Volume Title: American Economic Growth and Standards of Living before the Civil War

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Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-27945-6

Volume URL: http://www.nber.org/books/gall92-1

Conference Date: July 20-22, 1990

Publication Date: January 1992

Chapter Title: Introduction to "American Economic Growth and Standards of Living before the Civil War"

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Chapter URL: http://www.nber.org/chapters/c8006

Chapter pages in book: (p. 1 - 18)

Introduction

Robert E. Gallman and John Joseph Wallis

The Industrial Revolution and the Standard of Living: What Are the Questions?

Scholarly concern with the early stages of modernization, and particularly with the effects of developments during the industrial revolution on standards of living, has had a long history. The European literature on the subject has been much more extensive than the American, and British experience has drawn particular attention. The debate over the standard of living during the British industrial revolution has been extended, complex, and acrimonious. The acrimony has proceeded in part from ideological differences between disputants, but also in part from misunderstandings arising out of the complexity of the problem and the variety of ways in which it can be approached. How should the topic be defined? Should the focus of discussion be on the strictly material, measurable aspects of development and the standard of living? Or should the effects of modernization on social organizations—the nature and functioning of the family, for example, or changing degrees of personal freedom—enter into it? If the focus is restricted to the material side of the question, how should one deal with such issues as changes in the length of the

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This introduction has been reviewed by all of the participants in the conference from which this volume is derived. Particularly helpful comments were received from Stanley Engerman, Claudia Goldin, Thomas Weiss, and Jeffrey Williamson. The manuscript was also reviewed by Karin Gleiter, the Carolina Population Center, and Barry Popkin, Department of Nutrition and the Carolina Population Center, the University of North Carolina, Chapel Hill. Both provided helpful suggestions. The usual caveat applies.

work year, or the intensity of work, or externalities—positive and negative—surrounding industrialization? How should one distinguish events that are associated in time, but by chance, from those associated through causal links? And if we are to consider causal links, don't we have to work out a grand counterfactual, a comprehensive model that will show the consequences of a failure to industrialize, as well as the impacts of industrialization? All of these topics have been discussed in connection with the British case. Considerable ingenuity has been expended to obtain answers to a number of these questions, but it would be fair to say that the answers so far obtained are not accepted by all students of the subject.[1]

If we ignore noneconomic issues, externalities, changes in work intensity, and so forth, and consider only the standard measurements, the British debate suggests that there is still much room for disagreement. Real per capita national product measures can tell us about the opportunities for improved material well-being that have (or have not) emerged in the early stages of modernization. In the British case, these measures have been subject to frequent revision, and new interpretations persistently appear. Even if the fundamental series are finally settled on, and if they show improvements in per capita real income across the relevant period—which they seem to do—there remain questions as to how widespread the benefits of modernization were. If there were gains, were they used chiefly to expand the capital stock, or did consumption also go up? Were they absorbed by capitalists, or did labor share in the largess? Economic change involves shifts in the structure of the economy, with winners and losers. Who were the winners and who were the losers? one may ask. What happened to the size distributions of income and wealth? Were there shifts in the structure of wages? Furthermore, even if we look at a brief period—say two decades of intense change—the cast of economic actors will have changed significantly between the beginning of the period and its end. In what sense can we then speak of winners and losers? That X is better or worse off than his father (her mother) does not mean that X has gained or lost anything.

All of these topics have been treated at great length in the literature on the

1. There are two bodies of literature that are relevant, each too extensive to be fully cited here. A few references will have to suffice. The first body of literature has to do with national accounting concepts that have been designed with the object of producing measures useful in the study of economic growth. Simon Kuznets's two essays "National Income and Industrial Structure" and "National Income and Economic Welfare," chapters 6 and 7 of Kuznets (1953), raise all of the important issues. Kuznets (1952) contains an interesting effort to incorporate the value of leisure in the national product. The volumes produced by the NBER for the Conference on Research in Income and Wealth, especially in the early years of the conference but also more recently, contain much useful material; see, for example, Nordhaus and Tobin (1973). See also Usher (1980). The literature specifically on the standard of living during the industrial revolution is extensive and complex. For recent treatments, see Crafts, Mokyr, and Williamson (all 1987). A brief but comprehensive and thoughtful discussion is contained in Floud, Wachter, and Gregory (1990, chaps 7, 8). Finally, there is the insightful review and extension of the literature recently prepared by Stanley L. Engerman (1990).

British industrial revolution. The American discussion has so far been much less comprehensive, and fewer issues have been thrashed out. Various lines of work have been conducted, however, and the time is propitious to bring them all together and to see how coherent an account can be made. The essays in this volume do not take up all of the possible subjects described above. They treat economic development rather fully, including changes in aggregate inputs and outputs; they also take up the distribution of the rewards of development, and, at least indirectly, externalities. Some of these essays introduce new evidence, while others range over a field of research and pull things together for the first time. The volume opens up the topic and sets an agenda for research.

Conventional Indexes of Economic Development: Inputs, Outputs, Structural Changes, Income, Consumption, Wages, and Distribution

The story of the economic development of the United States in the six or eight decades before the Civil War that emerges from the pages of this volume is quite clear, certainly clearer than the comparable British story.[2] The supplies of inputs to the productive process rose very rapidly. Before 1800 the labor force and the capital stock sometimes grew faster than population, and sometimes a little more slowly. After 1800, however, the supplies of inputs typically grew at higher rates than did population; the rate of change of per capita supplies accelerated, and especially large gains were achieved in the last two decades before the Civil War (Weiss, Gallman).[3] The distribution of inputs among industrial sectors, regions, and types of economic activity steadily shifted in the direction of the more rewarding opportunities. For example, the highly productive industrial and commercial elements of the economy laid claim to larger shares of the labor force and the capital stock as time passed (Weiss, Gallman); workers gravitated to the West, where real wage rates exceeded those in the East, and the adjustment led to a convergence of regional wage rates (Margo); farmers changed the mix of their output in response to the promptings of the market (Rothenberg). These developments are reflected in the course of change of aggregate total factor productivity, which increased persistently (Gallman).

Productivity improved within northern agriculture and manufacturing, and in manufacturing, at least, productivity growth accelerated (Rothenberg, Sokoloff). The forms of innovation changed. Early in the period they were predominantly organizational adjustments that took advantage of the opportunities afforded by widening markets. Later, in the 1840s and 1850s, inno-

2. In what follows we focus on trends and virtually ignore cycles and long swings. Most of the papers follow the same plan, although a few (e.g., the one by Margo) take account of major short-term shocks to the economy.

3. All references that are not accompanied by a date refer to papers in this volume.

vations typically called for mechanization and capital deepening (Rothenberg, Sokoloff). In both instances, innovative activity—as measured by patent applications—closely followed the opening of markets (Sokoloff). There is the strong suggestion that profit opportunities encouraged innovative activity. Tools and machinery came to play much more important roles in production and in innovation (Sokoloff, Gallman). Between 1800 and 1860 the fraction of the real capital stock accounted for by land clearing and breaking fell by half, while the share represented by tools, machines, and other equipment doubled (Gallman).

These developments generated important and ever-growing increases in per capita income (Weiss). Americans were well off, by the standards of the day, as early as the late eighteenth century (Weiss, Steckel). Thomas Weiss shows that they were even better off than had previously been supposed. The rate of growth of real per capita income was somewhat lower than earlier studies had suggested, but it at least matched the rate recorded by the leading industrial nation of the period, Great Britain. That means that the American performance must have been one of the very best—perhaps the best—to be recorded during the six decades before the Civil War. Furthermore, the rate of gain persistently and markedly accelerated, so that in the last two decades before the war Americans enjoyed dramatic improvements in real income.[4] The aggregate economy was growing faster than any large economy had ever grown before.

Two features of Weiss's new series deserve special mention. First, as Claudia Goldin, the discussant for Weiss's paper, makes clear, the new income estimates are firmly based. These estimates will endure. Second, Weiss has worked with two alternate concepts of national product. One is the conventional concept, useful for making measurements that can be compared with standard estimates for other countries. The second incorporates elements of economic activity that are generally omitted from the national accounts. These elements consist of the value of home manufactures and the value of land clearing and breaking by the farm sector. As most of the papers in this volume show, the six decades before the Civil War encompassed the beginnings of the process of American economic and social modernization. For such a period it is important to have national product estimates of Weiss's second type. During this period new activities were arising and old ones were being displaced. Unless the declining activities—such as home manufacturing—are allowed to influence the measured rate of growth of the economy, an inaccurate account of the changing material circumstances of the society will be rendered.

The gains in income described by Weiss were widely shared. Real wage

4. There were also gains in real consumption per head in this period, according to the national income measurements. Compare the data on the real value of consumption goods flowing to consumers in Gallman (1966, 27), with data on the population of the United States in, for example, U.S. Bureau of the Census (1975).

rates rose throughout the nation, and free laborers everywhere participated in the economic improvement (Margo); slave laborers, however, may not have done so. Lee Soltow's work indicates that wealth and income distributions—arranged by size of holding or of income flow—changed little between 1798 and 1870. Soltow has given direct consideration to the lot of the very poorest free persons. The data are indirect, but his ingenious efforts squeeze useful matter from recalcitrant sources. He turns up no strong evidence of general deterioration in the lot of the poor. The process of industrialization generates forces that can lead to a widening of the distributions of wealth and income, and previous scholarship suggested that this was the American experience during the period here under discussion (Williamson and Lindert 1980). Soltow's findings contradict this position; according to Soltow, the benefits of growth were widely distributed, and income and wealth size distributions were fundamentally stable.

American diet improved in variety and quality, at least until the 1830s, and at least for the rich and those of middling status (Walsh). Evidence for the poor is too weak to permit firm conclusions, according to Lorena S. Walsh, but she believes the poor (free and slave) at least held their own. Since Americans were already extremely well-fed at the end of the eighteenth century, no marked increased in the volume of food (as distinct from its quality and variety) consumed per capita could be expected (Walsh, Steckel).

The sources on consumption for the years after the 1830s have not been well exploited as yet, but production data suggest that supplies of food were as generous in those years as before. For example, Walsh points out that the literature on widows' allowances has widows receiving 13–23 bushels of grain per year, in the years 1750–1830. She goes on to say that some of this supply must have been used in trade, since "the higher grain allowances include more than anyone was likely to have consumed." Data on grain production in the years from 1839 onward are abundant; they are to be found in the state and federal censuses and in the Patent Office Reports. This evidence indicates that grain production generally kept pace with population growth in the years 1839–79, and that per capita levels were as high as they had been in the years 1750–1830 (see tables 1–3).[5] The caloric content of grain supplies per capita was very high, especially when one recalls that Americans also consumed substantial amounts of meat and vegetables (Walsh).

Walsh believes, however, that distribution problems may have led to at least mildly deteriorating circumstances for the free poor, after the 1830s. In view of the extremely high levels of per capita net supplies of food in the United States in this period, it is difficult to imagine that the diet of the poor could have worsened by much. To suppose otherwise requires us to believe that

5. The widows' allowances refer to food for adults, whereas the data in table 1 have to do with net output per man, woman, and child.

Table 1 **U.S. Outputs of Grains, Field Peas, and Potatoes, Net of Seed and Feed Allowances and Exports, per Member of the Population, Crop Years 1839–79**

	Bushels	Daily Calorie Equivalents[a]
1839	16.3	1,843–2,539
1844	16.8	1,919–2,703
1849	15.0	1,698–2,463
1854	15.4	1,775–2,651
1859	16.5	1,953–2,784
1869	15.1	1,755–2,507
1874	16.1	1,882–2,891
1879	17.5	1,840–2,989

Sources: Population: U.S. Bureau of the Census (1975), ser. A-7, 1840, 1845, 1850, 1855, 1860, 1870, 1875, 1880. Outputs and calorie equivalents: see table 2.

Note: Excludes rice.

[a]Excluding milling wastes. See table 2.

substantial amounts of grain were wasted or somehow lost in the distribution network. No doubt the distribution system increased waste of certain types, but improvements in distribution surely reduced the waste that comes when trading connections between potential buyers and potential sellers are weak.

The volume and variety of household equipment owned by the middle and upper classes improved significantly. These improvements probably underlay changes in cookery, diet, and the exploitation of household space (Walsh). They brought with them higher standards of comfort and some economies. For example, the production of heating stoves increased dramatically; heating stoves made for much more comfortable living quarters, and much lower fuel costs.

Sources of Evidence

The conclusions described above are drawn from an exceptionally wide array of data types. At one extreme, Robert E. Gallman's estimates are constructed chiefly from aggregates that refer to major components of the economy and rest mainly on evidence drawn from sources such as the federal census and the federal direct tax of 1798. Lee Soltow employs the same types of sources but uses them to study distributions, rather than totals or averages. He is interested in observations for individuals and families, how they were arrayed in the cross section, and how the cross-section measurements changed as time passed. Thomas Weiss has made his labor force estimates on the basis of a meticulous analysis of census data, but at the state level, not the national or individual level.

Winifred B. Rothenberg employs community tax lists to work out information on the changing structure and productivity of the agriculture of various

Table 2 **U.S. Outputs of Grains, Field Peas, and Potatoes, Crop Years 1839–79**

	1839	1844	1849	1854	1859	1869	1874	1879
Panel A: Outputs, Net of Seed and Feed Allowances (millions of bushels)								
Wheat	72	84	87	104	151	241	310	399
Corn	70	99	115	162	158	146	249	404
Oats	37	45	44	47	52	85	82	125
Barley	4	4	4	7	12	20	24	25
Rye	14	11	11	9	16	13	13	15
Buckwheat	5	7	6	5	12	7	7	8
Peas & beans	4	5	6	6	9	3	8	6
Potatoes	52	58	55	60	92	120	108	146
Sweet potatoes	34	34	35	36	38	21	27	31
Total	292	347	363	436	540	653	828	1,159
Panel B: Outputs, Net of Feed and Seed Allowances, Exports[a] and Milling Wastes, Expressed in Daily Calorie Equivalents per Member of the U.S. Population								
Wheat	920	975	868	895	1,082	1,194	1,336	1,107
Corn	894	1,073	1,030	1,247	1,088	804	1,084	1,351
Oats	148	153	130	118	113	146	125	171
Barley	23	23	21	31	43	58	59	57
Rye	151	98	85	65	94	63	54	55
Buckwheat	35	42	32	24	47	22	18	19
Peas and beans	59	60	59	57	72	21	43	29
Potatoes	161	153	126	116	155	160	127	154
Sweet potatoes	148	126	112	98	90	39	45	46
Total	2,539	2,703	2,463	2,651	2,784	2,507	2,891	2,989

Sources: **Panel A:** Data underlying table A-2 in Gallman (1960, 46–48). **Panel B:** Estimates of the numbers of pounds of processed products that could be made from the bushels of output recorded in panel A were constructed. The conversion coefficients were taken from U.S. Department of Agriculture (1952, 39–42). In the cases of peas and beans, potatoes, and sweet potatoes, the products were unprocessed. The number of pounds of unprocessed products contained in a bushel, in each of these cases, was taken from the same source (33 [soybeans], 71). (The peas and beans reported in panel A are not soybeans but are likely to have been of a similar weight: 60 pounds per bushel.) The processed products chosen were wheat meal and wheat flour; cornmeal and dry hominy; oat flour; pearled barley; rye flour; and buckwheat flour.

The figures in panel B are based on wheat meal and cornmeal, and they underlie the upper-bound estimates in table 1. The milling loss rates for wheat flour and dry hominy are much greater; the conversion rates for these products underlie the lower-bound estimates in table 1.

The caloric contents of foods were taken from Nutrition Research, Inc. (1979, 200, 202, 204, 226, 230, 232): dry wheat meal, all-purpose sifted wheat flour, cornmeal, corn flour, oat flakes, light dry, pearled barley, light sifted rye flour, dark sifted rye flour, light sifted buckwheat flour, dark sifted buckwheat flour, potatoes baked in skin, and baked sweet potatoes.

Use of USDA coefficients (*Composition of Foods,* 1984, 1989), in place of the Nutrition Research figures, would have led to slightly higher estimates of the caloric value of the foods listed in this table. The export figures are from U.S. Department of the Interior, Census Office (1883, 5–7).

[a]Wheat flour, corn, and cornmeal.

Table 3 **U.S. Outputs of Major Grains, Crop Years 1839–49**

	1839	1841	1842	1843	1844	1845	1847	1848	1849
				Panel A: Total Outputs (millions of bushels)					
Wheat	85	92	102	100	96	107	114	126	101
Corn	378	387	442	495	422	418	539	588	592
Oats	123	131	151	146	172	163	168	186	147
Rye	19	19	23	24	27	27	29	33	14
Barley	4	5	4	3	4	5	6	6	5
Buckwheat	7	8	10	8	9	12	13	10	
Total	616	642	732	776	730	730	868	952	869
				Panel B: Total Outputs per Member of the U.S. Population, (bushels)					
	36	35	39	40	36	35	39	42	37

Source: U.S. Patent Office data underlying Gallman (1963).
Note: For caveats, see Gallman (1963).

Massachusetts communities, and to understand the diverse reactions to the broadening of markets registered by different communities—reactions of both an economic and a political nature. Kenneth L. Sokoloff, making use of the federal censuses and the McLane Report, assembles evidence on manufacturing at the level of the firm. He also produces an index of innovative activity based on the numbers of applications made to the Patent Office. Robert A. Margo reports on wage rate data collected from an underexploited source, the pay lists of civilians working for the army at various posts around the country. The regional coverage of this data set is exceptionally wide, and this makes it an unusually valuable source.

Whereas the Weiss, Margo, Rothenberg, Sokoloff, and Gallman studies look chiefly at the resources available to Americans and the productive results they achieved from them, Lorena S. Walsh is concerned with the disposition of the final product. Her sources are extraordinarily diverse and revealing. The lines of work she synthesizes make use of probate records, widows' allowances, business and household accounts, cookbooks, and the proceeds of archaeological digs. Each of these sources provides a somewhat different perspective on the standard of life. Soltow employs an equally wide array of types of evidence to try to understand the circumstances of the free poor.

Unconventional Approaches to the Measurement of the Standard of Living

All of the papers that deal with economic growth yield very similar results: growth was going forward at a rapid and accelerating pace, and the distribution of income among income classes seems to have changed little. But Walsh points out that economic growth may very well have interfered with the access

of the poor to adequate diet, the results of the income distribution studies to the contrary notwithstanding. With growth, natural sources of food derived from hunting and gathering (sources missed by the income studies) may have been reduced. She does not believe this was at all a serious loss in the nineteenth century—these sources had dwindled long before the beginning of the period under review. But systems of distribution depending on kinship may have deteriorated, with the expansion of market-directed activities, particularly after the 1830s, and the poor may have suffered thereby.

Unfortunately, according to Walsh, the period 1840–60 is one for which work on consumption is quite thin. Consequently, while we may know that nonmarket forms of distribution were attenuated during this period, we do not know the extent of the impact of this development on the poor. It is not simply a question of the importance of the kinship distribution networks and the extent to which they were destroyed by the market. There are also questions of the exact roles these networks played and the ease with which they could be replaced by other institutions. For example, networks that distributed fresh meat seem to have arisen in a setting in which fresh meat could not be stored for long and in which market outlets were inadequate. Under these circumstances, the Smith family might slaughter an ox and share the meat with the Joneses and the Browns, in the expectation that these families would reciprocate when it came their turn to kill a beast (Walsh). Or Smith might share with Jones and Brown, on the agreement that they would help Smith with his harvest, or provide him with firewood, or engage in some other trade. Smith might also use the slaughter of an animal as the occasion for dispensing charity to a poor relation, or giving a newly launched couple—say a son and his wife—a helping hand. With the opening of markets in fresh meat, Smith might find it simpler to sell off his excess production and handle his obligations to his kin and his need for labor by paying out cash. Did he remain as generous as before? Or did he become less generous? Or did his cash income lead to larger real disbursements? Did he tend to the needs of his poor relations? How far did the state supplant him in the charitable field? If the full impact of the rise of the market on the poor is to be understood, these are important questions to address.

Population gravitated to regions and economic sectors where incomes were high, and these movements raised average incomes. There were probably some associated costs. For example, did the shift from agricultural to industrial work change the length of the work year, or the intensity of the work, or the security of the work, or the extent to which the work was interesting? The literature of American economic history is filled with suggestions that the answers to these questions are that the industrial work year was longer, more intense, more insecure, and more boring. If, in fact, these assertions are correct—and if there were no fully compensating advantages—then the income and wage data overstate the true welfare gains achieved by economic growth in the decades before 1860. But whether they are correct has not been estab-

lished. Here is an area in which additional scholarly work is called for, although the research problems are extraordinarily difficult.

For example, a very substantial part of the industrial labor force created in this period consisted of immigrants. It therefore makes little sense to compare industrial and agricultural work conditions in the United States alone, to gauge the income gains of industrialization, net of all costs of industrialization. The proper comparison would consider the lot of the immigrants in their home countries before immigration and their situations after their arrival in the United States, taking account not only of the work conditions of these people in these two sets of circumstances, but also their incomes before and after immigration. That is, a new kind of national income series is called for, one that is a hybrid of the incomes earned in the United States and the incomes earned abroad by those immigrants who entered the United States before 1860. Constructing such a series would be a daunting task. We mention the point mainly to indicate the scale of the difficulties involved when one attempts to work out the net income gains achieved by structural change. It should be clear, however, that the measured gains from structural change would probably be greater if the condition of immigrants before immigration were taken into account, than if it were not.

Immigrants affected the standard of living in the United States in other respects. The flood of immigrants in the 1850s apparently weakened labor markets, such that the real wage rate of the native-born stopped rising toward the middle of the decade (Margo). Immigrants were associated with the rapid expansion of American cities. Housing facilities were crowded, and the problems of managing water supplies and wastes outran the ability of political organizations to cope with them (Steckel). There were costs in terms of illness and discomfort that are not taken into account in the income statistics. It is not entirely clear whether we should view the costs resulting from diseases borne by immigrants as exogenous changes in the standard of living, having little to do with economic development, or endogenous changes, flowing from it. The choice between these two positions turns on our view of the motives of the immigrants. If they simply fled intolerable conditions at home—for example, the Irish famine—and fetched up in America as the only practicable haven, the former interpretation should be adopted: diseases were exogenous. If they were drawn by American industrial opportunities, however, the latter is the appropriate view of things: diseases were occasioned by modernization. But the distinction is, in a sense, an artificial one, similar to the distinction sometimes made in migration studies between push and pull forces. (See Gould 1978, especially 628–34.) In any case, regardless of the position adopted with respect to the causal links (if any) between development and the deterioration of the disease environment, some allowance for deteriorating city conditions should be made in assessing changes in the standard of life during this period. This assessment should be made in the context of the equilibrating changes in wage rates, as Jeffrey Williamson has suggested (Williamson 1981, 1987).

The standard of living was surely affected by the incidence of disease, and there is some evidence that problems of morbidity increased in this period (Steckel). Population growth, to the extent that it led to higher population densities, encouraged the spread of epidemics; overcrowded cities became breeding grounds for germs (Steckel). The great cholera epidemics, beginning in 1833, were brought to North America by immigrants. The yellow fever epidemic of 1853 similarly came from abroad. Furthermore, students of malaria in the United States believe that there was an efflorescence of the disease (especially in the West) in the antebellum years, which carried forward into the seventies. It came about, some scholars believe, because of the enhanced movement of people associated with economic development, the Civil War, and in particular, the westward movement (Steckel).

Certainly malaria was a common western disease. Mark Twain probably had it in mind when, in describing life in Hannibal, he said: "Bear Creek . . . was a famous breeder of chills and fevers in its day. I remember one summer when everybody in town had the disease at once" (Twain 1901, 211). In 1861 Anthony Trollope visited the United States and described the typical westerner: "Visit him, and you will find him . . . too often bearing on his lantern jaw the signs of ague and sickness" (1862, 128): "their thin faces, their pale skins, their unenergetic temperament" (133). "He will sit for hours over a stove . . . chewing the cud of reflection" (135). Western women "are generally hard, dry, and melancholy" (135). Then a telling comparison: Americans from the Northeast "are talkative, intelligent, inclined to be social . . . almost invariably companionable. . . . In the West I found men gloomy and silent" (394).[6]

Although the paper-givers and discussants—especially Steckel, Walsh, Main, Shammas, and Soltow—draw attention to these aspects of American life, they have not assembled direct measurements of the significance of each for the standard of living, measurements comparable, for example, to the income and real wage indexes. Nor have they attempted to judge the elements of gain from modernization that the income statistics ignore.[7] That is, we are not now in a position to compute the real American national product per capita, exclusive of the costs and inclusive of the benefits that are left out of account when scholars study economic change; we do not have a nineteenth-century Nordhaus-Tobin index. Steckel, however, reports on a measurement

6. A colleague, Karin Gleiter, tells us that Charles Dickens mentions what was clearly midwestern malaria in his novel *Martin Chuzzlewit.*

7. The benefits are often ignored. City housing for the poor was cramped, but on the whole city dwellers could more easily find anonymity and privacy than could people living in small villages, or even on isolated family farms. A greater choice of companionship, new forms of entertainment, and more abundant supplies of information were also available in cities. For centuries country living has been characterized as innocent but vulgar and brutal; city life, sophisticated but wicked. In the discussion of the effects of the transition to urban life during the early stages of modernization, frequently the adjectives *vulgar, brutal,* and *sophisticated* drop out, and we are left with innocent country folk braving the wickedness of the city.

device that captures some of the effects of these developments, although it does not show the sources of individual costs, nor can it be combined with the national income–style measurements.

New Indexes of Well-being: Height and the Concept of Net Nutrition

Steckel argues that measurements of human size—height and weight—are sensitive indicators of nutritional status. For example, the distribution of heights of adult males of a given cohort in a large population is a genetic phenomenon, but the average height will reflect the nutritional status of the cohort during the years in which it went through its important growth spurts, one in infancy, the other during adolescence. The changes in well-being of a given population may be studied, then, by observing the average heights of succeeding cohorts of men or women. The level of well-being may be judged by comparing the average height achieved by a population with the one that would have been achieved under ideal circumstances. (In practice, comparisons are made with heights of modern populations.)

There remain, however, important dating problems. The growth spurts of a cohort are separated by about fifteen years. If, for example, a cohort born in the late 1830s is shorter than the previous cohorts, the events that produced this result may have occurred as early as the late 1830s or as late as the mid-1850s. Although there is no published documentation on the topic as yet, biologists believe that losses in infancy might be made up in adolescence.[8] The second growth spurt period is therefore probably the more important for determining whether or not there will be stunting. If a cohort is stunted, then, we should examine the period when this cohort was in its midteen years, to find the source of stunting.

Nutritional status is a net concept; it takes into account both gross nutrition and the claims against nutrition exerted by the activities of the individual (for example, work) and by illness. For example, a cohort may exhibit relatively short heights if the gross nutrition of its members was relatively low during childhood, or if the claims against gross nutrition occasioned by work or disease were relatively high. If a nation's population experiences a decline in average height, the causes may be sought in a deterioration in diet, an increase in energy expended in work or other activities, or an increase in the incidence or virulence of disease. Height can be affected only if net nutrition is altered during the crucial phases of childhood growth, and if the deprivation is not made good before the end of the adolescent growth spurt. The growth spurt may be delayed by deprivation; if it is put off too long, the individual will be stunted.

It will be obvious, then, that not all of the cost factors discussed on the

8. Personal communication from Barry Popkin, Department of Nutrition, University of North Carolina, Chapel Hill. Popkin has in mind documentation based on longitudinal evidence. Steckel's cross-sectional study strongly suggests teenage catch-up among antebellum slaves.

previous pages will be reflected in height changes. For example, an adult who has achieved his final height and then undertakes work of an intensity that depletes his nutritional reserves may get sick, but he will not grow shorter. Nor will a child be stunted if he experiences an insult to his nutritional status (through illness or through a change in work regime) that is on a modest scale or is subsequently corrected by good nutrition. Height changes, therefore, reflect important, uncompensated (or incompletely compensated) shifts in nutritional status during childhood.

Height is a useful general indicator of well-being, and a valuable one because, unlike national income statistics, sources of evidence on heights are fairly widespread in time and space, and measurements are relatively easily made (Steckel). Nonetheless, height indexes are not substitutes for national income statistics; they report only on nutritional status, not on any other aspect of human life. Heights can fall while income and consumption per capita are rising, and vice versa.

American history provides several sources of evidence on height. Steckel reports on measurements drawn from two: military records and coastwise shipping manifests; the latter contain data on slave heights. According to these records, Americans achieved nearly modern heights by the late eighteenth century. They were then taller, on average, than Europeans, and the cohorts of free whites born in each decade down to the 1830s were all tall by modern standards. In the case of slaves, adult males were shorter than free males throughout, and the heights of cohorts born late in the eighteenth century actually declined. But that development was reversed, and the cohort of the late 1820s was within one or two centimeters of the heights of free white males. Heights of both free and slave males then began to decline, very moderately at first, and then more dramatically. The drop was especially sharp for the cohort born during the 1860s, but the decline continued thereafter, until late in the century (Steckel).

Steckel's results, then, represent an important qualification on the conclusions drawn by most of the other papers in this volume. The other papers describe a period of successful economic growth, during which the standard of living was probably rising. Steckel's paper suggests that in net nutrition, at least, there were some losses. His findings tend to be confirmed by the results Clayne L. Pope has obtained with respect to mortality (Pope 1992). Pope's sample shows that mortality rates cycled in the nineteenth century and, in particular, that period life expectation dropped importantly in the 1840s, 1850s, and 1860s. Period measures—measures of the life expectation of all cohorts alive in a given interval—pick up more clearly the impacts of the peculiar experiences of a short historical period than do cohort measures. Pope's work supports Steckel's findings that all was not well in the two decades before the Civil War.

This does not necessarily mean that people became worse off, on balance. Walsh describes poor Americans at the turn of the century sitting on the floor

and eating their meals with their hands, straight from the pot. A cohort might gladly sacrifice, on average, a centimeter or so in height for a table, chairs, plates, knives, and forks. At the turn of the century, most people used fireplaces to heat their homes and cook (Walsh). By 1860, the total number of heating and cooking stoves produced in the United States in the previous thirty years was probably well in excess of twice the number of free American families.[9] Heating and cooking conditions must have improved enormously. These might be regarded as fair recompense for slightly shorter heights—if shorter heights and improved amenities were causally related; whether they would have been regarded as worth the three or four years of life that Pope finds were lost, on average, in the 1840s and 1850s is another matter.

How does one account for the decline in height that Steckel has reported? Steckel considers the possibility that gross nutrition fell but finds little reason to believe that happened. (See also tables 1–3, which indicate that nutritional levels remained high from 1839 through 1879.) A second possibility is that the urban crowding and environmental degradation that went hand in hand with industrialization led to a deterioration in the disease environment, with unfavorable results for net nutrition (Steckel). Easterners were typically shorter than southerners and westerners. The initial concentration of industrialization in the East might help to account for this phenomenon. Immigrants also were concentrated in the Northeast, and they no doubt made the pool of disease germs a richer brew. They also brought with them dietary practices based on conditions in the home country. They were themselves shorter than native Americans, and their children, raised on a traditional diet, may also have been shorter.[10] These are important considerations. There is one puzzle remaining, however. The effects of pollution, crowding, and disease must have fallen with particular force on the poor. If that is so, class differences in heights should have widened and the shape of the distribution of heights should have changed. In fact it apparently did not (Soltow).

No doubt other reasons could be elicited to explain the decline in heights in the East, particularly the urban East, but Steckel also found that western and southern cohorts were becoming shorter. The best explanation for this phenomenon seems at present to be that the disease environment became worse.[11] For example, cholera struck in 1833, 1849, and 1866 and quickly spread all over the country; in 1853 yellow fever killed one-tenth of the population of New Orleans. The timing is plausible; that is, these diseases hit the United

9. Inferred from Depew (1895, 2:361).

10. The entry of married women into the northeastern industrial labor force could have led to earlier weaning of children, with unfavorable consequences for net nutrition. But the number of married women in the industrial work force was so small that this practice—if it existed at all—probably did not have a detectable effect on average height.

11. This discussion of the disease environment depends on Ackerknecht (1945, 1965), Bilson (1980), Boyd (1941), Drake (1964), Duffy (1966), Rosenberg (1962), Toner (1873), and Wickes (1953).

States in the periods in which cohorts were apparently suffering deprivation. But cholera and yellow fever should probably not be implicated in the stunting of the population. They were too destructive for that. Death rates of the infected population ran from 50 percent to 90 percent. Infants and adolescents were not stunted, they were killed outright. In any case, victims of these diseases who recover usually do so in a relatively short period of time, so that even these people are unlikely to suffer stunting.

Malaria is a likelier villain, but not so clearly guilty as to warrant conviction. It is a recurring disease that can debilitate a population and can readily be associated with stunting. The problem is one of timing. The height data show that stunting began after the cohorts of the 1830s or 1840s and ended late in the century. But the disease was widespread very much earlier than this—for example, it was well-established in Illinois by 1760—and apparently became endemic in the West by the 1840s and 1850s. The movement of population during the Civil War may have given the epidemic form of the disease new life, but the disease seems to have stabilized again before the end of the period of stunting. The puzzle remains unsolved.

One of the most interesting features of Steckel's findings is that they follow very closely the results obtained by Floud, Wachter, and Gregory with respect to England (1990, chaps. 7, 8). That is, the English data show that heights peaked with the cohorts born in the 1820s and then fell from the 1830s to the early 1850s. The timing is not identical with the American pattern, but it is close enough to demand attention. Both countries were in the process of modernization in this period, but modernization had begun much earlier in England than in the United States and was much farther advanced in the years in which cohort heights were falling. The coincidence of height declines in the two countries suggests that the forces at work were international in their effects, and perhaps not closely tied to industrialization per se. There is the record of the international diffusion of catastrophic disease, and it is also well known that, in the period in which heights were declining, migration from Britain to the United States was increasing, ultimately to achieve very high levels.

It should be said, however, that Floud, Wachter, and Gregory do not take this position. They attribute the decline in heights in Britain to urbanization: in the early stages of industrialization, they say, real incomes rose enough to have a favorable effect on net nutrition and average height. It was only after the early stages had passed that the burdens imposed on the population by urbanization had clearly visible results.

Such an account will not serve for the United States, however, as we have seen. The declines in height took place in the countryside as well as the cities, and urbanization directly affected a much smaller fraction of the population in the United States than in Britain. It is possible, of course, that the British experience is to be explained by disease, occasioned by rapid urbanization, and that the British pattern was then transmitted to the United States by British

emigrants. If that is the case, however, what were the diseases that played the central roles in this drama?

Conclusions

We began this introduction by saying that the story of development told in these papers is quite clear: Americans at the end of the eighteenth century were well off by the standards of the day—indeed, quite well off by modern standards, as well. Their incomes were high, and they were so well-nourished that they had almost attained modern heights. Economic development was under way, and it went forward at an accelerating pace. Income per capita rose faster and faster, and the structure of the economy shifted. The United States was in the process of converting its economy from one that was predominantly agricultural and commercial to one that would become predominantly industrial.

Associated with development, there was a pronounced and quite persistent improvement in certain aspects of the standard of living, interrupted occasionally, perhaps, by major shocks to the economy, such as the impact of the Crimean War on the prices of grains. These long-term changes were negotiated without producing major shifts in the size distribution of income and wealth. The gains from growth were widely shared. But there were also some costs and benefits to development that are not incorporated in the standard income, consumption, and real wage estimates. We do not as yet have measurements of them, and clearly a major task for future scholarship is to attempt to produce such estimates. In particular, we need to know more about the effects of structural changes on patterns of work, morbidity and mortality, and nonmarket networks for the distribution of output. The sources on patterns of consumption for the last two decades of the period before the Civil War are as yet underutilized. Walsh's paper describes many of them, sources that have been much more effectively researched for the years before 1840. Additionally, the federal and state censuses provide detailed information on the output of consumer goods, and the reports of the Secretary of the Treasury provide similarly detailed information on imports. We need more work along these lines.

The measurements of height yield a kind of incomplete gross index of the costs of development. Here also there are tasks for future scholarship. Specifically, can we be sure that it was development, per se, that produced the results that Steckel reports in this volume? If so, which aspects of development were responsible and how far was each responsible? Where did the burdens of development fall with particular weight? If development was not at fault, what did cause the unfavorable turn of events with respect to morbidity and mortality in the two or three decades before the Civil War? These are the questions that future scholarship must answer. The essays here have settled important issues and have set the stage for the next round of research.

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