

## Introduction

Stanley Engerman and Kenneth Sokoloff have been leaders in renewing interest in institutions and their impact on economic development. The papers in this volume are concerned with human capital in its many dimensions, and bring to fore the role of political, social, and economic institutions in human capital formation and economic growth. The papers address a broad range of issues, from nutrition in pre-modern societies to twentieth-century advances in medical care, from the institutions that concerned workers in the middle and lower ranges of the wage scale to the factors that affected the performance of those who reached the pinnacle in business and art, and from political systems that stifled the advance of literacy to those that promoted public and higher education. Just as human capital has been a key to economic growth, so has the emergence of appropriate institutions been a key to human capital formation. It is this theme that underlies the papers in this volume.

Along with Stan Engerman, Robert Fogel pioneered the use of anthropometric evidence to study economic growth, and helped expand our view of human capital. Formal schooling, apprenticeship programs, specialized job training in the workplace, and learning-by-doing all raise productivity, but other forms of human capital investment are also important. The notion that health and physical size and strength can affect labor productivity is not new, but Fogel has brought these forms of human capital to center stage. Indeed, if we are to explain economic performance even in modern times, it is important that we not ignore those issues of diet, disease, sanitation, and health care that are at the foundation of Fogel's work.

In Chapter 1 Fogel addresses the relation between mortality and measures of health status, such as height and body mass index. Since the eighteenth century, health in the West has improved remarkably, although the estimates of life expectancy suggest that the gains have been by no means continuous. As Fogel documents, improved nutrition and sanitation accounted for much of the advance up to World War II, but since then expenditures on

medical care have played an increasingly important role, especially in reducing mortality of the elderly. To the extent that such investments in health are directed to those who have left the labor force, they have little effect on output, but as Fogel emphasizes they have a great impact on welfare. The high income elasticities of demand for health care that Fogel reports suggest that as economies advance, and workers retire earlier and live longer, the benefits of economic growth will become increasingly tied to health status. Fogel argues a greater investment in medical care for the old as well as the young is the appropriate market and social response.

Richard Steckel has been at the forefront of exciting work involving the use of skeletal remains to infer the health status of pre-modern populations. In Chapter 2, Steckel describes the approach and discusses some of the methodological issues, including both the weaknesses and the promise of this unique form of evidence. He, Jerome Rose, and Paul Sciulli have developed a health index for the pre-Columbian period based on the skeletons of 4,078 individuals who lived at 23 localities in North, Central, and South America. Steckel uses the index to compare the health status of hunter-gatherers with those who lived in villages and urban areas. Larger settlements led systematically to poorer health and the effect was large. Those not living in fixed settlements averaged in the top 15 percent of the health distribution in contrast to the urban dwellers who were in the bottom 20 percent. Although diseases related to crowding were less of a factor than in Europe, the scarcity of meat and fish and the lack of protein-rich grains were likely more serious problems. Over the long period from 6,000 BC to Columbus, the trend in health was downward, reflecting the shift from the mobile lifestyle associated with hunting-gathering to fixed settlements. Steckel is in the tradition of those who are finding that the progress associated with the transition to settled agriculture came with a human cost.

A healthy, physically able workforce has been the basis of successful economies and was a key element of eighteenth- and nineteenth-century industrialization. George Boyer points out, however, that the economic advances that increased wages also brought greater insecurity. Unemployment or illness of the main breadwinner could be devastating to even relatively high-income families. Important to workers in Britain and elsewhere was the emergence of institutions that provided protection to those experiencing a temporary decline in income. In Chapter 3 Boyer explores how Britain responded. Over the period from 1830 to the eve of the First World War, workers throughout the wage distribution faced serious income insecurity. In response, Britain introduced various forms of insurance, both private and public. Public relief provided through the Poor Laws was directed at those in the bottom third of the wage distribution, but higher income workers demanded protection as well. For many of these workers, friendly societies became an important source of income during periods of illness or unemployment. In the latter part of the nineteenth century, this insurance

role was gradually taken over by labor unions, and early in the twentieth century social programs such as the Old Age Pension and health and unemployment insurance superseded public relief. Like other forms of capital, the returns to human capital are uncertain; and because, for most workers in the nineteenth century, labor earnings were the only source of income, it was important that insurance mechanisms emerge. These mechanisms raised welfare by smoothing consumption, and made possible the entry of workers into occupations with high wage variability. Construction, for example, was characterized by high but variable wages. Thus insurance of the type examined by Boyer contributed to greater overall productivity by promoting entry into this and similar occupations.

Stanley Engerman and Kenneth Sokoloff have done influential work on how factor endowments can help shape the institutions so important to economic growth. In Chapter 4, also characteristic of the new institutional economics to which they have been leading contributors, Engerman, Elisa Mariscal, and Sokoloff explore the development of schooling institutions in the Americas. Until 1800, the center of economic activity in the Americas was outside mainland North America. It was the sugar-based slave economies of Brazil and the West Indies that produced the highest levels of income per capita and generated by far the most trade with Europe. But during the nineteenth century, the economies of these regions stagnated, falling far behind the United States and Canada. With their early emphasis on primary education, the United States and Canada had in 1800 perhaps the most literate populations in the world. And beginning in the 1820s their lead in education increased as the common school movement took hold. This experience contrasts with the rest of the Americas where public schooling was rare.

What explains the different education paths? Engerman, Mariscal, and Sokoloff itemize the possible candidates: religion, ethnicity, form of government, and resources; but in the end they argue that extreme inequality in Latin America both in income and political power, rooted ultimately in factor endowments, was the cause of their poor educational outcomes. They arrive at this conclusion partly by examining the record within Latin America, where there were differences across countries in the distribution of income and the timing of the suffrage. Argentina and Chile invested more in education than the other parts of Latin America, and it was there that income and political power were much more equally distributed. By describing and explaining cross-country differences in human capital investment, Engerman, Mariscal, and Sokoloff further our understanding of how institutions affect relative economic performance.

Focusing mainly on the United States, Claudia Goldin and Lawrence Katz have written extensively on the history of education, where prominent is their finding that investment in education there has been much greater than in similarly developed countries. In Chapter 5 they ask why this was

true in the period 1910 to 1940. Their focus is on high school enrollment and on the numbers graduating from high school. The United States stands out in terms of both measures. From 1910 to 1940, the proportion graduating from high school increased from 10 percent to 50 percent; and, in 1955, 80 percent were enrolled full time in high school. By contrast, the full-time enrollment rate in the highest enrollment European country, Sweden, was just 25 percent. Goldin and Katz use state-level cross-section comparisons of high school participation to shed light on the exceptional United States performance. Quite a number of factors influenced enrollment, but what especially distinguished the United States from Europe was its much greater reliance on local financing of public schools. This approach to funding made possible returns-to-scale not present in a private system while at the same time promoting public school systems that reflected the educational demands of the people within each local area. This matching of public schools to the costs and benefits of education in each community promoted much higher levels of investment than the centralized European model. Goldin and Katz argue as well that public investment in U.S. colleges and universities, by increasing the potential return from completing high school, further raised high school enrollment and graduation rates.

While Chapters 4 and 5 are concerned with international comparisons of access to and quality of general education, Michael Edelstein (Chapter 6) focuses on education of a more specific kind. Using a unique data set, he explores graduation rates from engineering schools in New York State over a period of 150 years. During much of the nineteenth century, few in the United States who described themselves as engineers were graduates of university or technical programs. But after 1870, a year when only 10 percent of engineers had a higher degree, there was a burgeoning in formal engineering education. By 1910 the share of engineers with degrees had increased to more than a third and, in 1940, 57 percent of the nation's nearly 300,000 engineers had four or more years of higher education.

New York State, which includes among the earliest American institutions of higher education, collected comprehensive data on college and university degrees beginning in the late eighteenth century. From 1823 to 1953 the annual number of higher degrees per 100,000 population increased from about 100 to nearly 3,000, an average growth of 30 percent per decade. And, during the late nineteenth and early twentieth centuries, the number of engineering degrees grew even faster. The peak was in the 1910s when 15 percent of graduates were from engineering programs. Underpinning these broad aggregates is Edelstein's detailed accounting of the number of engineering graduates at institutions throughout the state. In addition to presenting a remarkably full picture of the pattern of engineering graduation, Edelstein makes the case that the rapidly increasing share of professional engineers in the workforce was a significant element in America's industrial success.

Research on human capital typically deals with average or expected results. In their study of genius in the world of art, David Galenson and Robert Jensen (Chapter 7) look at outliers, focusing on whether great painters produced their most highly regarded work as the result of a long process of human capital accumulation, or whether their best work was produced early in their careers. From their survey of art history and their analysis of art auctions, Galenson and Jensen identify a clear distinction between those artists whose contribution resulted from what they describe as the experimental approach, typified by the paintings of Rembrandt, Cézanne, and Pollock; and artists whose genius has been regarded as conceptual, among them, Raphael and Picasso. They find that artists such as Cézanne, whose work is regarded as experimental, continued to add to their human capital throughout their lifetime, producing paintings of increasing importance and financial value. On the other hand conceptual artists, such as Picasso, made their greatest impact early in their careers. The lesser importance of their later work suggests a gradual depreciation of their human capital. Galenson and Jensen present an intriguing hypothesis about the life cycle of artists, and show how an analysis of markets, in this case art market, can contribute to our understanding of, not just artistic genius, but also the overall process of human capital accumulation.

Another approach to the tail of the human capital distribution is presented in Chapter 8. Peter Temin discusses the proportion of Jews in the Forbes 400, a list of the wealthiest Americans, focusing on the role of networks and information flows among small ethnic, religious, or other minority groups. Jews have comprised about 2 percent of the U.S. population; yet, in 1982, 15 percent of those on the Forbes 400 list were Jewish, and in 1998 the proportion was 20 percent. Such a disparity cannot be explained by a difference in levels of schooling; nor, Temin argues, does discrimination against Jews account for their economic success. According to the latter view, because Jews were prevented from becoming part of the business elite, they disproportionately became small entrepreneurs, some of whom were spectacularly successful. Temin points out that Jews were in fact present among the business elites throughout the twentieth century, and argues that, by limiting their opportunities, discrimination more likely reduced the chance a Jew could acquire great wealth.

Jews have been over-represented among the richest 400 Americans, according to Temin, because they have had the advantage of being part of a social network. Each financially successful Jew tended to promote the success of other Jews through business and social contacts to a degree not seen in the general population. Notwithstanding the recent troubles of the company that they founded, the experience of Marcus Goldman and Samuel Sachs illustrates how contacts with other Jews, including Julius Rosenwald head of Sears, Roebuck and Jacob Werthein of United Cigar Manufacturers, led to the emergence of a major financial firm. And the concentration of

the richest Jews in particular industries, notably apparel and cosmetics, and banking finance, is further evidence of the power of network effects.

Incentives are essential if a worker's human capital is to translate into high productivity. This message of the principal-agent literature has underlying it a model where employers design contracts to elicit effort from workers. In modern economies the range of contracts is circumscribed. Unlike the case of slavery, where employers use violence and threats of violence, in addition to positive incentives, to increase the productivity of workers, employers in modern economies are (appropriately) restricted in the degree to which their workers can be coerced. Robert Steinfield (Chapter 9) points out, however, that, as late as the nineteenth century, employers in England had available to them tools that, while not as draconian as those associated with slavery, allowed for severe punishment of nominally free workers. By invoking Master and Servant acts, employers might convince a court to fine and even imprison at hard labor a worker found to have violated a labor contract.

Such penalties, which were commonly applied to indentured workers and apprentices, protected employers. They also provided a mechanism for these workers to pre-commit to the terms of their contracts. The cost of hiring and training new workers could be considerable, and to the extent that employers bore the cost, they wanted to be assured that they would earn a return on that investment. The Master and Servant acts helped provide that assurance. Especially after 1860, British labor groups campaigned vigorously against the Master and Servant acts, and in 1875, eight years after the suffrage had been greatly expanded and political power shifted from business interests to workers, the acts were repealed.

In Chapter 10 Hugh Rockoff presents a wide-ranging analysis and review of usury laws. Usury laws, which date back at least to Biblical times, typically specified a maximum lending rate where the penalty for violating the law was a fine based on the amount of the interest and principal. Adam Smith, who recognized the benefits of loans above the usual market interest rate, still argued for some interest rate ceiling. He wrote that money borrowed at high rates would go to "prodigals and projectors"; prodigals who would dissipate the money on their own consumption, and projectors who would invest in improbable schemes. Jeremy Bentham took a contrary view; and his *Defense of Usury* became influential on both sides of the Atlantic.

The United States and some European countries were greatly affected by British thinking on usury laws, which Britain, in the nineteenth century, was liberalizing. In 1833 Britain eliminated usury limits on bills of exchange with less than three months to maturity, and in 1854 all Britain's usury laws were repealed. In the United States the maximum interest rate and the penalty varied by state, but, despite some differences in approach, the overall trend was toward relaxing interest rate restrictions and reducing penalties. By 1881, seventeen states had repealed their usury laws. There were attempts to control the interest rate charged by national banks, but the

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Congress ultimately gave them more flexibility than even the state banks. Rockoff points out that, by limiting interest rates, usury laws could affect many forms of investment, including investment in human capital.

Eight of these papers were presented at a conference in Rochester that honored Stanley Engerman. One of the organizers of that conference was Kenneth Sokoloff, who is also a co-author of one the chapters. Ken took the lead in bringing these papers together, but he was unable to see the project to completion. We dedicate this book to his memory.

PART I

HEALTH AND LIVING STANDARDS



## I

## Biotechnology and the Burden of Age-Related Diseases

Robert W. Fogel

During the past two decades, there have been a number of major advances in constructing time series on the decline in mortality in Western Europe, Japan, and the United States. The data for these time series were obtained from a variety of archives. Both the retrieval and the processing of the data were made possible by the remarkable advances in computer technology that not only permitted the creation of the time series but enabled linkage to a variety of variables aimed at explaining the improvement in health and longevity over the past three centuries. In this chapter, I focus first on England and France, for which the longest time series exist, but will make use of data from several other countries including Sweden, Norway, the Netherlands, the United States, and Japan.

Figure 1.1 shows time series for the decline in mortality rates going back to the 1540s in England and to the 1740s in France. These diagrams present the annual crude mortality rates for each country as a scatter of points. The heavy dark line in the center of each scatter shows the underlying trend in the mortality rate.

Figure 1.1 shows that in both England and France, crude mortality rates were much higher in the eighteenth century than they are today – on the order of three to four times higher. A second feature is the much greater volatility of mortality rates in the past than today, with annual death rates sometimes exceeding the secular trend by as much as 50 to 100 percent. It was these mortality crises that initially caught the attention of demographers who were focused on the data of particular localities. They argued that mortality crises accounted for a large part of total mortality during the seventeenth and eighteenth centuries, and that the decline in mortality rates after about 1750 was due largely to the elimination of these crises. The elimination of crisis mortality was, in turn, attributed to the elimination of periodic famines. However, when the nationwide time series shown in Figure 1.1 were partitioned, it turned out that in both the French and the British cases the elimination of crisis mortality, whether related to famines

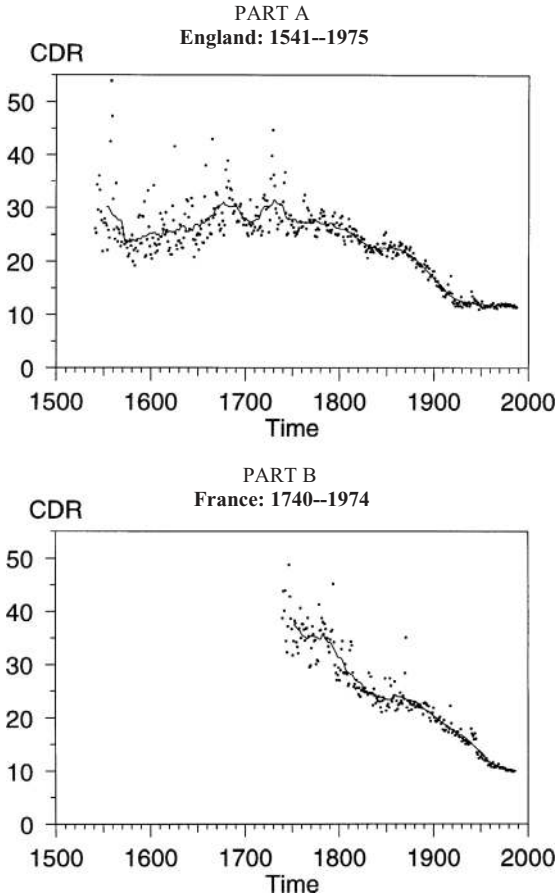


FIGURE 1.1. The Secular Trends in Mortality Rates in England and France. *Note:* Each diagram shows the scatter of annual death rates around a 25-year moving average. *Source:* Fogel (1992).

or not, accounted for only a small fraction of the secular decline in mortality rates. About 90 percent of the drop was due to the reduction in the “normal” levels of mortality.

Still another feature of Figure 1.1 is the repeated interruption of downward trends in mortality and their reversal. Substantial interruptions and reversals in the downward trend have also been demonstrated during the nineteenth century for the United States, Sweden, and Hungary. Such interruptions and reversals lasted several decades and prevented even the keenest contemporary observers from appreciating that the growing control of the environment had the capacity to transform human physiology. It was not until World War I that biodemographers and epidemiologists recognized