How and why it happened.

Thus we see that the relations between demography and economic growth are important and unusual. A number of the ways in which mortality and fertility came to be controlled have been explored. In understanding the causes of what happened, historians are faced with considerable methodological problems.

One of the central problems in this work has been the fact that most of the effects I am trying to explain are caused by multiple and often extended chains of causation. This has two implications. Firstly it is one of the reason why it has been so difficult to provide convincing explanations. Often, even if a statistical associations can be shown, it is difficult to see the causal link.

We may first distinguish the number of links in the chain. Often a single link chain appears at first sight to be adequate, for instance cotton -> typhus decline, islands -> warfare minimized, volcanic hot springs -> hygienic hot baths. Yet usually, on closer inspection, these chains turn into something more complex.

Many of the arguments put forward in this book have been based on two link chains, thus: tea -> boiled water -> dysentery minimized, absence of animals -> few flies -> absence of certain diseases, strong paper -> hand-kerchiefs -> less disease spread by nasal infection. Often in such two-link chains, the first link is explicit and intended by the people themselves. People have to boil water to make tea, they like to use paper handkerchiefs to avoid unseemly body matter being dumped. Yet the second link is often incidental and often unnoticed. Furthermore, even the first link is often unintended. People in Japan did not keep domestic animals for a complex of reasons, none of which probably related to the fly problem. The fact that people do not themselves see the links makes it more difficult for the analyst who thus has to undertake a kind of thought experiment as to possible hidden links which can then be tested.

Even more difficult to find, but even more interesting, are three, four or even five-link chains.[1] An example of a four-link chain from the chapters above might be:

[1]Chains can, of course, be much longer. A delightful example of a nine link chain is given in a tale told to a traveller in eighteenth century Japan. A man claimed he had decided to invest in the making of boxes, using the following links; a high wind in Tokyo -> dust clouds -> sore eyes -> blindness -> want to learn musical instrument (samisen) -> samisen makers need gut -> kill cats -> increase in rats -> gnaw goods and boxes -> high demand for new boxes.(Hizakurige, Shank's Mare,73.)

earth-quake prone geology -> flexible, small, light houses -> absence of load-bearing walls -> movable sides to house, good ventilation -> absence of certain diseases

An example of a five-link chain would be:
Buddhist belief about sin of eating animals -> absence of large domestic animals -> absence of animal manure -> use of night soil -> clean cities -> less enteric disease

In these cases, the chain is so long that it is unlikely that there is any intentional link between the start and end of the causal sequence, though each link tends to impel the next. Thus people observe the earthquakes, they have to build light houses and so on. But at each stage there are usually choices as well as constraints. Although the walls were not load-bearing, a whole set of other factors then enter. The presence of very good paper and bamboos in Japan makes it possible to build houses with movable walls (**shoji**). The hot climate makes it desirable to do so. With other building materials and climates, the houses would still have had to be small and flimsy, but might have had mud walls and little ventilation, for example.

This takes us to a second set of discriminations, between links which have just one effect and those with multiple effects. In many cases a particular part of the chain will probably have more than one effect, and the different effects inter-act with each other. Let us take just three examples. Tea drinking probably had a doubly beneficial effect because it both necessitated boiling and contained a bacteriostatic substance. Cotton clothes both allowed and indeed encouraged frequent washing with boiling water and also, in contrast to wool, consists of a vegetable fibre which gives lice a less attractive home. Glass both lets sunlight through, light which kills bacteria, and also makes it easier for people to see the 'dirt' in their houses.

It is easy to see that some of the parts of the chain had multiple effects. The absence of animals in Japan, for instance, affected the diet and hence nutritional status, it affected the level of insect vectors, especially fleas, flies and ticks, it affected the number of diseases carried in meat, particularly tape-worms, it affected the disposal of faeces through the need for night soil and hence enteric disease.

Another type of complexity is caused by the fact that each part of each chain is usually affected simultaneously by several different chains or contextual features. It is only when causes act together that they have the effects they do. Thus a single causal link is seldom sufficient in itself. For example, the introduction of hops into England and the subsequent widespread drinking of beer probably had large effects. Yet we are still left with the problem of why beer drinking was so widespread in England and not, say, in Scotland or France. Part of the explanation is ecological. Beer requires barley, which grows best in an English type of climate. The grape belt had its own drink. Yet it is more than this. The country had to be wealthy enough to be able to devote almost half of its grain crop to a drink in order for beer to have had the effect it did. Few pre-industrial countries are that rich.

Often it is in this way that geographical and material constraints interact with cultural constraints in the way that Sahlins has outlined. He points out that cultural materialism is over-naive in believing that

material forces, for instance the need for protein, leads to such things as cannibalism. Instead, material forces are shaped by culture, as much as the other way round.[2] As Paul writes, 'Man resides in a double environment - an outer layer of climate, terrain and resources, and an inner layer of culture that mediates between man and the world around him.'[3]

Numerous examples of the inter-play between material and cultural forces have been illustrated in this book. For instance, the chain which leads from hot springs, through communal baths, to body hygiene is strongly affected by concepts of decency and modesty and by Shinto beliefs about the need for physical purity and the washing away of bodily dirt. At a deeper level, the very material 'facts' themselves are shaped by the concepts. Many societies have straw and cloth, but no others in Asia make them into shoes as the Japanese did. This is not just a matter of comfort but is linked to the ideas of the danger and dirt inherent in the soil and the 'outside' world. This then contributes to keeping the house a pure and clean haven where 'outside' shoes are not used.

One might thus have a single-stranded chain, for instance geography -> disease. The absence of bubonic plague in Japan or the absence of malaria in northern Scotland could be reasonably explained by geography. Then there are double-stranded chains, for example geography plus culture -> disease. For example hot springs plus concepts of decency and purity leads to high levels of personal hygiene. One could even have three or more strands. For example one could have geography + economics + law + culture -> disease. An example of this would be the nature of English housing. This was determined by geography (the presence of stone and wood, the absence of earth-quakes), the affluence which allowed substantial investment in housing, the legal system which saw houses and the land they were built on as one unit and hence encouraged tall buildings with cellars, the culture, which contributed ideas of shape, proportion, durability and so on.

While the cause of mortality and morbidity show a rich mix of strands, material, cultural, economic and so on, this is even more the case with the determinants of fertility. For instance, the pattern of breastfeeding is the result of multiple forces. It reflects the status and role of women and the relations of the genders, the attitude to the human body, the contrast between men and animals, views on what is proper food, sexual mores and taboos, sleeping patterns, work patterns, religious views on the nature of human relations and so on. It is thus deeply cultural and social, with an admixture of the economic. Yet among its unintended effects is the biological fecundity of women.

The situation is made even more complex by various kinds of symbiosis between effects. Thus war causes famine and disease, disease leads to more famine and so on. The complex relations between nutrition, disease, work and animals has been central to this book. Yet even within these features there are complex interactions. Diseases mutually influence each other, for example malaria weakens people

[2]Sahlins, Culure.

[3]Paul, Beliefs (xerox),223.

so that they become susceptible to other infections. Furthermore, effects feed back and then become causes in a longer chain. For example, the absence of malaria in Japan added to the strength and efficiency and possibly the optimism of the population, hence leading to improvements in agriculture, which meant better-fed populations and improved health and more efficient agricultural techniques, all of which would make malaria less of a threat. The processes are often cumulative and this helps to explain the increasing divergence of Japan, and to a lesser extent England, from their continental neighbours.

Various methodological implications of these observations may be noted. The first is the need for a holistic or total approach to apparently narrow problems. In order to understand the absence of malaria or widespread enteric illness in Japan, or the general prevalence of breast-feeding in England, we have to examine the whole of the culture. The causal chains will zig-zag back and forth between different domains. They will certainly not remain within medicine or biology and often lead in unexpected ways into religion, law, economics and many other spheres. This is one reason why this book can only constitute part of an explanation of the problems I have outlined. For a fuller understanding we need to examine many other parts of the political, social, economic and cultural structure, a task I hope to continue in the future.

A second point is that since the chains are often long and complex, the effects are unintended and often unknown to the people themselves. To discover what they are and then to show that they are likely to be significant requires a combination of systematic intuition and techniques of testing. The methods cannot proceed by the methods of pure logic As Dubos points out, 'Logic is an unreliable instrument for the discovery of the truth, for its use implies knowledge of all the components of an argument - in most cases an unjustified assumption.'[4] The comparative method is very helpful in both encouraging intuition and allowing some testing. If one only considers one case, for example England, many of the links lie invisible both to the actors themselves and to later analysts. Only when we look at a number of varied cases do they become visible.

The idea of unintended consequences is also worth considering in relation to the central puzzle of this work. How did human beings escape from world of increasing misery? The problem was particularly acute in the case of disease. There appeared to be an impasse. One cannot have a society sophisticated enough to make powerful microscopes until many developments have occurred, in mathematics, in glass manufacture, in precision engineering and so on. It requires a vast set of interrelated developments which only flourished after the first industrial revolution. Thus the machine for giving the knowledge to conquer many diseases could only come after a reasonable plateau of disease had been reached. But how could that be reached without the knowledge?

The answer seems to lie in the theory of unintended consequences or accidents. People often do the right thing for the wrong reason, or rather, do a thing for one reason and then find it has other effects. The case of tea-drinking is an excellent example. In china and Japan tea drinking was introduces for the

[4]Quoted in Bynum and Porter(eds.), Companion Encyclopedia,473.

right reason - to improve health. In the west, apart from a few enthusiasts, it was mainly drunk for its reviving effects. The health side effects were enormous, but accidental. The same was true of cotton. Or again, maternal breast-feeding was encouraged in England and Japan for numerous reasons, but few of them had anything to do with the conscious effects in lowering mortality and fertility.

Often the changes only had to be very slight. This was noticed, for example, by Creighton in relation to leprosy, which he thought was largely caused by poverty, so that 'it was easily shaken off by the national life when the conditions changed ever so little'.[5] The same slight tipping of the balance may apply to many of the diseases we have been dealing with. The level that had to be reached was not enormously high. As Wrigley put it very well, 'An adequate level of nutrition, a tolerably pure water supply, a fairly low level of contact with serious infectious disease and an absence of opportunities for the rapid multiplication of disease vectors...may permit an average life span of half a century even though medical knowledge is slight and medical practitioners may be few and ignorant.'[6] As Szreter also emphasizes, one of the main lessons of the British case is that life saving through improved public health can occur without advanced medical technology.[7] This is even more forcefully shown by the Japanese example. They used social and bodily techniques to eliminate most of the major epidemic diseases well before the advent of 'modern medicine'.

The reasons for the changes were thus only incidentally to do with medicine. As Wear notes, 'Europe made the transition to a demographic regime in which people lived longer and died from chronic rather than acute disease', partly 'because people washed their hands, their bodies, and their houses; learned not to spit in public, killed flies, kept food from going bad...'[8] They did many of these things largely for reasons which had little do with health in itself. A number of the reasons for the changes were socially conditioned. There are many ways in which human pride, conceit, love of status has unintended consequences, for instance leading to changes in clothing, body decoration, food and housing which, as we have seen, had enormous effects. Whatever the reasons, Riley and others are surely right in arguing that 'if there was a revolution in medicine at the end of the eighteenth century...it involved the medicine of the individual; the revolution in the medicine of groups came earlier.'[9] That revolution in the medicine of groups is most clearly seen in the case of Japan and it is the Japanese example which has made it

[5]Creighton, Epidemics, i,112.

[6]Wrigley, Death (xerox),144.

[7]Szreter, Mortality (xerox),p.37.

[8] Wear, Hygine (xerox),1305.

[9]Ramsey, Environment(xerox),613.

possible to disentangle some of the ways which it worked in England. In the English case the causal chains are particularly complicated because the patterns of mortality and fertility are so intertwined with the first industrial revolution as both cause and effect. In Japan we can hold technology fairly constant and watch the way in which the organization of the society and cultural values led to an impressive control of mortality and fertility.

A third implication was discussed by Sorokin. He pointed out that multiple causation theory and the analysis of long chains of links can easily degenerated into vagueness. It soon becomes impossible to separate the important from the trivial. Almost everything might be relevant to a limited degree, as Chaos Theory has recently re-emphasized.[10] In order to overcome some of these difficulties, Sorokin suggests that 'more fruitful seems to be the way of discovery of the main, the necessary cause of these phenomena with an indication of the supplementary factors that facilitate and inhibit the effects of the main cause'.[11] In the case of this book, the single central necessary cause was islandhood and the book has then considered some of the numerous supplementary causes which were then needed to lead to the exceptional development of these islands, even when compared to other islands.

A further implication is a warning to the historian. There is always a strong tendency to impose a pattern on the past and to assume that because things occurred as they did, they had to do so. There appears to be design necessity, even calculation. As Chambers noted long ago, 'changes in the long-term trend of population appear to have sprung from forces that were, for an economic point of view fortuitous'.[12] It was not merely from an economic point of view, however. I cannot do better than end that what happened was not only a gigantic accident, but also an enormous exception. It was a miracle that ought not to have happened, nearly did not happen, yet by a set of coincidences and chances, did happen - twice. The point is well made by Mokyr. 'The study of technological progress is therefore a study of exceptionalism, of cases in which as a result of rare circumstances, the normal tendency of societies to slide towards stasis and equilibrium was broken. The unprecedented prosperity enjoyed today by a substantial proportion of humanity stems from accidental factors to a degree greater than is commonly supposed'. [13]

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[10] Sorokin, Sociological Theories,103; Sorokin, Society, Culture...,505.

[11] Sorokin, Society, Culture,p.507.

[12] Chambers, Economy,59; see also p.151.

[13] Mokyr, Lever,16.