Chapter 7. COMMERCIAL/INDUSTRIAL SOCIETIES

I. Introduction

A. Background

We are presently in the midst of one of the major technical revolutions in human history. The rise of "modern" societies during the last few centuries is the capital fact of recent history. The last five hundred years have witnessed technical changes of unprecedented scope and rapidity emanating from a small and heretofore unremarkable part of the world, Western Europe. In this Chapter we will try to put our finger on just how these societies differ from non-modern ones. In Chapter 28, we will return to some of the evolutionary issues involved.

By one useful definition, commercial and industrial societies are those with less than half of their population engaged directly in agricultural production. As usual, this definition has an arbitrary element, but it marks out those societies with a mostly urban character for special attention. Perhaps the most important point is that these societies, in contrast to the agrarian or horticultural type, are not dominated quantitatively or qualitatively by people with a direct interest in food acquisition. In these societies merchants and manufacturers are typically the dominant class, as opposed to land-owning lineages, chieftains, or aristocrats with a direct interest in agriculture as is the case in horticultural, agrarian, and pastoral societies.

Should we separate or join commercial & industrial subtypes? Occasional societies in the classical period, such as some of the Greek city-states, subsisted mostly on maritime-trade rather than agricultural production. (Only a maritime location could permit this specialization because only ships could reach far enough economically for grain under classical technology to support a society with few farmers). As we briefly glimpsed in Chapter 6, these rare societies are interesting because of their very modern looking character in some domains of social and political organization, and in other aspects of culture. They are the "precocious" counterparts to the "backward" pastoralists. These were ancient complex societies with widespread literacy, a large class of politically active citizens, republican—even democratic—political institutions, a talent for rational philosophy and science, and so forth. Such societies disappeared after a few centuries as the classical agrarian empires conquered them. They had a brief and ephemeral existence until the rather sudden emergence of early modern societies and the age of European dominance beginning about 1500 AD. Why did these heretofore hothouse flowers of agrarian history suddenly muscle on stage to become the dominant technological type?

Why has progress to industry and science been smooth this time—but not before? Many authorities, Lenski and Lenski are typical, make the taxonomic break between agrarian/commercial and industrial societies, and stress the improvements in production technology associated with the Industrial Revolution, beginning around 1800. Others, typically historians like McNeill, make the main break between classical and modern societies at the time of the Renaissance, around 1500. After a lot of reflection, we've adopted the historian's division in preference to the sociologist's. It is a judgment call, but it seems to us that the "Rise of the West" is a smooth trajectory from 1500 onwards and that the Industrial Revolution, as impressive at it is in some ways, is a natural outgrowth of several centuries of development. This taxonomic decision, while quite arbitrary, does have the virtue of highlighting the puzzle of why a particular set of maritime commercial societies led to such advances after many Classical Period examples flashed so brilliantly and vanished. This is a genuine puzzle, and if a taxonomy prevents it from being swept under the progressivist rug, so much the better. Why did Venice spark the Modern Era when Athens didn't?

A compromise taxonomy, perhaps, would entail dividing the type into simple and complex sub-types, commercial/ industrial societies, much as we have done with horticultural and agrarian societies. This scheme permits a focus on both the similarities and differences between the subtypes. In this Chapter, we aim to lay out enough of the data for you to make your own choice.

B. History

The first glimmerings of the commercial and industrial revolution can be seen in the Mediterranean city-states of 1000-1500 AD. As European societies developed during the Middle Ages, classical knowledge was reacquired from scattered sources, especially the Arabs, and a new series of maritime commercial societies developed again in Europe. The initial developments were centered in Northern Italy, in the city-states of Venice, Florence, Milan, and Genoa and nearby Barcelona. Venice turned out to be the single most important of these in terms of economic developments (McNeill, 1974), while Florence was the intellectual leader. Venice and her sisters linked the whole Mediterranean world with trade routes. Long, tenuous trade routes linked these routes in turn to the Orient, over which a number of key innovations diffused from China (paper-making, printing, the compass, gunpowder, silk-worm raising). Other areas contributed innovations in ship-building and these cities were themselves the center of the Renaissance, whose early scientific advances and general rationalism led to innovations of their own.

By about 1500 a few of these city-states probably met our definition of having half of their populations engaged in non-agricultural pursuits and became commercial societies. (Exact estimates of the ratio of rural to urban population are lacking as far as we know, but it is certainly true that these small states were highly urbanized, imported much food, and were centers of trade and manufacture to a degree quite unlike typical agrarian states.) From the Mediterranean, the innovations adopted and pioneered by the Italians spread to Northwestern Europe. From this time onward, the development and spread of transport and manufacturing technology was rapid and continuous, and the hegemony of European ideas and peoples became global. A Genoese entrepreneur, Christopher Columbus, turned the skills of the era into the discovery of the New World, which is a convenient historical marker for the emergence of the West.

The culminating development, still in progress, was the development of industrial technology, the application of mechanical sources of energy to an ever increasing number of production problems. By about 1800, the agricultural population of Britain had sunk to about 1/3 of the total. By mid-l9th Century, all the countries of Western Europe, plus the U.S. had more than half their populations in non-farm occupations. Even today, the industrial revolution is far from complete in two senses. First, only a minority of the World's people today live in industrialized societies by our definition (although most predominantly agrarian societies have a significant industrial sector). Second, industrial advances still go on, at an accelerated pace if anything. Of course, there is no guarantee that the industrial revolution will ever be complete. Nor, on the other hand, is there any guarantee, as we shall see in Chapters 22 & 23, that its accomplishments are permanent. The rate of environmental deterioration caused by industrial development may (or may not) exceed the rate at which technical innovation can make good the damage in the long run.

II. Technology

A. Commercial Innovations

The key initial development of commercial/industrial technology was a cheap means of seaborne transportation. The improvement of sailing ships to 100+ tons was, in hindsight at least, one of history's most pregnant developments. All-weather, seagoing vessels that could navigate the length and breadth of the Mediterranean and carry on a trade with Northern Europe were available by about 1300, according to McNeill (1974). (See figure 7-1.) Some of you may have visited replicas of such vessels. They quickly evolved into vessels that could sail the open Atlantic. Using these 100 Tonners, Columbus crossed the Atlantic in 1492, and Magellan circumnavigated the globe in 1519-1522. Samuel Elliot

Figure 7-1. “A Flemish version of the machine with which the {European mariners} changed the world: the three-masted ship, square-rigged on the foremast and main-mast, lateen-rigged on the mizzemast, with smaller vessel in sight” (Crosby, 1986: Plate 2).

Morrison (1974) gives a classic, admiring account of the Voyages of Discovery.These ships are tiny and primitive by modern standards, but huge and sophisticated by any earlier comparison. Combined with navigational aids like the compass and ship mounted cannon, reasonably reliable long distance maritime trade could be initiated, and in the 16th century, Europeans used them to build direct global networks of commerce. Columbus, Vasco da Gama, Drake, and their cohorts were the first to demonstrate how far European technology had outstripped the rest of the world. Long-distance trade was largely for high-value per unit weight products like spices, precious metals, dyes, slaves, and sugar. But in the vicinity of Europe, there was extensive trade in much more mundane bulk products such as grain, cloth, dried fish, and timber.

Other technical innovations besides ships appeared quite early in Europe. For example, water power was developed early on in the late Middle Ages for grinding grain. Various other bits of technology were acquired or invented at a steadily increasing rate as the modern era gathered momentum.

B. Industrial Innovations

Industrial innovation began in the late 18th century. The application of inanimate energy to basic production processes on the farm and in the shop dramatically increased the productivity of labor in such a broad variety of occupations that many large societies were able to make the transition from the agrarian to the modern type. By contrast, commercial societies without industry are inherently dependent on low productivity labor in other societies and for food and raw materials. Trade may make a few small societies relatively modern, but only industrial production can permit large proportions of the world's population to leave the farm.

Transport continued to improve with the application of industrial technology. Technically the sailing ship is an industrial machine. The application of more powerful sources of inanimate energy--coal in the early stages of the industrial revolution--to propulsion led to steam vessels, railroads, automobiles, and aircraft. The early commercial societies were limited in scale because bulky commodities like food could be moved economically only relatively short distances (e.g. Sicily to Venice). After the application of industrial technology, transportation costs fell dramatically, so that the wheat market became global. The first agricultural boom of California's Central Valley and in Australia in the 19th Century was based on the export of wheat to Europe from these then-remote regions in advanced iron-hulled sailing vessels.

C. Other Technical Innovations in the Commercial/Industrial Period

Agricultural innovations swelled the stream of labor to cities. For any significant number of societies to develop past the agrarian type, large numbers of people had to be able to leave the farm and enter other occupations. Innovations in European agriculture that began in the Medieval period (see last Chapter) were followed by other technical improvements in agriculture, such as livestock breeding, legume rotations, winter forage crops for livestock, and the import of new crops, especially potatoes and maize from the New World. Industrial technology was rapidly applied to agriculture in the form of new implements (seed drills, threshers) and later mechanical tractors.

Once people left the farm, they were drawn into first craft and later manufacturing occupations of a quite awesome variety. Cloth manufacture, spinning, weaving and dying, absorbed large numbers in England and the Low Countries, for example. Mining, metal-

working, building, and glass- and paper-making were among the early ones. These trades had widely varying rates of technical improvements. Mining was well advanced in Germany before 1500 and German techniques allowed the exploitation of vast quantities of precious metals in the Spanish New World during the 16th and 17th centuries. Mining, metalworking, and textiles were among the first industries to experience industrialization. The beginning of the industrial revolution is often dated to the application of steam power to run a rotating engine (1775) or running thread-spinning machinery (1785). The magnitude and variety of such changes is vast, and we must be content with a small sketch here. (A series of tables of key industrial innovations is given in Tuma, 1971).

The development of industrial technology is to this very day quite uneven. Some occupations are still hardly industrialized at all. The building trades are still relatively primitive, involving substantial amounts of hand labor. We teachers still lectureto *relatively* small groups, much as the ancient Greek philosophers did. Students still spend endless hours reading books and doing exercises by hand. Mass produced education seems technically feasible (nationally televised lectures, etc.), but the customer seems to want a live body up here in front of the class. We don't lecture to any greater number of students than Plato or Aristotle did, while movies and music play to millions. Why are we satisfied with industrial entertainment, but not industrial education?

D. Information Processing, Literacy, and Technological Innovation

The management of industry and commerce requires considerable improvements in information processing to be successful. The development of printed books, the spread of literacy, improved mathematical skills, and the like are one of the hallmarks of commercial/industrial societies. The Italians developed such innovations as double-entry bookkeeping and celestial navigation (for latitude only) before 1500. Mail services, banking and credit institutions, and the like were also very early. Clocks, telephones, computers and so forth were added to this repertoire as technology improved.

III. Demographic Consequences

A. European Population: Growth Followed by the "Demographic Transition"

From 1500 onwards, European populations increased steadily, especially counting the outflow to and increase in the New World. However, until the Industrial Revolution the rates were modest, ca. 0.5% per year. During the 19th century rates went up to 1.5% for substantial periods of time.

Towards the end of the 19th century, rates fell again, an episode demographers call the "demographic transition". We will cover these phenomena at more length in Chapter

16.

B. Industrial Achievement: Technological Progress Outruns Population Increase

It is interesting that general increases in per capita incomes did not result from the improvements in technology until the Industrial Revolution. From 1500 until 1800 improvements in technology in European societies were absorbed by a rising population and the average individual was hardly if any better off (the "Malthusian" model, see Chapter 15). Only since the Industrial Revolution have living standards for the mass of people improved substantially. Despite rapidly growing populations, technological improvements have more than kept pace in the industrial and industrializing societies. This is an unprecedented development as far as we know, and is one of the best reasons for making some sort of distinction between industrial societies and all other types.The attached graphs give some feeling for these differences. Figure 7-2 shows how prices rose during the 16th century, and how wages actually fell. This was a period of population increase. (The inflation index is obtained from historical records of the prices of key commodities, and builders' wages are used as a surrogate for general working-men's' wages. Of course, modern economic statistics are a product of the 19th and 20th centuries, so economic historians have to be content with more or less good proxies for the more distant past. Taken from Tuma, 1971.) Figure 7-3, prepared by Peter Lindert of the U. C. Davis Economics Department, shows some comparative statistics for the period since the beginning of the Industrial Revolution. Note that on Lindert's graph, a straight line is exponential growth. Thus, by contrast with an advanced agrarian/commercial society like 16th-18th Century Europe, many 19th and 20th Century industrial societies have managed exponentially growing incomes per capita, even in the face of rapid population growth. Still, it is easy to imagine that this is a temporary aberration, and that per capita consumption will cease rising at such rates in the relatively near future (as it almost certainly must at some point).

C. Extreme Urbanization

Improved transportation, declining requirements for labor on the farm, and the demand for large concentrations of workers promotes the growth of cities in commercial and especially industrial societies. Only among such societies can the majority (today it is the vast majority in the advanced industrial societies) live in urban areas. Many of the consequences of commercial and industrial technology are a by-product of the urbanization of the bulk of the population. Cities are inevitably "sophisticated" places with a quite different impact on social organization that rural homesteads and villages. A complete course in human ecology would devote an entire lecture to the phenomenon of urbanization.

Figure 7-2. Builders' wages and the cost of living: five-year averages. (Source: *Cambridge Economic History of Europe, IV*. 1966:482-483.)

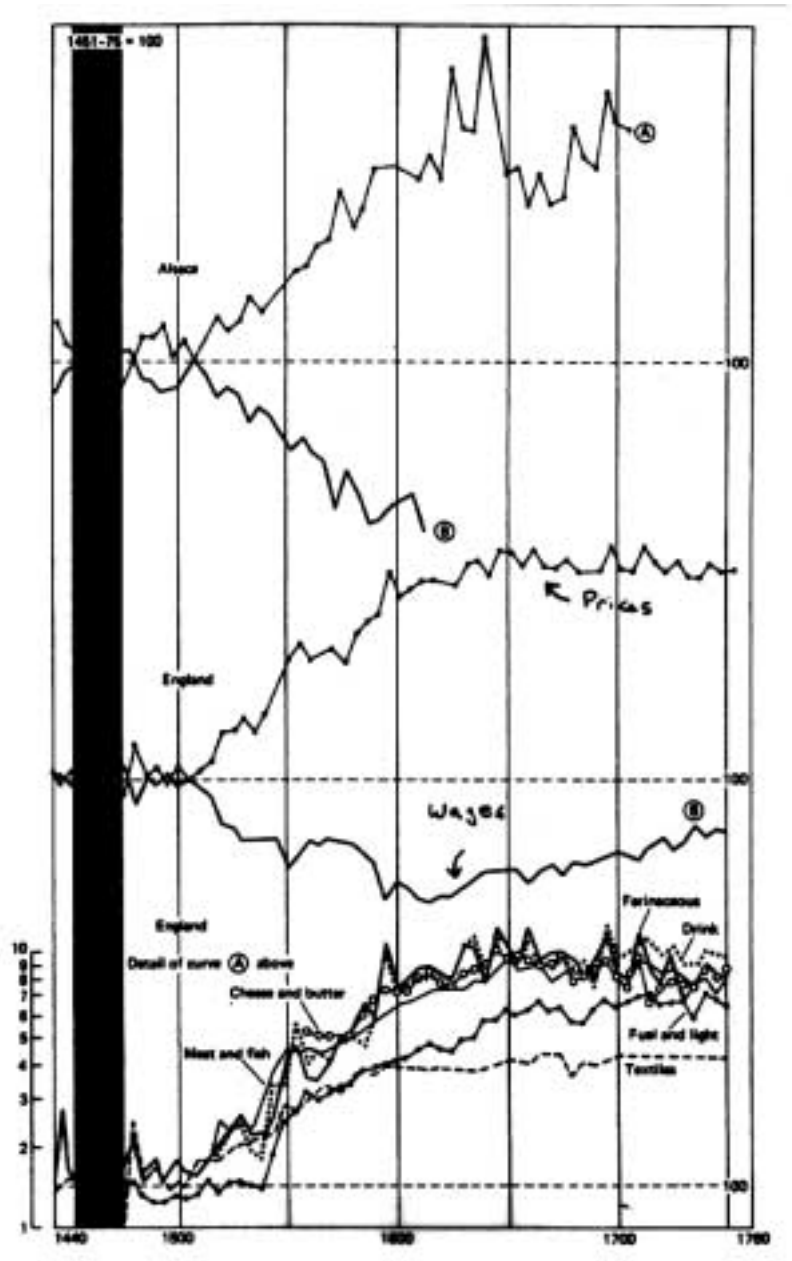
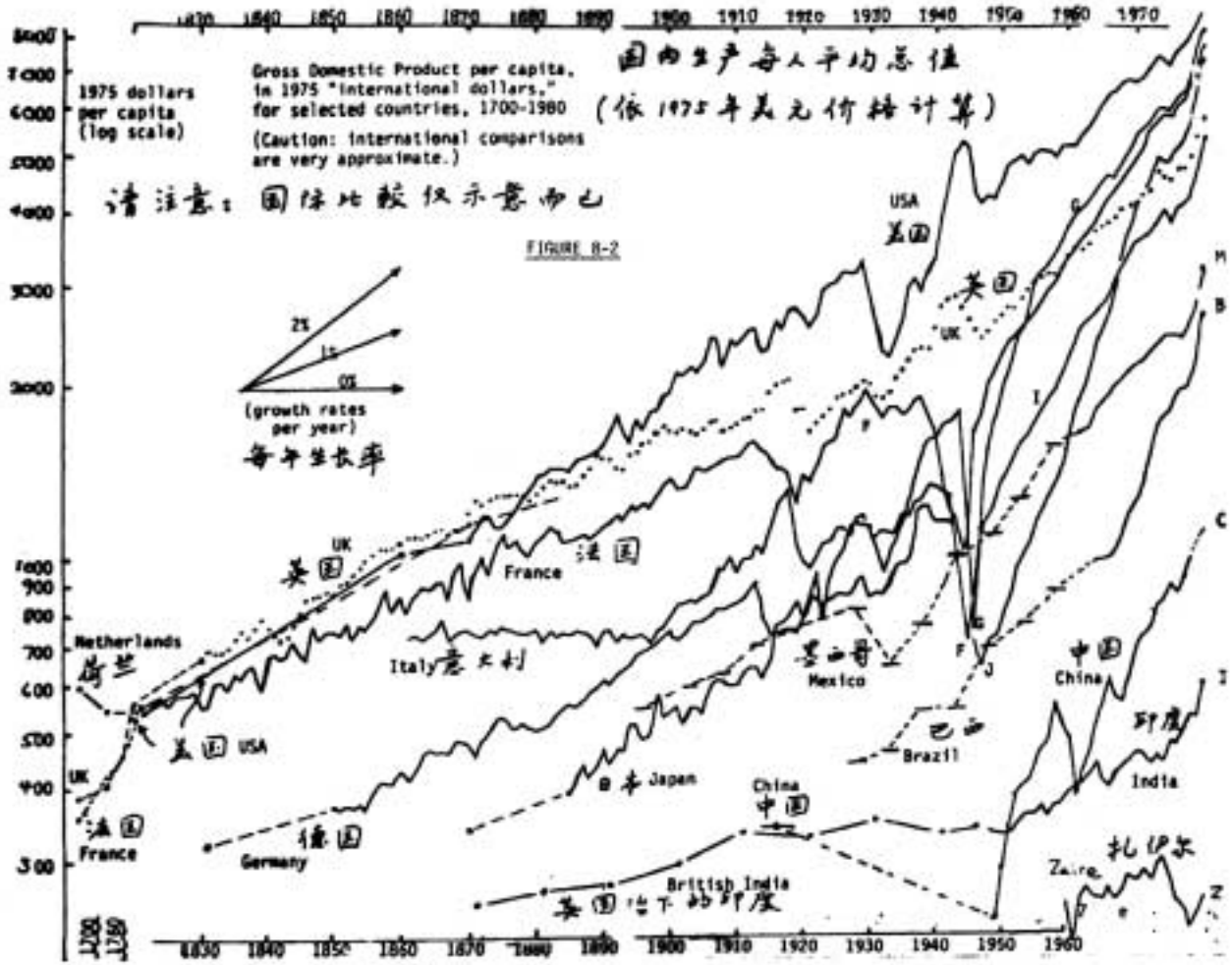


Figure 7-3. Gross Domestic Product per capita for selected countries, in 1975 “international dollars,” 1700-1980. Caution: International comparisons are very approximate. (Source: Peter Lindert, Economics Department, U. C. Davis.)



IV. Social and Political Organization

A. Social & Political Organization Transformed

The degree of occupational specialization increases dramatically in commercial and industrial societies. These are the societies that take maximum advantage of the virtues of the division of labor. Named occupational specializations expand from a few dozen in advanced agrarian societies to thousands in industrial ones. Furthermore, the vast majority of the population has withdrawn from primary production to the extent that trade for food and other essentials is a requirement for life. This confronts industrializing societies with an enormous organizational problem. Thus the trend we have been observing continues: Kinship continues to decline relative to other institutions as a means of social organization, and the importance of bureaucratic forms continues to grow.

B. Social Structure—Dominance by Achieved Elites

The social structure of commercial and industrial societies is quite unique in the numerical predominance of a middle class based on achievement. The subdivision of society into a governing aristocracy and a peasant mass, with a small artisan and professional class, is typical of agrarian states. Elite status is typically ascribed (by birth), and in the case of caste and caste-like statuses like slavery and peonage, many other statuses may also be ascribed. In commercial and industrial societies, the artisan and professional groups rise to numerical and political dominance, and these statuses generally are relatively open to anyone who aspires to them. Status tends to be achieved rather than ascribed. (This is not to deny the existence or importance of ascription and prejudice in these societies.) In the classical case, this lead to the liberal capitalist democracies of Western Europe and the USA, in which there is more or less open competition for political influence among many contending interest groups. Even in the pre-industrial commercial societies like Venice and Holland, the ascribed agrarian nobility was dominated in government by the achieved business and commercial community. Often, such societies were Republics.

This is an “organized chaos” way of running a state with a certain parallel to markets. There is free competition for political leadership that has a certain primitive flavor to it (recall the bigman system that is common in horticultural societies). In modern one-party states things are quite differently organized, but still the same general dominance of people with “middle class” backgrounds is apparent, and careers in the Party are open to talent. The old elites based on landed wealth and ascribed membership in the aristocracy have declined to near ceremonial significance (e.g. Britain) or have vanished entirely (USA, imperial Russia) in favor of an achieved “aristocracy” based on entrepreneurship in politics, bureaucracies, and business.

C. Markets & Bureaucracies—Mechanisms of Redistribution

Societies with strong market-orientation are usually the most dynamic. Having many specialists means that there must be an extension of trade or sharing so that each specialist can acquire all he/she needs to survive and prosper. Two major mechanisms are used in varying proportions to manage the redistribution necessary, markets and bureaucracies. Historically, the most rapidly developing and dynamic commercial/industrial societies have relied disproportionately on markets. This is true of the Italian city states, the Low Countries, England, the USA, and the currently dynamic East Asian countries during the periods of their leadership. Countries that have emphasized state controls of the economy have generally not developed as fast, for example Spain and France in earlier periods, many contemporary Latin American countries, and the communist USSR. In many of the most dynamic commercial/industrial societies, the state does play an important role in promoting business, quite unlike the *laissez faire* model, however. Venice was an old example, and Japan is a modern one. The struggle between more market and more state-oriented notions of how development (and in detail, just what government and markets ought to do) ought to proceed still furnishes high political drama in China under Deng, in the former USSR, and in Britain under Thatcher and Major—not to mention the USA under Bush and Clinton!

Markets have pluses and minuses. Two market-oriented issues are particularly relevant to our discussion: (1) the economist's hypothesis that competition spurs technological innovation; and (2) problems with cooperation and coordination that accompany the development of markets. Markets promote economic efficiency through the effects of competition; any of you who have had Economics 1A know the argument. In a well-functioning market buyers and sellers can convey information about their wants through the price mechanism more efficiently than by any other means. Markets also make laggards in the use of new innovations pay a relatively swift penalty and sometimes very richly reward innovation and other forms of entrepreneurial risk-taking. On the other hand, markets are rather anarchic and prone to all sorts of problems including failures to supply *public goods*[1], unscrupulous manipulation, panics and crashes (e.g., October 1987 stock market crash), an insensitivity to the distribution of income (the fairness question of F. Mondale in the 1984 Presidential election; Bush's pledge of a kinder, gentler America, Clinton's "change" theme), etc. The very dynamism of markets often means that the pace of economic change is much greater than many would desire; just the stress of a decline in income because your business or industry has become outmoded is a significant drawback. The devil-take-the-hindmost flavor of market competition is not to the taste of the hindmost at least! Last year

1. Goods like public order, national defense, and clean water whose use everyone shares.

IBM and Sears were among the giants that fell in stature. (See Dahrendorf, 1968, for a classic discussion of this dilemma.)

Bureaucratic management has pluses and minuses. The optimal market/bureaucracy mix has been endlessly debated. All commercial and industrial societies have found a more or less elaborate state management of economic affairs necessary. Empirically, the pure free market system is a figment of a few economists' imaginations. At the very least a fairly elaborate set of state institutions must ensure "fair" markets, manage a currency, conduct foreign affairs, secure public order, and the like. Almost all have gone much further, conducting income redistribution schemes to relieve the worst excesses of the maldistribution of income, through poor laws and relief for example. Often they have acted to preserve the economic privileges of powerful groups who would lose out in market competition. This is most frequently felt to be fair when the competitors are foreigners, hence tariffs, immigration restrictions, and the like.

Both market and bureaucratic run economies have had to develop organizational innovations to cope with the increased scale of economic activity, and the distribution necessary to support the extreme division of labor. Governments have expanded bureaucracies and rationalized their operations with increasingly detailed laws and regulations. Businesses have long used the joint stock company to organize larger ventures than is possible with the capital of one or a few individuals. As a result of these arrangements private corporations are often as bureaucratic as the government bureau proper. Multinational industrial corporations use bureaucracies on the scale of small states to coordinate the manufacture and sale of complex, capital intensive products in international markets.

D. Political Fragmentation

International conflict is one problem that commercial/industrial societies have not been successful in solving. Thus far, no one state has been able to dominate the others; the analog of the great civilized empires of classical agrarian societies has not arisen. We might expect that cheaper transportation and communication, together with gross disparities in development between societies, would have led to a single worldwide industrial empire. The European colonial empires of the past were perhaps a start in this direction, but the Europeans themselves were never united. Rather, the European states, and more recently the US, Japan, and China, have competed intensely among themselves for wealth and influence.

Many states have tried to construct a united empire in Europe. This began with the medieval popes' failed attempts to set up a politico-religious empire on the Roman plan, the Holy Roman Empire. Then Philip II of Spain tried and failed to conquer England and

dominate France in the 16th Century. Then the French tried, most conspicuously under Napoleon. Then the Germans tried it several times, 1871-1945. Britain built a huge extra-european empire in the 18th and 19th Century, but never attempted to unite Europe itself. Since WWII the US has run a sort of empire in collaboration with the Western Europeans (the NATO Alliance) and it has a shaky sort of global dominance since the collapse of the USSR.

In every case so far, the European tendency for all states to collaborate to defeat the strongest has been successful. The balance-of-power politics of the contemporary world is very much on this model (e.g. the complex shifts of Chinese policy in the post WWII period to try to ensure that neither the USSR or the US could entirely dominate to modern world). Played well (1814-1917) this works well enough. Played badly (1789-1812, 1914-18, 1939-45) it leads to severe wars. Nowadays, improvements in military technology are of such a scale that we must play it very well to avoid catastrophe. One hopes that this will provide sufficient motivation to encourage new innovations in political institutions. Neither the League of Nations nor the UN have filled this role very effectively. The 1991 Persian Gulf War was perhaps a step in the right direction, but recent events in the former Yugoslavia remind us of the lack of reliable effective institutions at the international scale.

One of the biggest single blows to the 19th century idea of progress and progressive evolution is the fact that the international institutions that seem necessary have not shown any signs of arising naturally during the 20th century. Indeed the present anarchic international structure of the world strikes one as a "primitive" feature. In a progressive world, such as some social scientists still envision, we could depend on some natural force to correct the situation, but they have not. WWI and WWII sharply dimmed the touching faith in progress that Europeans had inherited from their Victorian ancestors. We are presently stuck at a most dangerous point, a far more sophisticated technology than our political institutions are capable of controlling without the real threat of awesome catastrophe to make us pay attention. This is more reminiscent of the ***undirected*** Darwinian sort of evolution than the smooth progress of Spencer (see Chapter 9).

V. Other Aspects of Culture

A. Rationalism (Science, Business, Ideology)

Perhaps the most striking trend has been the development of rationalism. While the old religious ideologies of agrarian states have survived, their influence has been considerably reduced. In part these modes of thought have been replaced by a rational, scientific, attitude toward life. Indeed, it is likely that the development of science, entrepreneurial

business and technological progress are closely related in that they require similar individual independent thinking, a suspicion of traditional practices, and a calculating approach. Certainly, the developments of mathematics have been applied to most fields of modern endeavor. This is particularly conspicuous in the modern period when new technologies are developed in a few decades from ideas generated on the frontiers of science (the chemical, electronics, and military hardware businesses are good examples). Before the industrial revolution, the coupling was much looser but even then, mathematics and physics were applied to such problems as navigation and ballistics quite early. A strong, but controversial case has been made for a close coupling between science and industrial innovation during the early stages of the industrial revolution by Mussen and Robinson (1969).

Nevertheless non-rational ideologies remain, often dressed up as rationalism. Nationalism and various political ideologies are becoming increasingly important, often buttressed by religious beliefs. Science offers no answers about the ends of human life, only explanations of a cause and effect kind and prescriptions about means to reach ends, so an ample field for other kinds of ideological and theological systems remains. Pat Robertson, the Ayatollah Khomeini and 'fundamentalists" of many different hues illustrate the kind of reaction to the secularism of modern society that is possible, and one wonders if the maintenance of modern society would be possible under such leaders in the long run.

It is interesting that rationalism has such high prestige in the modern world that ethical systems and non-rational belief systems are often dressed up in rationalist garb. Thus, we have Christian Science, Scientific Socialism, Creation Science, and Scientology.

B. Child-Rearing Styles

Modern middle class child-rearing styles resemble those of hunters and gatherers more than they do those of the peoples of agrarian states. The stress is once again on relatively relaxed discipline, and on the encouragement of independence. In some ways the demands of middle class roles for individual self-reliant action seem to be similar to those of hunters and gatherers, despite vast difference in technological complexity.

VII. Gradient Test

The gradient test is not so simple to apply in the case of variations in commercial/industrial societies. Trade reduces dependence on the local environment. As noted in the last chapter, trade greatly reduces the direct impact of environmental variations on the technical form of societies by internalizing, but not necessarily eliminating, the effects of environment on society. Thus, we see relatively resource-poor nations like Britain and Japan develop industrial societies before their better endowed neighbors, such as Russia and Chi-

na. As always, the historical factor plays a role. European societies evidently had some factor that gave them a head start on the development of commercial and industrial societies, a question we will address in Chapter 28. Trade allowed early industrial societies like Britain to leap ahead by acquiring the resources it lacks from others.

The most conspicuous gradient is probably more historical than truly ecological. There is a strong pole to equator gradient in degree of industrialization of contemporary societies. Even within single nations like the US or Italy, the North is comparatively rich and the South comparatively poor. In South America, the richest countries are in the temperate Southern Cone, and the poorest are tropical. Most likely, this is a result of industrial technology having first developed in the North Temperate zone. People and technologies spread most rapidly to relatively similar environments, and diffuse more slowly across environmental gradients (Crosby, 1986). For example, the Southern Cone countries of South America are mainly European derived, whereas tropical American populations have more Native American and African immigrant genes. What are probably much more important than the genes are the ideas about technology and social organization that the immigrants brought with them; it is easier to apply technology invented in the temerate zones by people used to living in temepate zones in New Zealand and Argentina that in New Guenea or Colombia. There does not seem to be any reason why, in the long run, the tropical countries will not become as industrial as the temperate ones.

It is important to realize that environmental effects still play a large role in commercial/industrial societies. Transportation routes and the location of resources frequently affect the development of cities. Large cities are very frequently on the seacoast or navigable rivers for example. Competition for raw materials has long affected political calculations in these societies. For example, the early maritime commercial cities like Venice had to take great care not to be cut off from the grain-growing regions on which they were dependent for food. Eventually, the societies facing the bigger puddle (the Atlantic) sprang ahead of the societies limited to the Mediterranean. The fortunate oil-producing states have political and economic power directly related to their lucky endowment of resources. The existence of commerce and industry alters and complicates the impact of environmental variation, without necessarily reducing its fundamental importance. In a later Chapter, we will also consider the potent effects that industrial societies especially can have on environmental processes.

As bulk transportation becomes cheaper, electronic communication exceedingly cheap, and global trade more important, all of the World's societies are increasingly being drawn into a common production system with an extensive regional division of labor. At

the present time, this system is evolving extremely rapidly to the accompaniment of explosive population growth, great disparities of wealth and power, and large environmental impacts. In the midst of such great changes, it is exceedingly difficult to discern what the commercial/industrial adaptation might look like near equilibrium!

VI. Conclusions

The development of modern commercial and industrial societies saw the most sustained technical change in the whole human record and caused a transformation of culture core variables. This revolution took about a millenium to accomplish.[2] However, since it is the latest technical revolution, it is by far the best recorded, and thus makes a good one against which to test theoretical models.

But it certainly leaves a lot of puzzles. Why was Europe the locus of such changes, instead of China (the source of many key innovations), or the Islamic societies that transmitted classical knowledge and Chinese innovations to the West? Why didn't the commercial/industrial revolution start far earlier? Is there any obvious reason why the sophisticated civilization of the classical Mediterranean societies could not have embarked on this path 2,000 years earlier? Why is it spreading at different rates in different societies today? What role did environment, evolutionary processes, and chance play in the Drama? The rest of the course will be devoted to trying to pose these kinds of questions about the evolution of human societies in a more rigorous way and to (at least) formulating useful hypotheses to answer them.

VII. Bibliographic Notes

References:

Crosby, Alfred W. 1986. *Ecological Imperialism: The Biological Expansion of Europe, 900-1900.* Cambridge: Cambridge University Press.

Dahrendorf, R. 1968. *Essays in the Theory of Society*. Stanford: Stanford University Press.

McNeill, W.H. 1974. *Venice, The Hinge of Europe 1081-1797*. Chicago: Univ. of Chicago Press.

Morrison, S. E. 1971, 1974. *The European Discovery of America*, New York: Oxford University Press.

Mussen, A.E. and E. Robinson. 1969. *Science and Technology in the Industrial Revolution.* Manchester: Univ. of Manchester Press.

Tuma, E. 1971. *European Economic History.* New York: Harper and Row.

2. Its roots were in the spurt of technical progress in China 1000-1500 AD, and in the recovery of the West from the Middle Ages 1000 AD.

General notes:

Much modern social science is, of course devoted to industrial societies. In terms of social organization, a good textbook on sociology is a place to start (e.g. Lenski and Lenski). Relatively little conventional social science work is written with the broad evolutionary and ecological questions of this course explicitly in mind.