheetahs, but could never breed them in captivity. The animal must not have a nasty disposition. Why were horses domesticated, but not zebras;

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2 One exception is dogs. Aztec Mexico, Polynesia, and ancient China raised dogs for meat. However, dogs are omnivores, so this may not be an exception after all.

3 Both are herbivores that will eat a wide array of fruit and represent much meat.
they seem so similar? The answer is that zebras are ill-tempered, and become extremely dangerous as they grow older. Their worst tendency is to bite and not let go. Next time you see zebras in a circus, notice that they are likely wearing a muzzle. The fact is, zebras cause more injuries to zookeepers than tigers. If it were not for their bad disposition, we would likely be raising bears in captivity for meat today.

*Animals that have a tendency to panic are difficult to domesticate.* Gazelles were the most hunted game in the Fertile Crescent, but every time they were fenced in or herded they would panic and hurt themselves. *All domesticated animals share three social characteristics (1) they must live in herds (2) have a well-developed hierarchy and (3) different herds must be willing to occupy overlapping home ranges, rather than mutually exclusive territories.* The herd characteristic is useful because it makes it easier to keep animals together. The fact that the animals have a well-developed hierarchy allows humans to take over the dominant role easily. Finally, it is hard to keep many animals in one area who prefer to have mutually exclusive territories.

Only a few animals passed all eight tests and became domesticated. It so happens that almost all of these animals were located in Eurasia. The table below shows the number of mammals that were candidates for domestications in the world’s four major regions, and the resulting number that were domesticated. Remember too, that most of plants were domesticated in Eurasia. Agriculture began in Eurasia, and this had profound implications. What race dominates the world? Which race had the guns and steel that conquered all other regions? The answer, of course, is Eurasia. Here is why.

<table>
<thead>
<tr>
<th>Mammalian Candidates for Domestication</th>
<th>Eurasia</th>
<th>Sub-Saharan Africa</th>
<th>The Americas</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates</td>
<td>72</td>
<td>51</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>Domesticated Species</td>
<td>13</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of Candidates Domesticated</td>
<td>18%</td>
<td>0%</td>
<td>4%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table recreated from *Guns, Germs, and Steel*

1.1.3) *The Neolithic Revolution*

Agriculture allowed people to lead sedentary lives. Food production was more efficient, such that larger groups could live in smaller areas, and less time was needed for food production. More time could be spend in the production of other goods; such as tools, medicine, wagons, and even roads. Let us not forget weapons of war.

Man went from nomadic hunter-gatherers to societies, all due to agriculture. Politics and “large societies” were born in an effort to coordinate the desires and activities of these societies. Rather than coordinate the production of food and other goods within families or small clans, history reveals that societies tend to get “big,” such that people who grow food and the people producing other goods rarely know one another. To help coordinate all these activities, markets formed, and markets got bigger and bigger. As societies and their markets became larger, government had to become larger as well, because societies decided only governments could serve certain needs.
markets could not, and [historically] big governments tend to overtake smaller governments. This move from hunter / gatherers to complex agricultural societies is referred to as the Neolithic Revolution.

It is well-known that bigger and more cohesive governments tend to take over smaller, uncoordinated governments. Agriculture allowed the discovery of steel and guns, which made those takeovers easier. Regions comprised of hunter / gatherers became agricultural regions, because societies based on agriculture conquered the hunter / gatherers. Of course, it was easier to conquer people on foot when you were riding domesticated horses as well.

One of the major regions societies based on agriculture overtook the rest of the world was their livestock and the germs the livestock brought with them. Most of our epidemics originated from the livestock we raised. Measles, tuberculosis, and smallpox began as a cattle disease but evolved to affect humans as well. The flu began in pigs and ducks, and malaria in birds. The fact that agricultural societies live close together made these diseases easier to spread. Epidemics only thrive in crowds, rather they be herds of water buffalo or cities of people. So agriculture and its livestock gave us epidemics such as smallpox. Why did this make it easier for them to conquer hunter / gatherers?

Because those who do not die from epidemics develop immunity. Then, when they visited foreign lands, they spread disease without suffering it themselves. In the two centuries following Columbus’s arrival in the New World, American Indians suffered great fatalities from the diseases they brought; some say as high as 95%. The Indians never gave us diseases because they did not raise livestock and did not live in dense populations, so no epidemics developed in American Indian societies. It is much easier to conquer a people stricken with smallpox!

Due to these developments, most of the world depends on agriculture for food, and have rather sophisticated and larger societies. Larger societies often depend on both larger markets and larger governments. Thus, we ended up in a world where food production, or what we call agriculture, is intimately linked to market behavior and politics. The major purpose of this course is to study this linkage. The next section describes societies from early B.C. to the present, with particular attention to whether markets were used. It will illustrate that the markets our culture depends on have not always been used since agriculture was developed, and will try to explain under what conditions agricultural markets to develop. This will set the tone for the rest of the course; the study of the agricultural markets.

The source for most of this section’s information is Guns, Germs, and Steel by Jared Diamond.
Agricultural markets are a mechanism for society to coordinate the production and distribution (or consumption) of food. Markets can generally be thought of as the process of buyers and sellers negotiating who will by how much from whom through trades. We are more used to “trade” being prices; if I give you one dollar for a coke, that is a trade and the dollar is the price. Markets do not have to be a physical place or central point of exchange. For instance, there is a market for college professors, but rarely are professors herded into a room and bid on by competing universities. Markets usually describe trade on an impersonal basis, where buyers and sellers buy and sell on the basis of their own interests, and not altruism, religion, or government.

Much of our agricultural production is influenced by government. US and European farmers are in fact subsidized by urban citizens (through what we call the farm bill), and the method in which those subsidies are allocated influences agricultural activities. Most agricultural activity is influenced by markets though. Farmers plant crops and raise livestock based on the prices consumers will pay. Middlemen buy farm crops and livestock and transform it into a form consumers find more desirable, because they make profits doing so. Other middlemen buy grain and store it, in anticipation of higher future prices. The profit motive governs most of the decisions on what, when, and where to plant crops or raise livestock, how it should be transformed before sold to consumers, and what consumers will purchase it. Agriculture activities are largely guided by markets.

Why did our society end up using markets to allocate food production and consumption? There are other systems, including command economies where governments says who produces what and who consumes what, such as the former USSR. There are also communal organizations (hereafter, communes), such as Hungary and Yugoslavia from 1940-1980. In communes, small groups of people decide amongst themselves who produces what and who consumes what. We didn’t end up with these other systems; we ended up with markets. Why?

There is no single answer, but looking back at history we can get a feel of those factors that had something to do with the adoption of markets. It should be noted that the use of markets, as opposed to command economies or communes, has typically gone in and out of favor by societies. Markets usually don’t just evolve and then remain intact. They evolve, go out of favor, come back as different markets, and as markets exist they are continually changing.

From the first time one group of people traded with another group on an impersonal level, markets were born. Perhaps markets were the second method of coordinating economic activity, communes being the first. It is very likely that markets proceeded big government like republics and communism. So at this point, perhaps we should delve into what makes markets desirable.

1.2.1) Trading Clans and Gains from Trade

Markets can serve people well because they are voluntary trades, and voluntary trades make all those who participate better off. Suppose we start with two communes, each an agricultural clan that produces food only for themselves. What they produce, and who gets to consume what is decided by the clan, much in the same manner family decisions are made. Now, we will allow these two clans to trade with one another. We will assume these clans do not know or care about each other on a personal level. They only trade for selfish reasons. One clan will not give the

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4 Agriculture would also include goods like cotton, which are raised by biological systems but are not food.
other clan something for nothing, like family members do. I assume this because this will make the two clans resemble markets where trades are impersonal.

We need three things to make trade between clans desirable. First, each clan must prefer and produce a variety of goods as opposed to consuming one exclusive good. This need is almost always met. Suppose two clans produce and consume only one type of fish. What are they going to trade? One fish for a fish? One clan must have a good the other clan wants but does not have. If one clan produces salmon, and the other clan produces corn, there is reason to trade. It is likely each clan wants to consume both salmon and corn, and are willing to trade some of the good they produce for goods the other clan produces. Historically, most trade was driven by the fact that different regions produce different goods, and consumers desire a large variety of goods. For instance, Western Eurasia traded goods it produced for Eastern Asian’s spices and fabrics.

What if both clans produce both salmon and corn? Will they trade then? They will, if one clan specializes in the production of salmon and the other specializes in corn. When I say “specialize in salmon” I mean the clan is better at producing salmon than corn. More specifically, if Clan A specializes in salmon and Clan B specializes in corn, then to produce one salmon Clan A gives up less corn than if Clan B tries produce salmon. I realize this may be a bit confusing, so let’s explain this more slowly.

Suppose that it takes Clan A one hour to produce one salmon and one hour to produce one corn (one corn could mean one bushel of corn). Further, suppose this clan works ten hours per day. For every salmon Clan A produces it gives up one corn, and for every corn it produces it given up one salmon. We would then say, for Clan A, the opportunity cost of a salmon is one corn, and the opportunity cost of one corn is one salmon.

Consider this graph illustrating Clan A’s tradeoff between corn and salmon. If all ten hours are spent producing Salmon, the clan is at Point A, where it consumes ten salmon and no corn. Conversely, if all ten hours are spend producing corn, they are at Point B with ten corn and zero salmon. However, if half their ten hours are spent in corn and the other half salmon, they will

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5 The opportunity cost is the value of the next best alternative. If Clan A spends one hour producing one salmon, it must be the first-pick for Clan A. The next best alternative is to spend one hour producing one corn, by assumption. So here, the opportunity cost of one salmon is the value of one corn. Sometimes we use dollar values, but since there is no money in this example, I will just leave it as “the value of one corn.”
produce five salmon and five corn (Point C).

The line in the graph of Figure 1.1 is referred to as a *Production Possibilities Frontier (PPF)*.

**DEFINITION: PRODUCTION POSSIBILITIES FRONTIER**

A graph showing the tradeoff between two goods. The tradeoff could be for a single person (e.g. tradeoff between studying and watching TV) or entire nations (e.g. tradeoff between producing agricultural and industrial goods).

It shows the tradeoff between two goods a clan faces. We could draw a PPF curve for states and countries as well. Below, Figure 1.1 is shown again, but with a few added features.

Notice that the area to the left and underneath of the PPF is inefficient. Point D is in this inefficient region. At Point D, the Clan is consuming 4 salmon and 1 corn, but it could easily increase salmon consumption without giving up any corn. Conversely, the clan could easily increase its corn production without giving up any salmon. Here, extra consumption is free for the taking.

You may ask: But the Clan has to work to get more salmon or corn, so extra consumption isn’t free. However, recall I said the clans always work 10 hours per day. So being at Point D is like catching salmon and then throwing it back, or harvesting corn and then dumping it in a river. We assume it doesn’t happen.

Now, notice the area to the right and above the PPF is called the infeasible region. Point E is in this region. It is impossible for the clan to consume in this region (without trade). If it takes the clan one hour to produce a salmon and one hour to produce a bushel of corn, and the clan works ten hours per day, it is impossible for the clan to be at Point E where they produce and consume 7 bushels of corn and eight salmon.

We have just ruled out the clan producing and consuming in the inefficient and infeasible region, and so assume clans always produce and consume at some point on the PPF curve. Here is the amazing thing about trade: Although clans (or individuals or countries) cannot produce in the infeasible region, with trade, they can consume in the infeasible region. **WITH TRADE, YOU**
GET EXTRA CONSUMPTION FOR FREE! Allow me to demonstrate this seemingly outrageous claim.

We will now let this Clan A trade with another clan: Clan B. Suppose that Clan B is just as efficient at salmon production but not at corn. It takes them one hour to produce one salmon but two hours to produce one corn. Clan B’s opportunity cost of salmon is 1/2 corns, and its opportunity cost of one corn is two salmons.\(^6\) Thus, Clan B faces a different tradeoff between salmon and corn production than Clan A. Consider the table below.

<table>
<thead>
<tr>
<th></th>
<th>Opportunity Cost of Salmon</th>
<th>Opportunity Cost of Corn</th>
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</thead>
<tbody>
<tr>
<td>Clan A</td>
<td>1 corn</td>
<td>1 salmon</td>
</tr>
<tr>
<td>Clan B</td>
<td>1/2 corn</td>
<td>2 salmons</td>
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</table>

Now we can get back to the definition of specialization. Clan A specializes in corn while Clan B specializes in salmon. I know this because Clan A has a lower opportunity cost of producing corn while Clan B has a lower opportunity cost of producing salmon. In economics, instead of saying specialization which means a lot of things to lots of different people, we use the term comparative advantage.

**DEFINITION: COMPARATIVE ADVANTAGE**

One group is said to have the comparative advantage in the production of a good over another group if it can produce that good at a lower opportunity cost.

Figure 1.1 shows the Production Possibilities Frontier (PPF) Clan A. Now in Figure 1.2, I will draw the tradeoff for both clans.

You can see that Clans A and B face different tradeoffs between salmon and corn. You can easily see that Clan A is richer than Clan B, as they can produce more salmon and corn. What I want to show you now is that both clans can gain from trade. To see this, suppose both clans do not trade and produce the following amount of both goods (shown in Table 1.2). If no trade occurs, each clan’s production

\(^6\) If Clan B spends one hour producing one salmon, it foregoes an hour that could have been used producing salmon, and in one hour Clan B could produce ½ corn (like ½ bushel of corn). Conversely, if Clan B spends two hours producing one corn, it foregoes two hours it could have spent producing two salmon.
and consumption of each good must equal. This level of consumption (and recall without trade consumption must equal production) is shown in Figure 1.2 by black and gray circles.

<table>
<thead>
<tr>
<th>TABLE 1.2</th>
<th>CLANS A AND B WITHOUT TRADE</th>
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<tr>
<td></td>
<td>Production</td>
</tr>
<tr>
<td>Clan A</td>
<td>Salmon</td>
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<tr>
<td></td>
<td>Corn</td>
</tr>
<tr>
<td>Clan B</td>
<td>Salmon</td>
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<td></td>
<td>Corn</td>
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One thing we know is that, even though one clan will try to “gip” the other, the clans will not trade unless both can be made better off. Before trade, each clan has obtained a particular level of happiness by catching so many salmon and raising so many bushels of corn. Now, given the opportunity to trade, the clans do not strike a deal unless that level of happiness can be exceeded by the trade. So if they trade, they both must be made better off. That is the beauty of markets. They are voluntary, and people don’t participate unless it benefits them. So long as comparative advantages exist (the opportunity costs of producing goods are not equal across clans), each clan will produce and export the good they have a comparative advantage in, will import the good for which they do not have a comparative advantage, and both groups will benefit from the trade.

<table>
<thead>
<tr>
<th>Important Economic Fact: Gains From Trade (assuming small groups)</th>
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</thead>
<tbody>
<tr>
<td>So long as each clan produces more than one good and one can produce a good at a lower opportunity cost than the other, one or more mutually beneficial trades exist. Furthermore, each clan will produce export the good for which it possesses a comparative advantage.</td>
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</tbody>
</table>

Clan A has a comparative advantage in corn, and so will produce corn and trade its corn for Clan B’s salmon. Clan B produces only salmon, since salmon is their comparative advantage. These production levels are denoted by black and gray triangles in Figure 1.2. Suppose Clan A produces 10 corn (the maximum amount it can produce, since with trade it only produces salmon) and trades three bushels of their corn for five of Clan B’s salmon. Clan B produces 10 salmon and trades five salmon for three corn. The consumption levels for both clans are shown as rectangles in Figure 2.1. Each clan’s production and consumption of each good is then

<table>
<thead>
<tr>
<th>TABLE 1.3</th>
<th>CLANS A AND B WITH TRADE</th>
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<tbody>
<tr>
<td></td>
<td>Production</td>
</tr>
<tr>
<td>Clan A</td>
<td>Salmon</td>
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<td></td>
<td>Corn</td>
</tr>
<tr>
<td>Clan B</td>
<td>Salmon</td>
</tr>
<tr>
<td></td>
<td>Corn</td>
</tr>
</tbody>
</table>

**NOTICE THAT WITH TRADE, EACH CLAN NOW CONSUMES OUTSIDE ITS PPF CURVE, IN THE INFEASIBLE REGION!** With some inspection, you can see that this hypothetical trade will make both clans better off than they could possibly be without trading. Look back at the tradeoff between salmon and corn for both clans in Figure 1.2. Notice that without trading, there is no way Clan A can produce and consume five salmon and seven corn. If it produces five salmon,
the maximum amount of corn it can produce/consume is five. By trading with Clan B, it is almost like Clan A got two corns for free. This is what we call gains from trade.

Clan B also gains from trade. Looking back at Figure 1.2, without trade there is no way Clan B could produce five salmon and three corn. It would be in the infeasible region. If it produced five salmon, the maximum amount of corn it could produce/consume is two. Again, it is almost as if Clan B got one more corn for free, and again, that is what we call gains from trade. Due to the fact that each clan specialized in a particular good (produced a particular good at a lower opportunity cost) both clans can gain from trade.

This is why, historically, once civilizations formed they soon began trading with one another. Notice that we could easily replace “Clan A” and “Clan B” with “Country A” and “Country B.” These arguments for gains from trade extend to whole nations as well. Just as both clans gain from trade with one another, whole countries gain from trading. This is why we trade on such large volumes with other countries, and is part of the reason we have such a high standard of living. The argument also extends to individual people. Most of my research has been in collaboration with one particular friend. We work and publish together because I specialize in statistics and he specializes in other areas. We each have a comparative advantage, and by working together, produce better research than we ever could working alone.

If you think about it, these gains from trade explain why we tend to live in societies. Isolationists like Pat Buchanan would argue we should close our borders to all trade with other countries. Well, should Oklahoma close its borders to trade with other states as well? Should Stillwater, Oklahoma should produce everything it consumes right inside its town borders? Should I venture off into the woods and produce everything that I consume myself, and trade with no person?

No. We participate in society because large societies allow each person to specialize in a particular field. Then, by each person producing what they are best at, and then trading for goods they are worst at producing, as a whole our society ends up with more goods and services than if each person lived in seclusion. When someone specializes as an engineer, she generally produces only engineering services. She usually does not build her own house, car, or refrigerator. She trades her engineering services for those other goods. While the first trades were barters, where individual goods are traded, modern trades are conducted through money. Each person trades their services for money, and then trades that money for goods and services produced by others.

When two parties are located far from one another, or if the goods they trade are difficult to transport, another condition must be met for trade to be mutually beneficial: the transactions cost of trade must be sufficiently low for gains from trade to be realized. In our previous example, we found that Clan A gained two bushels of corn (without giving up anything) by trading with Clan B. This assumed there was no cost to trade. In many instances though, trading with other people does involve a cost. Clan A may have had to travel to trade with Clan B, and traveling certainly incurs a cost. Suppose this trade required that someone Clan A travel a distance to trade with Clan B. Suppose they needed a camel to carry the corn they were planning to trade, but must hire someone with a camel to carry the corn. If that person charges more than two units of corn, then it is not worth it for Clan A to trade. So long as that person charges less than two units, Clan A will gain from trade.

Other transaction costs include fees for entering other regions, tariffs, the risk of losing the export items along the way, or even the hassle of having to learn another language. The higher these transaction costs, the less trade that will occur. One reason nations trade with each other today in
volumes far greater than the past is that inventions such as the gasoline engine, better ships, and planes have substantially reduced the transaction costs of trade.

Trade between countries is admittedly more complex than trade between two clans, but even international trade is a fairly simply concept. We said that groups will generally find trade desirable if (1) the transactions cost of trade are sufficiently low (2) the groups produce different goods and clans prefer a variety of goods and/or (3) if each group produces a particular good at a lower cost. When the trade is between countries, we can add one more condition. If, when moving from no trade to trade, those who lose from trade must be compensated such that they allow trade to occur. The major reason countries do not trade is do to this last condition. The news media always makes a big deal about industries that are hurt by competition from foreign trade. This includes textiles for North Carolina and car manufacturing for Detroit. Some fruit and vegetable farmers were hurt economically by the passage of NAFTA when Mexican fruit and vegetables start coming across the border.

While the news always reports those hurt by trade, they seldom describe those who gain from trade. I imagine when the automobile began replacing the horse and buggy, the media reported sad stories on how those making buggies were being forced out of work. Aren’t you glad this didn’t prevent the automobile from being adopted? Those who benefit from trade include consumers who get either a higher quality item, the same item at a lower price, or both. Exporters also gain from trade; for example, much of US wheat production is sent abroad. One thing economists know for certain is that the gains from trade will almost certainly outweigh the losses. You saw this in our example of Clans A and B trading. The problem is that those who stand to lose from trade often possess political clout, and can prohibit international trade with that political clout.

Consider sugar production. Our government limits the amount of sugar that can be imported into the US. Let us just call this the “sugar program.” This means most of our sugar must be produced domestically, and since the US cannot produce sugar as cheap as other countries, we pay more for sugar than we would without the sugar program. This also implies that sugar producers get a higher price than they would without the sugar program. This means that Coke, candy, and anything with sugar costs more. Obviously, sugar consumers lose and sugar producers gain from this program, but consumers lose $532 million more than producers gain! Put differently, the losses to sugar consumers are easily outweighed by the gains to sugar producers, and it would be overall beneficial to eliminate this program.

Why don’t we eliminate the program then? The answer of course is politics. Sugar producers will lobby for the sugar program, but no consumer group will lobby against the sugar program. Sugar producers are willing to donate thousands of dollars to maintain their profits from sugar production. The profits were are divided among a few. But who among you--the sugar consumers--are willing to write to your congressmen urging them to eliminate the sugar program? Not a single one, because the losses of the sugar program are divided among many. Each sugar producer will give lots of money to keep the sugar program, while each consumer will not even write a letter. This is a case where those who stand to lose from eliminating the sugar program prohibit the free trade of sugar, and thereby hurt society.

To summarize, this section illustrates that societies under the right circumstances will trade goods and services with one another, and both groups will gain from trade. In other words, markets will develop. These “societies” may constitute individuals, clans, villages, states, or even entire countries. Trades between groups occur if (1) if the groups produce different goods and prefer a variety of goods and/or (2) each group produces a particular good at a lower cost. (3)
transactions cost of trading is sufficiently low and (4) if there are losers from trade, they
compensated such that trade is politically acceptable.

Moreover, these markets determine who produces and who consumes what. It is likely that early
civilizations traded frequently with nearby societies; they formed markets. However, much of
history reveals many societies where markets were few, and much of the decisions as to who
would produce what foods and who would consume what foods were determined by
governments. The next section describes the disappearance of markets in Europe during the
middle ages. The purpose is to give you an idea of what settings are not friendly to markets. The
next section also describes how markets started playing a major role in society after the end of
feudalism, and briefly describes where we are today.

1.2.3) The Disappearance of Markets and Rise of Feudalism (Source: Rider unless stated
otherwise)

Early civilizations soon realized that they needed more than markets for a well functioning
society; they also needed government and the military that comes with governments. People soon
realized that, instead of increasing their standard of living through trading with other people, one
could become richer quicker by conquering those other people, taking their possessions, and often
enslaving them. For thousands of years after this realization, there was less market activity and
more activity in building and protecting empires. For example, consider the Roman Empire.
Rome was ruled by emperors during its beginnings in 753 B.C., but by 509 B.C. became a
republic. Rome gained larger and larger wealth by conquering and many times enslaving its
neighbors, becoming bigger and bigger and ever more formidable. Rome was less concerned
about trading goods and services in markets, and more concerned with conquests. For many
reasons, the empire fell apart in 500 A.D., leaving large tracts of land vulnerable to attack from
Rome’s neighbors, such as the Germanic Barbarians, Muslim Arabians, and Nordics. Now,
people in the land formerly known as the Roman Empire were less concerned about trading goods
and services, and more concerned about protecting their lives from these invaders. The
transaction costs of trade became large enough to choke off almost all trade.

The Muslims were especially threatening, and presented a different type of warfare than
conducted in earlier times. The Roman Legion consisted mainly of infantry; the Muslims used
cavalry, which is a more expensive type of warfare due to the expense of training and maintaining
good horses and horseman. It is believed this simple fact caused feudalism in Europe. Only the
wealthy had horses, so only the wealthy could fight. Kings, who needed these fighters (often
referred to as vassals) gave them more land to fight in their armies. The poor who did not have
horses gladly subjected themselves, their liberty, and what wealth they had to the vassals for
protection. Quickly, society diverged into two societies: lords and serfs. If you had wealth to
fight in cavalries, you were free and a noble. You were called a lord. Otherwise, you farmed the
noblemen’s land, were servile, and called a serf.

The lords gained greater wealth and power, and society became very decentralized. Each manor
(an area of land controlled by a feudal lords) was basically self-sufficient. Exchange or trade was
not a way of life, because one did not wander very far from their manor. The lord directed all
economic activity within his manor, and gave the serfs what he felt was appropriate. There was
no voluntary exchange, but before you conclude this way of life was unfair to the serf, remember
that the serfs voluntarily gave up their freedom for their lord’s protection. Though some money
existed in the form of coins, exchange of money was limited because people rarely traveled
outside their manor, and capitalistic activity was simply not the social ethic. The only large group
of merchants where commercial activity was the norm was the Jews, who traded with East
Eurasia for incense and precious fabrics needed by the churches. They were also the only group who were allowed to charge fees for loans, as it was considered unchristian-like to charge interest on loans.

Religion, and the culture of feudalism, kept trade between people at a minimum. Life was guided more by religion and feudalism than markets. So far I have ignored developments in other parts of the world, partly because I know less about the history of these other cultures and partly because they are less relevant. It was Europe where the capitalism really developed on a large scale, and where markets increasingly guided daily life. The capitalistic way of life then spread from Europe to much of the world. Even China, who is currently a communist government, is becoming increasingly capitalistic. Thus, when we describe the history of capitalism and market economies in Europe, we are describing it for the rest of the world as well.

1.2.4) The Demise of Feudalism and the Rise of Market Economies

Major social changes were needed for Europe to switch from feudalism to markets. First, there had to be peace. If every time someone left the manor they were attacked, very little trade between manors would occur. Europe needed a reprieve from war before it could begin thinking about building wealth. There had to be a surplus of food production on the manors. Otherwise there would be nothing for those on manors to trade. If more food was produced than needed, the lords would likely try to trade this food for other goods. Given peace and safety to travel, lords would seek cities for these trades. Surplus food also implied there was more serf labor than needed. These serfs could be sent to the cities and produce nonagricultural goods. The serfs would trade these non-food goods for food. Finally, social customs had to change from one that encouraged the feudal system to one that encouraged markets and the seeking of self-gain. Serfs had to be allowed to trade and to seek profits. They had to become accustomed to using money and making their own decisions, instead of relying on their lords for their needs.

Between the 14th and 15th centuries, such changes took place. Foreign attacks were less frequent. Agricultural advances created ever more food from the same amount of work. Horses were substituted for oxen, after simple equipment such as horse shoes and horse collars were developed. Heavier and more effective plows were engineered. Also, the costs of transporting surplus food decreased as ships became larger and better constructed, sails started to replace oarsmen, and navigational tools like the compass were discovered. These developments reduced the transactions cost of trade and gave the lords something to trade. It was only natural that greater regional trade ensued.

Most of this trading occurred within cities, and to accompany the trades a new class of society rose: Merchants. The merchant profession was distinct in that there was a desire for wealth in spite of the fact that the Church condemned it. They did not possess the feudal mentality that pervaded the European countryside. The merchants created economic institutions which encouraged trade. Economic institutions refer to a set of rules in how activities are conducted. Our laws, court system, and enforcement of laws are all economic institutions that encourage economic activities. For instance, it is unlikely you would sell enter into contracts, such as labor contracts, if those contracts were not enforceable in court. By having economic institutions that enforce such contracts, both parties are more willing to enter contracts, and greater economic activity results.

The merchants created a consumer friendly atmosphere by creating special areas where certain products were known to be sold. Streets were given the name Bread Street and Milk Street so consumers could easily find goods they desired. Moreover, a set of laws and punishments were
enacted to ensure seller honesty. If a baker was found guilty of selling an underweight loaf of bread, he would be carried on a horse-drawn sled through the city streets with the loaf around his neck. If caught selling rotten fish, the seller would be publicly locked into stocks while the fish were burnt at the stock base. Have you ever wondered why there are 13 in a baker’s dozen? In the 15th century, bakers began selling rolls, buns, and cakes in dozens (12). Bakers soon realized they could cheat the customer by making each individual pastry smaller and smaller. At first, consumers couldn’t tell because they were sold twelve-at-a-time, making it difficult to see the size of each individual pastry when stuffed into a bag. Consumers eventually caught on though, and after complaining to officials, London lawmakers passed a law standardizing the weight of the goods to be sold. The penalty for selling less than this prescribed weight was stiff; they included substantial fines and even jail time. So to be absolutely sure they met the weight, bakers began throwing in an extra “thirteenth” pastry, and 13 began to be called a baker’s dozen.

The point is that the merchant class and society itself became more accustomed to the use of markets to distribute goods from producers to consumers. Merchants and governments steadily introduced institutions that would enhance the desirability of markets. Feudalism was still the social norm though, and norms do not die fast. The serfs had to be broken from their land, brought out from under their lord, begin thinking and working for themselves, using money, and accepting the uncertainties a capitalistic way of life brings. For society to accept the large serf population as independent entrepreneurs and wage earners, a revolution was needed. And a revolution came from a series of sources.

Great famines occurred in the 14th century causing thousands of deaths, mostly in the poorest sect—the serfs. This caused great unrest and dissatisfaction with the status quo among the serfs, resulting in numerous peasant uprisings that lasted into the 15th century. The Hundred Years war between France and England and a series of plagues (including the Black Death) placed further emotional and economic strain on its citizens, and greater dissatisfaction with the current system. This made them more inclined to a new way of life; in fact they demanded a new way of life. The uprisings associated with this dissatisfaction drew the serf class further away from the traditional feudal system, and closer to a more market-oriented approach.

The serfs eventually did become assimilated into a more market oriented way of life, and the cultural, political, and economic environment made markets increasingly desirable. As time went on, Western Europe became increasingly capitalistic, though all countries flirted with socialistic policies at times. America was capitalistic from its beginnings.

By the 18th Century, it was socially acceptable in America, and even encouraged, for one to try to better themselves by profit making. People sought wealth by producing goods at a lower cost, inventing new goods, or controlling markets. Moreover, people were allowed to do this without government interference. There was a new aura of creativity, innovation, and work ethic that lead to great increases in economic activity. It produced the entrepreneur; and the Industrial Revolution as well. Compare this to China, where at least historically, where you are strongly encouraged to follow in the footsteps of your father, and not try to surpass him in terms of living standards (Williams). Given this, is there any doubt that America is the home of mechanical invention and higher living standards, and China is not?

The Industrial Revolution began when entrepreneurs realized that could produce masses of goods at a lower cost by centralizing production in factories and matching labor with more machinery. Goods were produced at a lower cost, prices fell, and the old traditional production practices now became unprofitable. Now, to compete you had to build a factory. Large portions of the population moved from rural to urban areas to work in these factories. The entrepreneurs raised
lots of capital, engaged in risky ventures, and made lots of money. Granted, some groups suffered under the Industrial Revolution. The lower working class worked many hours in tedious and dangerous jobs. Children in particular suffered from this new way of life. These abuses would induce Karl Marx to write *Das Kapital*, the intellectual foundation for communist systems formerly employed in the USSR and currently employed in China. Let us not overlook all the industrial revolution gave us though. New technologies and production methods were developed that resulted in our high standard of living today. The realization of what industry had to offer also gave us a whole new appreciation for markets and capitalism; so much that a new philosophy developed.

This new philosophy is called *laissez-faire* and states that society obtains its greatest level of welfare when governments stay out of peoples way and allow markets to govern the production and consumption of goods and services. Adam Smith, the founder of economics, introduced this philosophy in his seminal book *The Wealth of Nations*, published in 1776. It is interesting that the first and greatest book to be written on capitalism, and the country that best exhibits the benefits of capitalism, began the same year.

Before Adam Smith, most social thinkers believed that society was best served by a benevolent dictator; someone who exerted absolute control but acted to create the greatest amount of happiness in her subjects. Adam Smith argued that society is best served by allowing individuals to pursue their self-interests. Every individual in pursuing her own best interests is led, as if by an “invisible hand”, to the greatest good for all.

To illustrate, consider beer, the foundation of every man’s happiness. What if, for some reason, society decides it wants more beer? What if society would be happier if it had more beer, that it is willing to give up some of other goods to get more beer? A benevolent dictator upon hearing her subjects would certainly devote more resources toward beer production and would distribute the extra production to the people who want it most. The dictator would decrease production in some areas like food or cars and use that free labor and capital to produce more beer. It would keep decreasing production of other goods and increasing production of beer until society was again satisfied.

If society all of a sudden decided it wanted more beer, and were willing to give up other goods to get more beer, how would markets respond? If people want more beer than is currently produced they will bid up the price of beer. Beer producers are now making more money, so the existing producers produce more beer and new beer producers enter the market. Consumers are now buying more beer at a higher price, so they must be consuming less of other goods. If the consumption of other goods falls then production must as well. Here, we get the exact same outcome as the benevolent dictator. Society wanted more beer at the expense of other goods, and the market gave it to them. The process of consumers bidding up prices and firms producing more in response is what Adam Smith referred to as the “invisible hand.” He further argued that since markets produce the best outcome, government interference could only reduce societal welfare.

This philosophy has undergone many changes, but much of what Adam Smith argued still remains. We learned that markets serve us well in some circumstances, they fail us in others. We then learned to identify when markets work and when they don’t. As time went by, this philosophy became economics. Were it not for the demise of feudalism, the Industrial

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7 Laissez-Faire is French for “let things along.”
Revolution, and Adam Smith, we might not be studying economics right now (as the students reply: Damn that Adam Smith!).

This section has left out the history of much of the world. Africa, Asia, and Island nations were not discussed. This is for two reasons. One is I know less about these regions. The second is that they are less relevant. It is the market oriented society that developed out of Western Europe that we live in today, and that society is the envy of most of the world. This course is about markets, in particular, agricultural markets. The purpose of this chapter is to illustrate how agriculture began, why groups (including countries) trade, and how economics came to be.

Reasons why markets go out of fashion were also explained. Hopefully, you have gained an appreciation for markets and the conditions necessary for effective markets to thrive. Markets require institutions. They require a government that informs consumers and protects them against sellers. Markets require an efficient court system that allows people to place faith in contracts; faith in contracts enhance trades because both parties to the contract feel more comfortable. Markets are a way of allocating society’s resources that is essentially “hands off” by government. Isn’t it ironic, then, that markets require economic institutions, and economic institutions can only be provided by government. **Effective markets require effective government.**