Chapter 19. DIFFUSION OF INNOVATIONS

> "I have never learned to accustom myself to innovations, and I fear that above everything else, for I know full well that in making innovations, safety can in no way be preserved."
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> Proctus—Advisor to Roman Emperor Anastasius

I. Introduction

A. Definition

The concept of diffusion of innovations usually refers to the spread of ideas from one society to another or from a focus or institution within a society to other parts of that society. As is typical in this series of lectures, we will concentrate on particularly dramatic cases of diffusion between societies to illustrate the main processes. Many of the same principles will apply to the spread of ideas within a society. The value of extreme examples is that they often reveal processes in more pure and stark form than less extreme cases.

B. Importance

Recall the costly information hypothesis from Chapterss 11-14. Diffusion of innovations between societies is one of the most important processes in cultural evolution. The diffusion of innovations is important because it is relatively hard to invent (or develop) many kinds of useful knowledge. Complex techniques (e.g. maize farming) are combinations of many skills, and develop over a long period of time. It is usually difficult to invent all the requisite parts in the right order, foresee the advantage of nascent new technology, etc. It may also require a special environment or a historical/cultural preadaptation to make the earliest steps of an invention possible. It is usually much easier to acquire all but the simplest skills from someone else than it is to try to invent them for yourself. The possibility of non-parental transmission, combined with the existence of various types of biases, means that humans can selectively borrow ideas from other societies—we can attempt to guide the evolution of our culture. As a consequence, societies trade ideas and techniques, as well as disease organisms, genes, and commodities. Elements of the costly information hypothesis are well exemplified by the diffusion of innovations process.

Most societies have undoubtedly acquired most of their cultural repertoire by diffusion. For example, Europeans acquired the following basic technical innovations from foreign sources during the Medieval period: "Arabic" numerals (Indians), compass (Chinese), astrolabe[1] (Arabs), paper (Chinese), astronomical tables (Arabs), mechanical clock (Chinese), algebra (Persians), printing (Chinese), and explosives (Chinese).

There is even some evidence, referred to in the first chapter on cultural evolution, that isolated societies sometimes lose cultural traits (Diamond, 1978). In small, isolated societies, skills that are known only to specialists or are practiced rarely are liable to be lost by accident. Everyone must be a bit of a generalist, but that limits the sophistication that specialization makes possible. Reacquisition by diffusion may be necessary to maintain some skills in small populations.

C. Diffusion of Innovation Studies

Several independent research traditions have studied the diffusion of innovations: *Anthropology, geography, and sociology* have a long tradition of trying to understand present behavior in terms of patterns of diffusion of techniques and ideas from source societies to their present distributions. Critics charge that this tradition has tended to focus on descriptive history as inferred by patterns of similarity (diffusionism) and to neglect causal processes. Rather implausible links were often postulated by extreme diffusionists[2].

Rural Sociologists pioneered the quantitative study of the diffusion of innovations. Classic studies include the diffusion of hybrid corn and 2-4-D weedkiller in the American Midwest. The largest number of studies come from this field, including many studies of attempts to diffuse modern techniques to Third World peasants.

Similarly, students of *educational reform* have studied the spread of kindergardens, drivers training and modern math. Someone right now is probably studying the spread of General Education requirements in U.S. universities! *Medical Sociologists* have studied how the use of new drugs spreads among communities of physicians. *Communications and marketing* experts study how propaganda and advertising work to persuade people to adopt new ideas and products.

Rogers and Shoemaker's (1971) classic study reviewed l,500 diffusion of innovation studies. Their book is notable for its content analysis of all these studies in order to make quantitative tests of general hypotheses about diffusion processes. Virtually all of these are studies of situations where change agents (often but not always foreigners) are trying to diffuse scientific or technical innovations to a clientele. What is notable about this literature is that most of the innovations studied are the products of relatively careful technical development. They ought, on average, to be objectively much better than typical foreign traits that people usually have decided whether or not to adopt. As we shall see, even under these

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1. a compact navigational instrument used (before the invention of the sextant) to observe and calculate the position of celestial bodies
2. Thor Heyerdahl's ideas about contacts between Polynesia and South America are a famous example.

relatively favorable circumstances, the decision of whether or not to adopt an innovation is a tricky one. We can use the studies of the diffusion of innovations as a "laboratory" to examine the effects of the decision-making forces of cultural evolution. ***Which hypothesis best explains the data on diffusion of information, the costly information hypothesis or the sociobiology hypothesis?***

II. An Example, the Plains Indians' Horse Hunting

A. Acquisition of Horse Technology from the Spanish (1650-1750 AD)

Paleo Indians had hunted horses, never domesticated them. In fact, as we shall see in Chapter 21, the Paleo Indians may have been responsible for the extinction of horses in North America ca 10,000 BP. As far as is known, horses were domesticated only once somewhere in the Eurasian steppe ~5,000 BP. Initially, horses, onagers, and donkeys were used as draft animals, to pull plows, carts, and chariots. Riding astride was apparently a late innovation. Interestingly enough, the horticultural/hunting and gathering frontier where horses were domesticated was ecologically and culturally analogous to the Great Plains ca 1700 AD.

Horse riding diffused from Mexico after the Spanish conquest; most of the development of Plains adaptation of the Western-movie/Custer's-Last-Stand type occurred in the l8th Century and 19th centuries. According to Roe's classic account (1955), the timing of the diffusion of horses is difficult to date. Probably the Apaches of New Mexico had horses by the 1660s at the latest. Some of the Northern Plains tribes, such as the Sioux and the Blackfeet probably did not have horses until a century or so later.

According to Roe, Indians almost certainly acquired the horse technology directly from the Spanish settlers in Mexico, not from independently domesticating stray feral horses. On the frontier in Northern Mexico, some Indians learned how to ride, probably by working as wranglers for settlers. Subsequently these Indians taught others, and horse riding diffused away from the frontier. The saddles and bridles used by Indian horsemen are based on Spanish patterns, for example, suggesting diffusion rather than reinvention. Later, the fur trade played a very important role in stimulating the adoption of complex pastoralist technologies by diffusing the use of guns and other manufactured items in return for skins. The fully developed Plains horse culture was very much like pastoralism in the Old World, a system basically derived from an agrarian technology applied in a semi-arid grassland environment, and with complex relations between the agrarian states and the pastoralists.

B. Local Innovations Were Still Required

One should not underestimate the amount of local innovation that went into the evolution of the Plains societies. Use of the horse set in train a vast array of technical and social innovations.

New hunting technology made it possible to follow bison herds: Foot hunters on the Plains had long hunted bison, but rather inefficiently because they could not reliably find and follow herds. With the mobility provided by the horse, an almost complete reliance on this rich resource could be achieved. The Plains Indians became a peculiar kind of pastoralists whose efficient use of the bison as a source of food and many other implements is legendary.

The Plains warfare pattern was also essentially a pastoral one. The herds of valuable horses, in classic pastoral fashion, gave rise to raiding, horse-stealing and defense against same. The military effectiveness of horse mobility was turned to account in the raiding of settled peoples; Northern Mexico suffered from fierce raids by Southern and Central Plains groups who traveled long distances to steal horses, women, children, and other booty. It was also turned to account to try to defend the Plains against Anglo-American encroachment, but with only local success. The application of industrial technology (rifles, light steel cannon, steamship, and railroad transportation), and the masses of Whites prepared to move West, overmatched the pastoral mobility advantage.

New social institutions were developed to make use of the new technology. Bison hunts were large, collective affairs in the summer, when the animals gathered into vast herds. Allies in war were required to defend oneself on the Plains, and small groups with no friends to help would likely suffer severe defeats. The Western hunting and gathering groups that moved onto the Plains had previously been ordinary food foragers. Now they had to acquire more sophisticated political forms in order to effectively exploit the resource and to provide some deterrent to attack. Recall Steward's argument regarding composite bands and migratory, big game herds. In Winter, bison broke up into small herds. The Eastern settled, sedentary horticultural societies that took up hunting on the Plains had to become more flexible and opportunistic in order to cope with the unpredictable contingencies of buffalo hunting. Among other things, rigidly unilineal kinship systems were abandoned to allow more flexible principles for kin-based cooperation. It is said that the Cheyenne, a formerly settled horticultural tribe, once tried to spend the whole year hunting as a tribal unit and suffered considerable starvation as a result. Historic Cheyenne social and political adaptations were suited for farming and had to be modified for life on the Plains. ***Note that this example of cultural evolution is decidedly not consistent with progressivist notions***

of evolution.

The convergence in social organization between the more highly organized groups of horticultural ancestry and the simpler ones of hunting and gathering background was not complete by contact times (1830-50s). Despite a great similarity among the Plains tribes, their social and political organization still betrayed their horticultural or hunting/ gathering cultural background, according to Oliver (1962). Societies that derived from a hunting and gathering background, such as the Comanche, had much more informal leadership than those of horticultural ancestry, such as the Cheyenne and Sioux.

No one group appears to have invented the whole complex of adaptive traits. Instead, elements invented in one group diffused to others. The horses themselves and knowledge about them spread from group to group over the period of a century or more. Other techniques, and social organization principles likely spread along the same routes. The involvement of Plains peoples in trade, and the great mobility the horse made possible made communication and observation easy.

C. Diffusion Was Necessary

Without diffusion from outside the Plains—and within the Plains among the various tribes— it is difficult to believe that so novel and sophisticated a strategy could have developed in 1 or 2 centuries. Think what might have happened if these people had been able to acquire innovations from full-blown pastoral nomads like the Mongols! The Plains peoples never did become fully pastoral cattle-herding people. Perhaps because they had no models. The Western ranching tradition was Spanish an inspiration, and was tied to a fixed headquarters, quite unlike nomadic pastoralism. The Navaho are an interesting example of a Native American group that became highly pastoral, but on the Spanish, not the Central Asian model. The Navaho lived just across the Spanish American frontier, and perhaps had an extra increment of time and more access to Hispanic models of migratory sheep-raising, an important tradition in Spain. They did adopt the fixed residence headquarters, not the mobile tent.

On the Plains, the penalty for failure to acquire innovations was extreme. Horticultural groups were raided persistently until they adopted horse hunting (Cheyenne) or left the Plains (Apache). The Apache clung to corn cultivation, and were virtually excluded from the Southern Plains about the time of regular contact with Whites (1820s) by persistent raiding by Comanches, who poured out onto the Southern Plains from the Upper Colorado River country. In the North, a few horticultural groups, the Arikara and the Hidatsa, still cultivated corn along the Upper Missouri in the 1830s, but they played an important role in trade for agricultural staples and furs that was perhaps not so important in the south.

When more invention is necessary, cultural change is slower than if innovations can be copied. The Plains Indians obtained much of their basic toolkit from the Europeans, a toolkit that had required thousands of years to evolve in the Old World. Nonetheless, the rate of evolution of novel traits on the Plains was indeed striking. By contrast, agriculture took about 4,000 years to diffuse from the Middle East to Britain. Presumably, much more independent invention was required in the latter case. The lesson of the Plains case seems to be that the diffusion of innovations can greatly accelerate cultural evolution, but even then there are real limits to how fast societies can absorb and modify new ideas to develop a new economy.

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III. Theory of the Innovation Decision

A. A Decision-Making Model

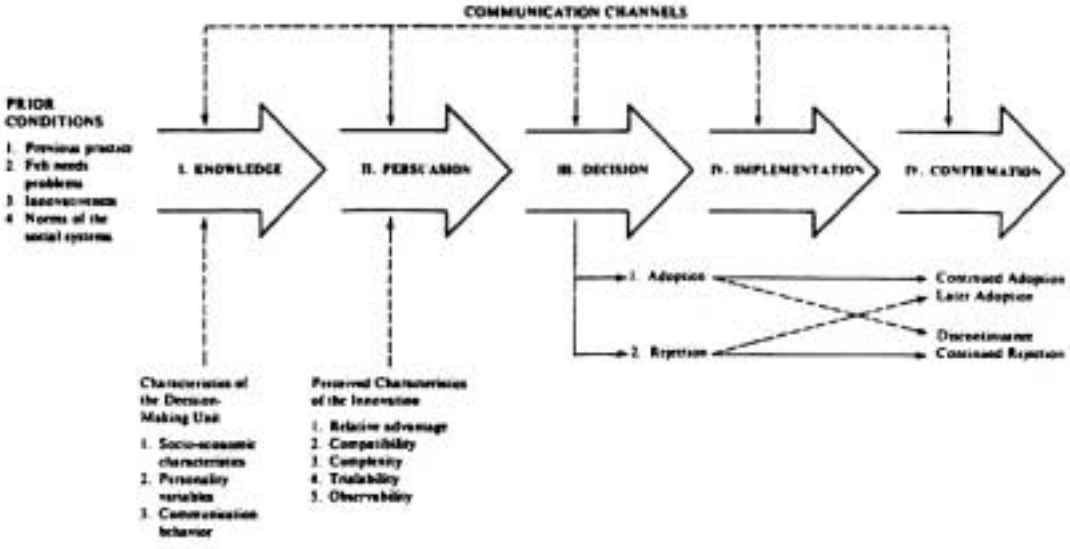
A complex series of influences affect decisions to adopt innovations. They include: (a) *individual attributes* (e.g. income); (b) *attributes of the social system* (e.g. the innovation may be perceived as violating ethical norms or the privileges of elites); (c) *perceived attributes of the innovation* (e.g. whether a new crop variety looks better in a test plot). Figure 19-1 presents Rogers' (1983) model of the stages involved in deciding whether or not to adopt an innovation.

B. Expectations from Cultural Evolution Theory

Information on the value of an innovation is costly to acquire. On the one hand, there are certainly innovations "out there" that would be beneficial to the potential adopter. On the other hand, there are plenty of bad ideas out there, or at least ideas not suited to a particular decision-maker's situation. There are often shady salesmen and overenthusiastic entrepreneurs that one has to worry about. Recall Proctus' lament from the epigraph. The trick is to use appropriate decision-making rules that increase one's chances of adopting good innovations and rejecting bad ones—always remembering that making decisions is a costly business.

The theory we developed in Chapters 11-14 suggests several rules, derived from the costly information hypothesis, that might be used depending upon circumstances:

Figure 19-1. A model of stages in the innovation decision-making process. "The *innovation-decision process* is the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (figure and text from Rogers 1983:166)." Note that the consequences of the innovation are not shown in this diagram for the sake of simplicity.



a. Be highly suspicious of innovations, *trust tradition*, use culture as a stable inheritance system (recall from Chapter 11 that in a relatively stable situation, the past is often a very good guide, and this is the cheapest rule). However, the use of this rule must be balanced against the possibility that the environment has changed recently (e.g., your neighbors have recently acquired horses and guns).

b. Rely on your own learning (*guided variation*). If highly sophisticated complex information must be discovered, invention for oneself is very costly, but many innovations will require a certain amount of fine-tuning to suit an individual's circumstances. Those who would invent, or even adopt most proffered innovations, have to be prepared to pay some learning costs. Rogers refers to this requirement for at least minimal individual learning in order to adapt new practices to local conditions as "re-invention".

c. Evaluate innovations carefully on their merits (*direct bias*). This is a less costly rule than individual learning, but will still require trials (and the evaluation of trials) that are costly, particularly if the innovation turns out not to work. It may also require substantial modifications for local circumstances.

d. Adopt innovations modelled by people who are thought to be generally trustworthy (*indirect bias*). Using those who seem to be successful, those who have prestige, and so forth as guides for what to adopt and what to reject is a relatively easy rule to apply—at least once trust is successfully established. Students of the diffusion of innovations apply the term "opinion leadership" to the results of this rule. However, traditional standards of prestige or success may be poor guide in a changing situation.

e. Go along with the majority (*frequency dependent bias*). Once most other people have adopted an innovation, it is probably the right thing to do. This is a very cheap rule to use, but in a competitive situation where many good innovations are available, an individual using it is liable to suffer, at least relatively speaking.

Based on the Costly Information Hypothesis, we would expect people to be sophisticated managers of information costs. The decision to adopt or not will depend on the cost of evaluating the innovation (and the cost of learning any required modifications of details) and the ability of the decisionmaker to bear those costs. The lower the ability to bear information acquisition costs, the more likely it is the person will rely on low-cost rules. When decision costs are very high, people will be very conservative, relying on tradition and adopting few innovations. In general, people will, balance the costs of applying high information acquisition rules against the probability of making a mistake by using traditional behaviors or a cheap but inaccurate rule. Now let us see what people actually do.

IV. Empirical Evidence

A. Typical Pattern of a Successful Innovation[3]

The rate at which people adopt innovations appears to be normally distributed. Figure 20-2a illustrates this pattern. Note that over time the cumulative total describes a sigmoid[4] curve that is very similar in shape to the logistic growth and frequency-dependent curves. This pattern could be explained by a simple contagion theory (a disease spread by individual contact in a uniformly and totally susceptible population would look exactly like the innovation in Figure 19-2). However, the data are considerably more complex. Rogers categorized adopters as is shown in Figure 19-2b. In most studies, these categories are correlated with sociological variables:

(1) *Innovators*—well-educated, risk loving. In Third World situations they are often the well-connected outsiders as far as the local community is concerned.

(2) *Early adopters*—local leaders and people of high prestige in a community

3. Note that there is very little data available on *failed* innovations.
4. S-shaped

Figures 19-2. (a) “The bell-shaped frequency curve and the S-shaped cumulative curve for an adopter distribution.” (b) “Adopter categorization on the basis of innovativeness.” (Both figures copied from Rogers 1983:247.)

(a)

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(b)

but not outside it. In the Third World, such people often have marginally more land, education and income than the average farmer or worker, but they are still the same class. Soviets called farmers in this category Kulaks, which became a term of denigration. Such people usually strongly subscribe to general local norms, even as they adopt innovations. These people are very frequently the most effective opinion leaders. If people in this social category adopt innovations, the rest follow. If they do not adopt, the innovation typically does not spread.

(3) *Early majority*—deliberate, more tradition-bound, less educated, less likely to be leaders, etc. than early adopters, but likely to follow opinion leaders.

(4) *Late majority and laggards*—still more traditional. Often poorer, lower status individuals for whom peer pressure is required to motivate adoption.

Table 19-1 summarizes some of the information developed by Rogers and Shoemaker from their large 900 + sample of studies of the diffusion of innovations. They developed a large series of hypotheses about the effects of many variables on innovativeness or the probability of adopting an innovation. Here we present only a small sample of their data to give you an idea of how it worked. Their basic method was simply to read all the studies and score the ones that mentioned a particular variable as either in support or not in support of a given hypothesis. This is a crude version of what has since come to be called meta-analysis.

TABLE 19-1. Summary of evidence from studies of Rogers and Shoemaker on innovations. Positive means hypothesis predicts variable to have positive effect on innovativeness or adoption.

GENERALIZATION	NUMBER OF STUDIES		PERCENTAGE
	Supporting	Not Supporting	
Socioeconomic Characteristics			
Education (positive)	203	72	
Literacy (positive)	24	14	63
High social status (positive)	275	127	68
Personality Variables			
Dogmatism (negative)	17	19	47
Rationality (positive)	11	3	79
Favorable to education (positive)	25	6	81
High aspirations (positive)	29	10	74
Communication Behavior			
Social participation (positive)	109	40	73
Change agent contact (positive)	135	21	87
Mass media exposure (positive)	80	36	69
Opinion leadership	42	13	76
Innovation Characteristics			
Perceived relative advantage (positive)	29	14	67
Trialability (positive)	9	4	69
Observability (positive)	7	2	78
Compatibility (positive)	18	9	67

B. Conformance With the Costly Information Hypothesis

Notice how Rogers' generalizations conform to the costly information prediction of

cultural inheritance theory. People with less wealth and less education, and thus on higher relative information costs, tend to be later adopters and to use the example of higher prestige people or the majority, rather than learning or direct bias, to evaluate innovations. (We are presuming here that literacy and general knowledge make information costs lower; think of the trouble an illiterate person would have comparison shopping in catalogs, reading reports, evaluating advertisements, etc.) Innovators and early adopters have the skills to evaluate innovations more easily, to bear the costs of adopting the innovation to local circumstances, and to tolerate the risks involved. The people who can less well bear decision-making costs rely on higher status "opinion leaders" and use the cheaper indirect bias decision-making rule. It is interesting in this context that the microevolution of dialects (Southern U.S. speech, Brooklyn accents, and the like) has many parallels with the diffusion of ordinary innovations, especially in that the role of opinion leaders is important (Labov, 1972). Recall our discussion of dialect evolution in Chapter 14.

Indirect bias is used in a sophisticated way. People in the "innovator" category are usually not opinion leaders. Their status is so high that no one imitates them. It seems that people judge that those who are too different from them in status are probably so different as to be unreliable models. Also, the innovation-prone are often pathologically so. Thomas Jefferson invented and adopted many innovations, but went broke as a farmer. Local people judge, perhaps correctly, in the main, that the circumstances of life of people much higher in status is so likely to be different that they are not useful models. They tend to see the local person, who is like themselves—but just a *little* more successful as the best model. In the Third World, the diffusion of innovations often fails because the extension agents and foreign experts are very different in status from peasant farmers. (Contrast with the U.S.A., where agricultural extension agents have roughly the same status as their early adopters.) Diffusion is generally successful only if "change agents" can reach key people in the "early adopters" category; they are likely to be the opinion leaders. Oftentimes, change agents who do not learn enough about local conditions to make some friends are not likely to know which innovations are useful anyway.

The cost of evaluating an innovation has a direct impact on the rate of adoption. Innovations with obvious advantages usually diffuse quickly. For example, hybrid corn has a three-fold yield advantage over open pollinated varieties; its use is quite easy to diffused. Innovations with small advantages (e.g., a l0% increase in yield) tend to spread more slowly. Hard-to-evaluate advantages such as sanitary practices also tend to spread rather slowly. (Sanitary practices are hard to evaluate because people cannot see disease microbes and because improvements in health are not immediately manifest.)

When information costs are high people often do simply depend upon tradition. Rogers and Shoemaker give the example of a case in which a folk theory of disease inhibited the diffusion of boiling water in Peru. People can't see the microbes that cause disease, and distrust public health workers. They cling to apparently irrational traditions. Modern Western people tend to invert this tendency. We are now innovation-adopters by tradition so to speak, and often adopt the latest technical fads as a matter of course. Many of them do work, and we can usually afford the cost when they go wrong[5]. This trust of traditions when decision-making costs (and the risks due to erroneous adoptions) are high may explain some otherwise puzzling features of cultural evolution.

Complex social organizational innovations are often very difficult to acquire. It may be very difficult to understand what gives another society its advantages. For example in New Guinea some peoples have acquired many technical innovations and have become moderately successful entrepreneurs. However, they use the big-man system to pool capital to buy trucks and other costly goods. The big-man system is preadapted for this role. The trouble comes when the big-man retires. This system is not geared to long-lasting capital goods. Each of the people from whom the big-man has obtained capital has an interest in his enterprise, but the big-man system has no provision for the transfer to a new leader of the business. He can't will it to his son, because the role is not hereditary. There is no custom of electing a new leader. Thus the business tends to be broken up among the big-man's clients or allowed to languish. These budding New Guinea capitalists can acquire many innovations, but the idea of a corporation has never spread to them. It is presumably more difficult to see the advantage of a corporation compared to the advantage of truck transport, so the New Guinea native relies on a traditional, short run serviceable, but ultimately flawed, social-organizational form (Finney, 1972).

There is a school of thought (see Chapter 23) that maintains that technical innovation per se is relatively easy, and that in the long run it is the difficulty of acquiring new social institutions that limits the rate of evolution of human societies. Social innovations are complex and hard to observe. Foreigners do so many things differently, and it is not easy to see how the whole pattern works. They require the simultaneous agreement of many people and are hard to try out. Yet social organization is a culture core feature; new tech-

5. Why have people in the U.S. become such avid adopters of innovations? Perhaps part of the answer lies in the fact that, until very recently, we continued to have a growing frontier. As you have seen from this course, life (i.e., the environment) is often quite unpredictable on the frontier. Thus innovations tend to be favored more often than is the case in more well settled environments. Perhaps another reason we can afford to be such avid adopters of innovations is that on average we use 30 times more resources per capita that people in nonindustrial societies.

nology cannot be properly deployed without it. A new technology may set off a wave rapid change, based on a modest reworking of existing institutions, then rates slow down as more fundamental social-organizational innovations are required.

C. Effects of patterns of innovation on distribution of income

Students of diffusion have noted that it is usually the wealthier people in a village, the most prosperous doctor, the upper middle class school district, etc., that adopt innovations first. If innovations are successful, this tends to make the rich richer, at least temporarily. In a developing or growing country, this will lead to *relative* worsening of the distribution of income.

Thus, even when development is proceeding so that incomes and well-being are generally rising, relative and absolute losses by some groups are common. This can generate very substantial social strains. It seems a hypothesis worth exploring that the political turbulence in developing countries today is as much a product of generally rapid growth as it is of underdevelopment per se. Countries like Brazil have a very poor distribution of income and rapid growth rates. The East Asian countries (e.g. Taiwan, Korea) seem impressionistically to have less poor distributions of income despite rapid growth than is the case in Latin America. They also seem to be somewhat less turbulent politically. (Recall the graph from Chapter 8; many underdeveloped nations have been growing at very rapid rates by historical standards since WWII.)

Lindert and Williamson (1985) conclude that effects like this may account for the rise in income inequality that accompanied the industrial revolution in Europe and the USA. Interestingly, for all the heat generated on this subject, they claim that good data are available only for these countries. By and large we don't know much about how the distribution of income actually varies as modernization and other economic changes occur.

There may also be regional or occupational effects due to the spreading of innovations. Some occupations disappear entirely. For example, craftsmen and peasants may be displaced by factories and commercial agriculture. Or new classes may arise, such as when factory workers and middle-class professionals gain power and challenge old elites. Moreover, particular ethnic groups may gain ascendancy because they were preadapted in some way that allowed them to take advantage of innovations. This occurred with the Ibo who came to dominate government and business in Nigeria, exciting much resentment on the part of formerly dominant groups, leading to a bloody civil war in the 1970s.

V. Conclusions

A. The Importance of Diffusion

Diffusion of innovations permits culture to evolve more rapidly than would be possible if each society had to evolve their own innovations. The acquisition of ideas from other societies is extremely important to the evolution of *complex* adaptive strategies. All the evidence is that key technical innovations are usually invented far more rarely than they are acquired by diffusion from other societies. (It would be a mistake to think that multiple independent invention never occurs, however. There is every indication that the Americas before Columbus were entirely uninfluenced by the Old World, and that parallels between the Old and New World in technology, social organization, politics, art, etc. were the result of independent developments.) Even in simpler societies, trade, population movements, warfare, and inter-marriage provided a steady flow of innovations from one society to another. The result is that the landscape of, for example Native North America, can be divided into "culture areas" in which similar adaptations to similar environments have been achieved, despite the fact that linguistic evidence suggests that many of the peoples in such areas had very different ancestry.

B. Complexity of the Adoption Process—Costly Culture Idea

Adopting innovations is by no means a simple process. The practices of foreigners (or of a different social class or occupation within a society) may or may not be useful to those who live in a different environment, practice a different craft, etc. Theory and evidence suggest that individuals use various bias strategies in a fairly sophisticated way to increase their chances of adopting useful practices while avoiding as much as possible the information costs attendant on adoption decisions. The human system of separate cultures with leaky barriers to diffusion is unique in the animal world; the barriers to gene flow between species are much more extreme. The decision-making forces and non-parental transmission that differentiate culture from genes have proven to be a powerful device for allowing humans to adapt quickly to new environments while providing a tolerable protection from the diffusion of inappropriate ideas from other environments.

VI. Summary

A. *Concept*: diffusion of innovations

B. *Model*: Socially-structured adoption curve for desirable innovations

C. *Discoveries*: importance of opinion leaders in successful adoption; importance of diffusion of innovations in long-term cultural evolution

D. *Hypothesis*: The costly information hypothesis explains the socially structured adoption curve, especially what sort of people are opinion leaders and what sort are not.

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