

1

ECONOMIC GROWTH AND STRUCTURAL CHANGE IN THE LONG NINETEENTH CENTURY

ROBERT E. GALLMAN

INTRODUCTION

This chapter is concerned with quantitative features of the development of the American economy in the period between the late eighteenth century and World War I – the long nineteenth century. A reasonable place to begin is with measurements of the size of the economy. Since a central feature of any economy is production, size is appropriately measured by aggregate output. Other indicators, such as population and geographic extent, are considered below.

The conventional measures of aggregate output are the national product – that is, output produced by factors of production owned by Americans – and the domestic product – output produced by factors of production domiciled in the United States. The proper index to select depends upon whether one thinks of the United States as the sum of all Americans or as a geographic entity. We are interested in the history of the people of the United States, and therefore the national product is the more appropriate concept. It underlies most of the measurements treated in this chapter; in practice the choice matters little, however, since in the years under examination the national product and the domestic product were virtually identical. A more important question is the extent to which these conventional measures properly describe levels of output and changes in output over time, a question set aside for the moment but treated later in this essay.

SIZE AND GROWTH OF THE AMERICAN ECONOMY

Size

The American gross national product probably ran around \$144 million just before the Revolution (Table 1.3). (A wide margin for error must be allowed.) By modern standards, that is a small value, considerably less than half as great as Helene Curtis's sales in the quarter ending August 31, 1995. If we allow for price changes, gross national product in 1774, expressed in prices of 1995, would run roughly \$2.8 billion. That is less than four-tenths of the current annual output of the state with the smallest total output, Wyoming, and less than one-third greater than A&P's sales in the twelve weeks ending September 9, 1995.

By the standards of the world of 1774, however, the American economy was not small. It yielded a gross national product that was probably more than one-third that of Great Britain (excluding Ireland) (see Table 1.1). Great Britain was then undergoing an agricultural revolution and was in the early stages of the Industrial Revolution; it was one of the most powerful nations in the world, economically and politically. The American economy was smaller than the British – and, no doubt, smaller than the Spanish or French, in Europe, and the Chinese or Indian, in Asia – but it was by no means tiny. It may very well have been as large as the well-developed Dutch and Belgian economies, taken together.

Growth

Between 1774 and 1909 the American real gross national product increased about 175-fold, or at an average rate of 3.9 percent per year (Table 1.3). Higher rates have been recorded in recent times, but only for much shorter periods. In the nineteenth century, the frontier economies of Australia and Canada grew about as fast as the American, and the Argentine economy, considerably faster. (See Table 1.2.) Again, the periods these records cover are substantially shorter than the 135 years encompassed by the American record. Although it is possible that higher rates of growth were recorded by one or more of these three economies over the extended period 1774–1909, the rates would be computed on very small bases: for example, in 1774 the entire population of Australia consisted of a small number of aborigines – Captain Cook had arrived only four years before –

Table 1.1. *Aggregate product in various countries, compared with aggregate American product, various dates*

	Current prices		1990 Geary-Khamis dollars			
	1774	1840	1850	1870	1890	1913
<i>Western Europe</i>						
a. United Kingdom	2.7	1.3–1.5	1.42	0.97	0.67	0.41
b. France		1.7	1.43	0.73	0.44	0.28
c. Germany			0.69	0.45	0.33	0.28
d. Belgium			0.19	0.14	0.10	0.06
e. Netherlands			0.14	0.10	0.07	0.05
f. Ireland			N.A.	0.07	0.03	0.02
g. Denmark			0.06	0.04	0.03	0.02
h. Norway			0.04	0.02	0.02	0.01
i. Sweden			0.11	0.07	0.05	0.03
j. Finland			N.A.	0.02	0.01	0.01
k. Italy			N.A.	0.42	0.24	0.18
l. Switzerland			N.A.	0.06	N.A.	0.03
m. Portugal			0.10	0.05	0.04	0.02
n. Spain			0.40	0.23	0.15	0.09
o. Czechoslovakia			0.22	0.12	0.08	0.05
p. Hungary			N.A.	0.07	N.A.	0.03
q. Austria			0.15	0.09	0.06	0.05
r. Totals (excl. Switzerland and Hungary)			N.A.	3.52	2.32	1.56
<i>Eastern Europe</i>						
a. USSR			N.A.	0.85	0.47	0.45
<i>Australia, New Zealand, and the Americas</i>						
a. Australia			0.03	0.06	0.07	0.05
b. New Zealand			N.A.	0.02	0.01	0.01
c. Canada			0.07	0.06	0.05	0.06
d. Argentina			N.A.	0.02	0.03	0.06
e. Brazil			0.12	0.07	0.05	0.04
f. Mexico			0.12	0.07	0.05	0.04
g. Chile			N.A.	N.A.	N.A.	0.02
h. Colombia			N.A.	N.A.	N.A.	0.01
i. Peru			N.A.	N.A.	N.A.	0.01
j. Venezuela			N.A.	N.A.	N.A.	0.01
k. Totals (excl. Chile, Colombia, Peru, Venezuela)				0.30	0.26	0.26

Table 1.1 (cont.)

	Current prices		1990 Geary-Khamis dollars			
	1774	1840	1850	1870	1890	1913
4. <i>Asia</i>						
a. China			N.A.	1.90	1.09	0.58
b. India			2.42	1.20	0.66	0.32
c. Indonesia			0.36	0.19	0.12	0.09
d. Thailand			N.A.	0.04	0.02	0.01
e. Japan			N.A.	0.26	0.18	0.13
f. Totals				3.59	2.07	1.13
<i>Grand Totals</i> (Σ of 1r, 2a, 3k, 4f)				8.26	5.12	3.40

Note: The table should be read in the following way: in 1774 the aggregate product of Great Britain (excl. Ireland) was roughly 2.7 times as large as the aggregate product of the Thirteen Colonies, when both aggregate products are expressed in prices of 1774; in 1913, aggregate product in the United Kingdom was roughly 41 percent as large as the aggregate product of the United States, when both aggregate products are expressed in Geary-Khamis dollars of 1990. Aggregate products refer to GNP, in 1774 and 1840, and to GDP, in 1850–1913.

Source: 1774: The estimate is based on Alice Hanson Jones, *Wealth of a Nation To Be* (New York, 1980), 39, 68. The American per capita income level is the higher of Jones's two estimates, on the authority of Weiss. Thomas Weiss, "U.S. Labor Force Estimates and Economic Growth, 1800–1860," in Robert E. Gallman and John Joseph Wallis (eds.), *American Economic Growth and Standards of Living before the Civil War* (Chicago, 1992), 32. See also, Lance E. Davis, Richard A. Easterlin, William N. Parker, et al., *American Economic Growth, An Economist's History of the United States* (New York, 1972), 24; 1840: Derived from Gallman, "Gross National Product in the United States 1834–1909," in Dorothy S. Brady (ed.), *Output, Employment, and Productivity in the United States After 1800*, Studies in Income and Wealth, Volume 30 (New York, 1966), 5, 26; 1850–1913: Angus Maddison, *Monitoring the World Economy, 1820–1992* (Paris, 1995), 180, 182, 184, 186, 188, 190. The Geary-Khamis procedure yields multilateral comparisons. See Maddison, 162–63.

and the total European population of Argentina in the same year was probably no more than 160,000. Canada was larger, but not much larger. The U.S. economy remained much bigger than the other three, down to World War I: American real Gross Domestic Product in 1913 was almost six times as large as the sum of the real GDPs of Argentina, Australia, and Canada (Table 1.1).

These four countries shared several characteristics. They were colonized by Europeans (and Africans, in the case of the United States), their native

Table 1.2. *Average annual rates of change of real GDP (1990 Geary-Khamis dollars), nineteen countries, 1820–1913*

Argentina	{6.0%}
U.S.A.	4.1
Canada	(3.8)
Australia	{3.5}
Netherlands	2.4
Germany	2.4
Denmark	2.3
Belgium	2.1
Finland	2.1
Brazil	2.0
U.K.	2.0
Austria	1.9
Norway	1.9
Sweden	1.9
Italy	1.6
Mexico	1.6
Spain	1.4
Japan	1.2
Ireland	0.6

Note: () = 1850–1913; { } = 1870–1913

Source: Derived from Maddison, *Monitoring the World Economy*, 180, 182, 184, 188.

populations were small and easy to brush aside, and having done so, the colonizers were left with abundant, rich natural resources. All four countries then experienced rapid population and economic growth. Rapid growth simply began earliest in the colonies that ultimately became the United States.

No European economy grew so fast for so long as did that of the United States before World War I. For example, the British growth rate ran only about 2.2 percent per year from circa 1770 to 1913. The difference between Britain and the United States with respect to the pace of growth had important consequences. In 1774 the British current price GNP was almost three times the American; in 1840 it was only about one and a half times as great, while in 1913, the entire United Kingdom had a real GDP only about 41 percent as large as the American real GDP. As time passed, the relative standing of the two economies had reversed.

By the beginning of World War I the United States was by far the largest producer of goods and services in the world. Aggregate annual output was greater in the United States than in the three main World War I belligerents – the United Kingdom, Germany, and France – combined. In fact, at that time it was roughly two-thirds as large as the total GDP of *all* of the leading Western European economies (Table 1.1).

The Price Level

Most of the preceding remarks refer to measures of real output. Over the long term, U.S. real and nominal output grew at approximately the same rates (Table 1.3). That is, prices seem to have been at roughly the same level just before the Revolution as just before World War I. This statement is subject to well-known qualifications, arising from the changing composition of aggregate output as time passed. Many items produced in large amounts before the Revolution (e.g., oil lamps) were either not produced at all in the early twentieth century, or in very small quantities. Similarly, important products of the years just before World War I (e.g., electric lamps) were completely unknown in 1774. Price indices that cover many years thus pose serious problems of construction and interpretation. Nonetheless, there can be little doubt that American experience with the long-term drift of the price level was very different in the long nineteenth century from what it has been since. In the first period there was little trend (prices rose about 0.05 percent per year); in the second, the trend has been strongly upward, the index rising at a rate of about 3.4 percent per year. In 1991 the price level was about 13.5 times as high as it had been on the eve of World War I.

Although the trend in nineteenth-century prices was approximately zero, there were periods of marked inflation and periods of marked deflation. Table 1.3 is not ideally suited to deal with this issue. Nonetheless, the inflations associated with the French-British wars, the boom following the War of 1812, and the inflation of the Civil War all make their imprints on the record in the table. So do the periods of price decline after the collapse of the 1819 boom and after the Civil War. The reflation of the world economy after the gold discoveries of the 1890s also appears. (See Rockoff, Chap. 14, this volume for a more comprehensive treatment of this subject.)

able 1.3. *U.S. gross national product, current prices and prices of 1860, 1774–1909, and rates of change*

Panel A: GNP (Mil. \$)			
Years	Current prices	Price index (1860 = 100)	1860 prices
1774	144	(97)	149
1793	(317)	(119)	266
1800	(544)	(151)	360
1807	(680)	(139)	489
1810	(765)	(148)	517
1820	(1,079)	(141)	765
1830	(1,229)	(111)	1,107
1834/43	(1,803)	(112)	1,610
1839/48	1,951	97.4	2,003
1844/53	2,649	100.8	2,628
1849/58	3,474	102.3	3,397
1859			4,226
1869			5,547
1869/78	8,009	120.7	6,633
1874/83	9,736	111.8	8,711
1879/88	11,467	104.4	10,987
1884/93	12,536	97.1	12,915
1889/98	13,464	91.9	14,655
1894/03	16,335	93.1	17,546
1899/08	22,588	103.1	21,903
1909			25,968

Panel B: Average annual short-term rates of change, GNP in prices of 1860	
1774–1793	3.1%
1793–1800	4.4
1800–1807	4.5
1807–1810	1.9
1810–1820	4.0
1820–1830	3.8
1830–1834/43	4.2
1834/43–1839/48	4.5
1839/48–1844/53	5.6
1844/53–1849/58	5.3
1849/58–1859	4.1
1859–1869	2.9
1869–1869/78	4.1
1869/78–1874/83	5.6
1874/83–1879/88	4.8
1879/88–1884/93	3.3

Table 1.3. (cont.)

Panel B: Average annual short-term rates of change, GNP in prices of 1860	
1884/93–1889/98	2.6
1889/98–1894/1903	3.7
1894/03–1899/1908	4.5
1899/08–1909	3.1
Panel C: Average annual long-term rates of change, GNP in prices of 1860	
1774–1800	3.5%
1800–1834/43	3.9
1834/43–1869	4.2
1869–1909	3.9
1774–1909	3.9

Note: The estimates for the later years are more reliable than those for the earlier years. See the bibliographic essay. Bracketed price index numbers refer to the cost of living, not to the GNP deflator; parenthetical GNP figures were derived by use of a cost of living index, rather than by the more appropriate GNP deflator.

Source: *GNP, 1834/43–1909, 1860 prices, and 1839/48–1909, current prices:* Taken from Robert E. Gallman, “Gross National Product in the United States, 1834–1909,” in Dorothy S. Brady (ed.), *Output, Employment, and Productivity in the United States After 1800*, Studies in Income and Wealth, Vol. 30 (New York, 1966) 26 (and underlying worksheets), adjusted to incorporate inventory changes, the latter computed from Robert E. Gallman, “The United States Capital Stock in the Nineteenth Century,” in Stanley L. Engerman and Robert E. Gallman (eds.), *Long-Term Factors in American Economic Growth*, Studies in Income and Wealth, vol. 51 (Chicago, 1986), 204 and Robert E. Gallman, “American Economic Growth Before the Civil War: The Testimony of the Capital Stock Estimates,” in Robert E. Gallman and John Joseph Wallis (eds.), *American Economic Growth and Standards of Living Before the Civil War* (Chicago, 1992), 94 (and underlying worksheets). The years 1834/43 through 1859 are census years. For example, the year 1859 refers to the 12 months from June 1, 1859, to May 31, 1860. The current price figures for 1839/48, 1844/53, and 1849/58 are actually 3-year averages, rather than decade averages: 1839, 1844, 1849; 1844, 1849, 1854; 1849, 1854, 1859. *Price Index, 1839/48–1909:* Computed by dividing current price GNP by GNP in prices of 1860. *GNP, 1774–1830, prices of 1860:* The figure for 1834/43 was extrapolated to the earlier years on real GDP estimates (1840 prices) drawn from Thomas Weiss, “U.S. Labor Force Estimates and Economic Growth, 1800–1860,” in Gallman and Wallis (eds.), *American Economic Growth*, 27, 31, 32. The resulting estimates are treated as calendar year estimates. *Price Index, 1774–1834/43:* David and Solar cost of living index, base 1860 (Paul A. David and Peter Solar, “A Bicentenary Contribution to the History of the Cost of Living in America,” *Research in Economic History*, 2 (1977)). *Current Price GNP, 1793–1834/43:* GNP in 1860 prices multiplied by the price index. *Current Price GNP, 1774:* See source note to Table 1.1.

Variations in the Rate of Growth

Although there was virtually no trend in the rate of change of aggregate output between the Revolution and World War I (Panel C of Table 1.3), there were important short-term changes, many of an episodic character (Panel B of Table 1.3). The data in Table 1.3 are not well devised to show short-term movements in the economy – for example, the estimates for the years before 1834 (except for those for 1793 and 1807) make no allowance for variations in the level of employment of inputs, nor do they take into account differences in the level of crop production from one year to the next occasioned by variations in weather, the ravages of insects, crop diseases, etc. The estimates were devised for the study of long-term trends, not for short-term changes. Nonetheless, some of the short-term variations exhibited by this series for the early period probably do reflect real phenomena. For example, the rate of growth shown for the period 1774 to 1793 is relatively low, no doubt due to the effects of the Revolutionary War and the troubles of the Confederation years. It is a little surprising that it is not lower. The years of prosperity for American merchants, shippers, and ship-builders during the hostilities between France and England show up clearly in the table (1793–1800 and 1800–1807) as a time during which the growth rate was high. The rate drops off sharply in the period 1807–1810, likely a consequence of events leading up to the War of 1812.

More reliance can be placed on the series beginning in 1834. The data show clearly the surge of growth during the 20 to 30 years before the Civil War, a surge usually associated with the beginning of industrialization, the westward movement, and the first great nineteenth-century inflow of European migrants. The impact of the Civil War is registered in the low rate of growth for the interval 1859–1869, 2.9 percent per year (a rate that would undoubtedly have been lower still, if the period had been limited to the war years), and the Great Depression of the 1890s made its mark in an even lower rate for the period 1884/93 through 1889/98, 2.6 percent per year. The so-called Great Depression of 1873–1879 does not show up in the aggregate statistics, partly because the decade averages in Table 1.3 are not well designed to catch its effects, but partly also because the quantitative record for the 1870s does indeed suggest that there was a strong upward movement of output in that period. The seeming conflict between the evidence on vigorous output growth and persistent, deep unemployment has received much scholarly attention, without being resolved.

Several of the fluctuations in output described above are the economic consequences of political or military events. Others are due to economic processes that can be regarded as systematic. Every market economy experiences undulations in economic activity. Some – seasonal variations – do not influence annual data; others – business cycles – are difficult to trace in annual data, and even more so in decade-average data of the type contained in Table 1.3, since nineteenth-century business cycles were typically short – three to five years, peak to peak or trough to trough. Important collapses, such as the Great Depression of the 1890s, affect annual series, and even decade-average series, but less cataclysmic events are difficult to date and to measure.

There is a third form of economic fluctuation – the long swing, or Kuznets cycle, of an amplitude of fifteen to twenty-five years, peak to peak or trough to trough – that occurred during this period. It is observable in annual data and in decade averages of the sort figuring in Table 1.3. It has been subject to analysis by Simon Kuznets, Moses Abramovitz, Richard Easterlin, Brinley Thomas, and Douglass North, among many others. All five see these fluctuations as central to the story of American nineteenth-century economic growth.

North's account relates exclusively to the period before the Civil War. To North, the impetus to American antebellum growth from 1815 onward was British demand for American cotton, a demand that arose out of the Industrial Revolution. In the two decades immediately preceding the Civil War, cotton accounted for almost one-half of the value of American exports. The cycling of the Southern economy was a consequence of the process by which planters responded to the British demands. The expansion of the British economy gradually raised the price of raw cotton and eventually encouraged planters to move westward onto new, fertile land, to clear the land, and to begin to produce. There were also investments in social overhead capital, such as railroads, that went along with the westward expansion. When such investments matured, cotton hit the market in unusually large amounts, prices fell, and investment by planters ceased, not to begin again until the expansion of British demand caught up with the ability of Americans to produce, and cotton prices again began to rise.

According to North, the cycle influenced the rest of the American economy through Southern expenditure of cotton earnings. Planters bought manufactures from the Northeast and food supplies from the Northwest. During the expansion phase of the cycle, these demands

were pronounced, and they stimulated growth in the North; during the contraction phase, they fell, both because planters' incomes fell and because planters diverted labor from the production of low-priced cotton to the production of food to feed their slave labor forces, and therefore did not need to buy as much from the Northwest. North's transmission mechanism – particularly the posited links between the West and the South – has been subject to a variety of serious criticisms, as have aspects of the fit of his model to the data, but his account of the impact of cotton demand on the Southern economy remains compelling.

Kuznets, Abramovitz, Easterlin, and Thomas focus chiefly on the migration of European labor and capital to the United States, and, thus, their stories are particularly relevant to the period from the second half of the 1820s onward. Thomas's view is that the long swing was generated by British activities. British labor and capital were induced to migrate overseas during periods of deep and enduring depression in Britain. In turn, British investment of capital and labor stimulated booms in the recipient countries, of which the United States was the chief. These booms involved investment in social overhead capital with long gestation periods. Thus the booms were extended, running roughly 8 to 12 years, rather than the 1.5 to 2.5 years of the standard business cycle.

Kuznets believed that the impetus for these developments came not from England but from the United States. In a very influential paper, Easterlin built and tested a model that was intended to describe both long-term and trend-cycle influences on international migration. In brief, his argument is that the long-term forces at work were essentially European demographic forces, which in turn reflected the diffusion of modernization across Europe. Modernization stimulated population swarming, which, with a substantial lag, led to clogged European labor markets, which in turn stimulated internal and overseas migration. The specific timing of the long swings, however, depended upon developments in the United States. Easterlin's paper represents a test of Kuznets's hypothesis, a test that the hypothesis survived. The debate, however, is by no means closed. Papers continue to appear, setting out a variety of explanations of the long swing, and some denying that the long swing, as a systematic phenomenon, existed.

The manner in which domestic and international factors figured in the American long swings was developed in particularly persuasive form by Kuznets, Abramovitz, and Easterlin. Although their accounts differ in

detail, in each a recovery from a severe depression in the United States (e.g., the depression of 1839–1843) eventually led to tightening labor markets, which drew in workers from abroad, easing the American labor constraint and encouraging further investment, particularly in housing for the new workers. The boom also called for investment in social-overhead capital such as railways. Railways, in turn, were attractive projects for British investors, and the foreign capital thus called in to the United States solved at least temporarily the balance of payments problems that would otherwise have developed from the pronounced increase in imports arising from the boom. Expansion periodically slowed, in response to inventory adjustments, but these adjustments were relatively mild. Ultimately, there was a major collapse, leading to a deep and long depression, and to a slowing of immigration.

The long swing as an interaction between domestic and international phenomena seems to have been confined to the period before World War I, which ended the phase of mass migration for several decades. According to Easterlin, however, there has remained a modified domestic element, in the form of the Baby Boom, the Baby Bust, and further echo effects. (See Easterlin, Chap. 9, Volume III of this series.)

Factor Inputs and Productivity

The general phenomenon of rapid growth of output during the long nineteenth century was chiefly a consequence of the expansion of the supplies of factors of production. As part of the settlement with Great Britain after the Revolutionary War, the United States received enormous tracts of western land that the people of lower Canada had regarded as their own and that they had been exploiting in pursuit of the fur trade (see McInnis, Chap. 2, this volume). This cession represented a very large gain for the new country, and a very large loss for its northern neighbor. In 1803 the Louisiana territory was purchased, which almost doubled the area of the United States. Another 72,003 square miles – consisting chiefly of Florida – were obtained in 1819 from Spain, while in the 1840s the acquisition of Texas, Oregon, and the Mexican Cession added another 1,204,740 square miles, a territory almost half again as large as was gained with the Louisiana Purchase. The Gadsden Purchase (1853), Alaska (1867), and Hawaii (1898) rounded out American acquisitions of the eighteenth and nineteenth centuries. By 1900 the United States encompassed 3,002,387 square miles of land and water, almost three and a half

times as much territory as it held after the post-Revolutionary agreement with Britain.¹

Population grew even faster, from about 2.354 million in 1774 to about 297 million in 1799, despite the losses of the war and the emigration of large numbers of loyalists (roughly 100,000). By the beginning of the Civil War population was almost six times as large as it had been in 1799, and by 1909, three times as large again. All told, then, population expanded almost fortyfold between 1774 and 1909.

The labor force increased even more strikingly – by a factor of over 48 in the same period. The rise in the labor force participation rate thus implied was due partly to the employment of women and children in the industrial factories built during the nineteenth century.² It was also partly due to a change in the structure of the population, arising from the effects of immigration and, to a lesser degree, to the effects of a decline in the birth rate. As a consequence of these two developments, the average age of the population increased, and the fraction in the age groups that had high labor force participation rates went up. The labor force, then, grew a good deal faster than the population. (See, also, Haines and Margo, Chaps. 4 and 5, this volume.)

Finally, the capital stock increased at even higher rates. Capital more than tripled between 1774 and 1799, increased more than 16-fold between then and the Civil War, and a bit more than another eightfold, between 1860 and 1909. In toto, the capital stock increased all of 388-fold between 1774 and 1909.

Supplies of inputs, then, grew very rapidly. The question arises as to what part of the growth of output was due to the growth of inputs, and what part arose out of improvements in input productivity. The conventional way to answer such a question is to weight the rate of growth of each factor by the factor's percentage share in aggregate income, sum up the results for the three factors, and subtract the sum from the rate of growth of aggregate output. Productivity change is taken as a residual.

The theoretical warrant for this approach may be found in the literature on production functions, a literature filled with qualifications and doubts. A commonsense interpretation of the procedure is to say that if the rates of growth of the three factors are to be averaged, for purposes of determining

Including various occupied territories outside the United States – Puerto Rico, the Phillipines, Guam, American Samoa, the Canal Zone, and the Corn Islands – the United States held 3,735,002 square miles at the outbreak of World War I.

The rise due to this factor was more apparent than real, since it was a consequence of a definition of laboring that leaves out household work.

the contribution of inputs to the growth of aggregate output, then the average employed must be weighted average, and the weights should reflect the relative importance of the three factors. In the context of production, importance may be taken to be the fraction of output paid to each factor, since the payment represents a judgment as to the contribution of each factor to production. (At least this is true in competitive equilibrium.)

Since not all laborers are equally important to production – and the same may be said of individual pieces of capital or of land – one can make a case that more than three inputs should be recognized, and that more than three weights should be established. The point is a good one and will come up for subsequent discussion. For the present, however, three factors will be all that will be considered. Furthermore, since the output and input series for 1774 are particularly chancy, the analysis will be confined to the years subsequent to 1774. Finally, the input series represent supplies of inputs available, rather than supplies of inputs actually employed. The measurements of productivity change – at least for the period from 1834 onward (see above) – therefore include shifts arising out of changes in levels of employment as well as changes in the intensity of use of factors. Whether intensity went up or down over the long run is not perfectly clear. The end of slavery tended to reduce labor intensity, as did the modest downward movements in the industrial work week, but the shift in the structure of the economy, which increased the relative importance of industrial activity, must have raised it (as it did the intensity of use of capital.) The estimates of productivity change must, therefore, be interpreted with caution. It seems doubtful, however, that changes in employment levels or the intensity of factor use are responsible for a large part of measured trends in productivity in the long nineteenth century.

In the nineteenth century, growth of U.S. output was apparently dominated by the increase of supplies of factor inputs. The rates of change of these inputs, taken together, accounted for between about 82 and 85 percent of the growth rate of output (see Table 1.4); productivity change, of course, accounted for the residual, 15 to 18 percent. Productivity seems to have contributed more to the expansion of the economy after 1840 than before, but the contrast between the two periods is not great. It is certain that in the years after World War I productivity had a larger relative significance. (See Abramovitz and David, Chap. 1, Volume III of this series.) It should be said, however, that the increase in *relative* importance is only partly due to improvements in productivity growth as time passed; it is also partly a consequence of the lower factor input rates of growth

Table 1.4. Rates of growth of real GNP, labor, capital, land, and total factor productivity, 1800–1900

Panel A: Rates of growth				
	(1)	(2)	(3)	(4)
	Real GNP	Labor	Capital	Land
1800–1840	3.92	3.09	3.98	2.80
1840–1900	4.10	2.72	4.96	2.17

Panel B: Computation of rates of change of total factor productivity					
	Weighted rates of growth			(4)	(5)
	(1)	(2)	(3)	Sum, Col (1)–(3)	Rates of growth of total factor productivity
	Labor	Capital	Land		
1880–1840	2.10	1.15	0.08	3.33	0.59
1840–1900	1.85	1.44	0.07	3.36	0.74

Panel C: Contributions (%) to output growth				
	Growth of			
	(1)	(2)	(3)	(4)
	Labor	Capital	Land	Productivity
1800–1840	54%	29%	2%	15%
1840–1900	45	35	2	18

Note: The real GNP estimates refer to the calendar year 1800, the average real GNP for census years 1834 through 1843 (centered on calendar 1839), and the average real GNP for calendar years 1894 through 1903 (centered on 1898.5). The capital and land estimates refer to 1799, 1840, and 1900.

Source: Panel A: GNP: See the notes to Table 1.3; Capital: Gallman, “American Economic Growth,” 88 [Table 2.4, Panel A, Column (3)]; Labor and Land: *Ibid.*, 97; Panel B: Weights: *Ibid.*; Rates of Growth of Total Factor Productivity: Panel A, Col. (1) minus Panel B, Col. (5); Panel C: Panel B, Col. (1), (2), (3), and (5) divided by Panel A, Col. (1). The results multiplied by 100.

would account for a larger share of output growth in the period in which inputs were expanding the more slowly – the later period.

Productivity is taken as a residual and therefore its measurement is

and outputs adopted (discussed above), and errors of estimate with respect to the rates of growth of inputs and output. Given the definitions used in this chapter, the forces that are likely to have been most important in the nineteenth century (other than errors) are four: improvements in technology (that is, improvements in production processes and the development of new products), improvements in efficiency (that is, improvements in the allocation of factors of production), improvements in human capital, and economies of scale. Individual chapters in this series (see Margo, Chap. 5, and Engerman and Sokoloff, Chap. 9, this volume) are devoted to the first, the third, and the fourth forces; the second will be treated further, below.

Changes in the relative importance of the three factors of production also have some interest. Land supply, because of the small weight assigned to it, but particularly because of its relatively slow rate of growth (compared with the other factors), contributes little. But that statement surely understates the true importance of the land factor and exhibits the severe limitations of this style of analysis. It was, after all, the enormous potential of the continent that encouraged the high rates of fertility and immigration by which the population grew so rapidly, the high rates of internal migration, by which it was more efficiently distributed, the enormous recorded investment, and the technical change that contributed to the improvement in productivity. The land estimates, which describe only the physical volume of land in production, bear on the direct effects of the expansion of the land supply, but leave out of account these indirect effects.

The shifts in the relative importance of the other two factors, labor and capital, speak to an important development, the extraordinary rate at which capital was formed in the nineteenth century. The share of capital in the responsibility for the expansion of output is shown to grow rapidly, relative to the share of labor. At the same time, the increases in the supply of capital per worker must have had favorable consequences for labor productivity and, thus, labor income – there was almost ten times as much capital per worker at the end of the long nineteenth century as at its beginning. Furthermore, the capital was new and therefore near the frontier of best practice techniques – between 1870 and World War I roughly two-thirds of the capital stock was ten years old or younger.³ Finally, the great

³ In part the rapid growth represented recovery from a decade – the 1860s – during which the increase of the capital stock was unusually low. But the rate of growth before the war was even higher than it became after 1870, and the average age of capital in 1860 must have been even lower than it was to become toward the end of the century.

speed with which the capital stock grew meant that the redeployment of capital to meet new and unexpected opportunities could be made quickly, so that the distribution of capital among alternative uses should have been remarkably efficient.

THE PERFORMANCE OF THE AMERICAN ECONOMY

Concepts

The scale of the economy is an important phenomenon, but most students of growth focus more attention on the level of output generated per member of the population. The reason is clear enough. Economics is concerned centrally with the allocation of scarce resources among alternative uses to produce output to meet human wants. In the per capita real product measure, the output of the economy is compared with the number of people to be supported, and the size of the ratio is a crude index of the success of the economy – its performance. Many criticisms of the per capita output (income) measure have been made, and they will be entertained shortly. But it is useful to begin with the per capita measure and to see how far it can take us toward understanding American economic growth in the long nineteenth century. We can then consider the shortcomings of the concept.

During a substantial part of the long nineteenth century a fraction of the population was enslaved, and during a shorter part of this period another fraction was in indentured servitude. A case has been made that these exploited workers – at least the slaves – should not be counted in the denominator of per capita national product. Rather, their consumption should be treated as intermediate production – like the coal used to run the industrial steam engines – and subtracted from the aggregate output. The remainder should then be divided by the number of free persons to get the measure of per capita output in the economy.

Such a choice represents a decision to evaluate the economy in terms of the views of the slaveholders, for whom the slaves represented a means to the end of planter well-being. But if we look at the economy from the standpoint of the late twentieth century, and if we are interested in economic performance, clearly we must see slaves and servants as part of the

population being supported by the economy, and the performance of the economy must be judged not by how much output there was to divide among free persons, but how much there was to divide among all. That is, appraisal must be in terms of modern standards. The fact that the incomes of slaves and servants were low is irrelevant; the incomes of some free persons were also low – some as low as or lower than that of the slaves and servants. The way to deal with this issue is not by dropping the poor from the population for whom per capita income measures are to be made, but by analyzing the income distribution of the population and changes thereto (for which, see Pope, Chap. 3, this volume).

More relevant is an aspect of the qualitative differences among the lives of the free, the servants, and the slaves. The free may have been imperfectly free, but they were freer than indentured servants, and indentured servants in turn were better off in this respect than slaves since, if they only managed to live through servitude – a matter of four to seven years – they would become free, while the prospects for freedom faced by most slaves were negligible for most of the period in which slavery existed. The way to deal with this issue is to put a consumption value on freedom and to assign this consumption value to all free persons. Then when indentured servitude died out, the measure of output would record a gain, and when the slaves were emancipated, the output index would record a bigger gain. With such an adjustment the big drop in the rate of growth of recorded output between 1859 and 1869, referred to above, would be moderated and, perhaps, turned into an increase.⁴ What is not so obvious is how one could make an index of the consumption value of freedom. (For more on these issues, see Engerman, Chap. 8, this volume.)

Per Capita Income (Output)

In August of 1793 Thomas Cooper traveled from England to the United States, with the object of considering the virtues of resettling there with his family. He returned to Great Britain in 1794 to collect his family and to settle up his accounts before emigrating, and while there he published a little book on America in the form of letters to an English friend. The first of these letters begins:

⁴ The issue is more complex than these comments suggest. There are also distributional considerations. The gains achieved by slaves with emancipation were paired with losses to slaveholders. See Engerman, Chap. 8, this volume.

While land is so cheap, and labor is so dear, it will be too hazardous a speculation to embark a capital in any branch of manufacture which has not hitherto been actually pursued with success in this country. Even though these obstacles did not present themselves, I should fear the common lot of inventors and first improvers; they usually enrich the country and impoverish themselves . . .⁵

In expressing these sentiments, Cooper ran none of the risks he believed innovators bore; it would be hard to find a written work by a visitor that did not make the identical points. Americans, too, spoke of the extent of the land and the impact it had on American economy and society. Benjamin Franklin believed the abundance of land led to universal and early marriage and large families. Tench Coxe stressed American comparative advantage and the structure of the American economy. (Franklin's ideas are taken up in Haines, Chap. 4; Coxe's, in Lipsey, Chap. 15, both in this volume.) For present purposes the point that needs to be drawn from Cooper's little book is that in the late eighteenth century American land was abundant and labor scarce; land was cheap and labor dear. Wages were relatively high, the distribution of income among free families was relatively egalitarian, as compared with the distribution in England, and income per capita – the variable of central interest here – was also high.

How high is not perfectly clear, but Alice Jones estimated that before the Revolution American per capita income was perhaps “on a par” with that of England and Wales, but more likely somewhat below the English-
elsh level.⁶ The data for the nineteenth century indicate that the gap between the two economies – the comparison now being drawn between the United States and the United Kingdom – was roughly 30 percent, at least down to 1870, with the advantage on the side of the British. Thereafter, American performance improved the faster, and by 1913 the United States probably had a GDP per capita slightly higher than the one achieved by the United Kingdom (see Table 1.5).

As to the rest of Europe for which estimates are available, income levels were generally below the American level (exceptions: Belgium and the Netherlands) throughout, and sometimes very much below. For example, late in the nineteenth century, average income in Russia was roughly one-fourth the American level, and in Italy and Finland, less than half. Furthermore, almost without exception the European countries were

Thomas Cooper, *Some Information Respecting America, Collected by Thomas Cooper, Late of Manchester* (Dublin, 1794, Reprinted New York, 1969), 1, 2.

Alice Hanson Jones, *Wealth of a Nation to Be: The American Colonies on the Eve of the Revolution* (New York, 1980), 68–69.

Table 1.5. *Aggregate product per capita in various countries, compared with aggregate American product per capita, various dates*

	Current prices		1990 Geary-Khamis dollars			
	1774	1840	1850	1870	1890	1913
1. <i>Western Europe</i>						
a. United Kingdom	1.25	1.20–1.40	1.30	1.33	1.21	0.95
b. France		0.78	0.92	0.76	0.69	0.65
c. Germany			0.81	0.78	0.75	0.72
d. Belgium			0.99	1.07	0.99	0.78
e. Netherlands			1.04	1.07	0.92	0.74
f. Ireland			N.A.	0.72	0.66	0.51
g. Denmark			0.93	0.78	0.71	0.71
h. Norway			0.59	0.53	0.48	0.43
i. Sweden			0.71	0.68	0.61	0.58
j. Finland			N.A.	0.45	0.39	0.39
k. Italy			N.A.	0.60	0.48	0.47
l. Switzerland			N.A.	0.88	N.A.	0.79
m. Portugal			0.60	0.44	0.36	0.26
n. Spain			0.63	0.56	0.54	0.42
o. Czechoslovakia			0.59	0.47	0.44	0.39
p. Hungary			N.A.	0.52	N.A.	0.40
q. Austria			0.91	0.76	0.72	0.66
2. <i>Eastern Europe</i>						
a. USSR			N.A.	0.56	0.27	0.28
3. <i>Australia, New Zealand, and the Americas</i>						
a. Australia			1.69	1.55	1.41	1.04
b. New Zealand			N.A.	1.27	1.11	0.98
c. Canada			0.70	0.66	0.66	0.79
d. Argentina			N.A.	0.53	0.63	0.72
e. Brazil			0.39	0.30	0.23	0.16
f. Mexico			0.37	0.29	0.29	0.28
g. Chile			N.A.	N.A.	N.A.	0.50
h. Colombia			N.A.	N.A.	N.A.	0.23
i. Peru			N.A.	N.A.	N.A.	0.20
j. Venezuela			N.A.	N.A.	N.A.	0.21
4. <i>Asia</i>						
a. China			N.A.	0.21	0.18	0.13
b. India			0.30	0.23	0.18	0.12
c. Indonesia			0.36	0.27	0.20	0.17
d. Thailand			N.A.	0.29	0.23	0.16
e. Japan			N.A.	0.30	0.29	0.25

Source: See Table 1.1 and text.

falling behind the United States as time passed; that is, per capita real incomes in these countries were growing more slowly than per capita real incomes in the United States.

For the rest of the world, the contrasts are even more striking, with certain exceptions. On the whole, American per capita income levels were much higher than those observed in Asia and Latin America, and they were growing much faster. For example, according to Maddison, Indian GDP per capita was about three-tenths of the U.S. level, in 1850, but only 12 percent, in 1913 (Table 1.5). There are two classes of exceptions. Australia and New Zealand had unusually high levels of per capita GDP in the nineteenth century, but as time passed both lost ground to the United States, ending in 1913 with per capita incomes similar to that of the U.S. (Table 1.5). In the other class, the performances of Argentina and Canada were well below that of the United States, but both countries experienced higher rates of growth – between 1890 and 1913 for Canada, and from 1870 to 1913 for Argentina. All of the nineteenth-century high-income, and/or fast-growing economies, with the exception of the United Kingdom were settler economies, with abundant natural resources, all of which received very large infusions of European capital and labor.

The performance of the American economy between 1774 and 1913 was unusually strong, then. Indeed, although comparisons across long reaches of time and across widely different cultures are problematical, it is likely that American late-nineteenth-century income levels were higher than those in most parts of the world today.⁷

The short-term variations in U.S. per capita product roughly match the movements of aggregate product (see Table 1.6), previously discussed. For example, the small gain recorded by real GNP between 1774 and 1793 is converted into a small loss, for per capita real GNP, and the success of the period 1793–1807 comes through clearly, as does the unfavorable economic impact of the Civil War – the rate of growth between 1859 and 1869 amounts to 0.5 percent per year.

The major new result obtained from the per capita series has to do with long-term rates of growth. The rate of change of real GNP, as we have seen, exhibits no pronounced long-term trend. The pace of change of real GNP per capita, on the other hand, does shift over time. From 1774 until the 1830s, the average rate of growth of this variable is less than 1 percent

Angus Maddison, *Dynamic Factors in Capitalist Development: A Long-Run Comparative View* (Oxford, 1991), 198–206.

Table 1.6. *U.S. gross national product per capita, prices of 1860, 1774–1909, and rates of change*

Panel A: Real GNP per capita (prices of 1860)			
1774	63.3	1859	135.9
1793	61.4	1869	142.0
1800	68.0	1869/78	152.4
1807	73.6	1874/83	178.9
1810	71.6	1879/88	200.7
1820	79.5	1884/93	211.3
1830	85.8	1889/98	216.7
1834/43	96.5	1894/1903	236.6
1839/48	102.4	1899/1908	269.1
1844/53	116.1	1909	287.0
1849/58	127.9		

Panel B: Average annual short-term rates of change, GNP per capita in prices of 1860			
1774–1793	–0.2%	1849/58–1859	1.2%
1793/1800	1.5	1859–1869	0.5
1800–1807	1.1	1869–1869/78	1.6
1807–1810	–0.9	1869/78–1874/83	3.3
1810–1820	1.1	1874/83–1879/88	2.3
1820–1830	0.8	1879/88–1884/93	1.0
1830–1834/43	1.3	1884/93–1889/98	0.5
1834/43–1839/48	1.2	1889/98–1894/1903	1.8
1839/48–1844/53	2.5	1894/1903–1899/1908	2.6
1844/53–1849/58	2.0	1899/08–1909	1.2

Panel C: Average Annual long-term rates of change, GNP per capita in prices of 1860	
1774–1800	0.3%
1800–1834/43	0.9
1834/43–1869	1.3 (1.7) ^a
1869–1909	2.4
1774–1909	1.1

Note: 1774–1830, 1869, 1909: Both the GNP and population data refer to calendar years. 1834/43–1859: The GNP data refer to census years, centered roughly on calendar years 1839, 1844, 1849, 1854 and 1859.5. The population data refer to the calendar years on which the GNP estimates are centered $\left(1859.5 = \frac{1859 + 1860}{2}\right)$. 1869/78–1899/08: The GNP data refer to calendar years. The averages are centered on calendar years 1873.5, 1878.5, 1883.5, 1888.5, 1893.5, 1898.5, 1903.5, and the population data refer to these calendar years (e.g., 1873.5 = the mean of 1873 and 1874, etc.) ^a1834/43–1859. *Source:* Table 1.3 and U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial*

per year. It then rises to an average of well over 1.5 percent per year between 1834/43 and 1859, and between 1869 and 1909, to the still higher rate of almost 2.5 percent per year. The timing of the increase is suggestive. The process of industrialization advanced in important respects in the 1820s, and the industrial sector began to assume significant weight in the 1830s and 1840s, as we will see. There is the strong suggestion that the acceleration of the rate of growth of per capita GNP was associated with the process of modernization.

A second new result has to do with the sources of economic growth. When economic growth is measured in terms of aggregate real output, the responsibility of productivity improvements for growth is modest (see table 1.4). But when growth is measured in terms of real GNP per capita, the story is quite otherwise – productivity improvements now account for a substantial fraction of total growth (see Table 1.7). The growth of factor

Table 1.7. *Rates of growth of per capita real GNP, labor, capital, land, and total factor productivity, 1800–1900*

Panel A: Per capita rates of growth				
	(1) Real GDP	(2) Labor	(3) Capital	(4) Land
1800–1840	0.90	0.10	0.99	-0.19
1840–1900	1.52	0.18	2.42	-0.37

Panel B: Computation of rates of change of per capita total factor productivity					
	Weighted rates of growth			(4)	(5)
	(1)	(2)	(3)	Sum,	Rates of growth
	Labor	Capital	Land	Col (1)–(3)	of total factor productivity
1800–1840	0.07	0.29	-0.01	0.35	0.55
1840–1900	0.12	0.70	-0.01	0.81	0.71

Panel C: Contributions (%) to per capita output growth				
	(1) Labor	(2) Capital	(3) Land	(4) Productivity
1800–1840	8%	32%	-1%	61%
1840–1900	8	46	-1	47

inputs was thus sufficient to increase aggregate output as fast as population, and somewhat faster, but the pronounced increase in output per capita depended importantly on the rising productivity of inputs, a matter of some importance.

Qualifications

CAPITAL CONSUMPTION AND NET NATIONAL PRODUCT

Real GNP per capita is a reasonable first approximation to an index of material well-being, for reasons previously given, but it is not in every respect ideal. First, the GNP may measure the aggregate output of the society, but if the entire GNP is consumed each year, the level of output will not long persist. A better index of well-being, then, would be a measure of the Net National Product – that is, the GNP minus the investment that must be made to sustain output at its current level. The actual measurements of NNP are only rough approximations of the desired measure, but they are better than nothing.

Table 1.8 contains rates of growth computed from NNP per capita measurements, and the table shows that real NNP per capita increased more slowly than real GNP per capita. There are two reasons for this development. First, the process of modernization called for more and more capital per unit of output, so that a larger and larger fraction of real GNP was required just to replace capital that was being worn out or discarded because it was obsolete – that is, a larger fraction of output had to be withheld from consumption just to assure that the level of output would not decline in future. Second, modernization called for new forms of capital. Traditional agriculture depended heavily on long-lived capital, such as improvements to land of one sort or another, and non-depreciable capital – inventories of animals and crops; artisanal industry also used long-lived capital, such as tools that changed little as time passed. The modern industry that was growing up after 1820, and particularly, after 1840, made heavy use of machines, which had relatively short lives, both because machines wore out faster than buildings, and, more important, because they were subject to particularly high rates of obsolescence. The modernization of the American economy in the nineteenth century, then, called for a much larger annual consumption of capital goods than had been true formerly. Consequently,

Table 1.8. *Average annual rates of growth of per capita real GNP and real NNP (1860 prices), 1834/43–1894/03*

	GNP	NNP
1834/43–1844/53	1.87%	1.85%
1844/53–1859	1.51	1.38
1859–1869	0.46	0.45
1869–1874/83	2.46	2.45
1874/83–1884/93	1.68	1.34
1884/93–1894/1903	1.11	1.00
1834/43–1894/1903	1.52	1.41

Source: Rates of growth of GNP per capita computed from data in Table 1.6. Rates of growth of NNP per capita: NNP was computed by subtracting capital consumption from GNP. Capital consumption was derived from capital stock data – equipment and improvements (Variant B) – in Gallman, “United States Capital Stock,” 204, table 4.A.1, constant price data. I assumed a life span of 15 years for equipment and 50 years for improvements, and average ages of 5 and 10 years for equipment and improvements, respectively. The depreciation method adopted was straight line. For population data, see the notes to Table 1.6.

a smaller and smaller fraction of GNP was left over for consumption and new investment.⁸

HOME MANUFACTURING AND FARM CREATION

A second respect in which GNP per capita falls short of the ideal measurement is that it does not include all elements of output. It does include all agricultural output and all of the shelter value of houses, but it excludes other elements of output that fail to pass through markets. For many periods of history, the omission leads to a downward bias in the measured *level* of aggregate output, but does not inordinately influence the *rate of change* of that variable. Since the rate of change is usually the measure that attracts analytical attention, the omissions are of little importance.

This is not strictly correct. All of gross investment is always employed in new investment, sometimes to replace capital that is being retired, and sometimes to open up new avenues of investment. Capital consumption allowances are as readily used for the second purpose as for the first.

That is not the case, however, when one considers the United States in the nineteenth century. This was a period of industrialization, and many economic activities were being shifted from the home to the shop or factory. Since the standard GNP concept ignores home production but counts the output of shops and factories, the rate of growth computed from the real GNP during this period will be biased in an upward direction.⁹ Table 1.9 contains estimates intended to deal with this problem, at least in part. It incorporates in GNP both major elements of home manufacturing – baking, the production of textiles and clothing, the slaughter and butchering of animals – and the clearing and first breaking of farm land, and farm construction from farm materials. It is incomplete, because it leaves some elements of home production out of account, but it is a useful addition to the list of measurements. It will be observed that the incorporation of these elements of output leads to lower, but still high, rates of growth of real GNP per capita.

It will be obvious that the same problem treated here in the context of changes across time reappears when one makes international comparisons among nations at very different levels of development. For example, in a previous paragraph I pointed out that the conventional measurements show that in 1913 per capita income in India was 12 percent of the level in the United States. Without much doubt, in 1913 the fraction of output passing through markets was much larger in the United States than in India. Thus, although India was surely much poorer than the United States, the conventional GNP measures overstate the extent of the difference between these two countries.

EXTERNALITIES

There are yet other ways in which the standard measures of real GNP probably exaggerate true economic growth during the process of modernization. One way arises from the fact that modern industry produces costs that are not incorporated in the costs of the goods sold, and therefore are not taken into account when the GNP is measured. Pollution is a good example. An ideal measure of GNP would deduct the cost of pollution.¹⁰ Modernization also leads to a reorganiza-

⁹ See Simon Kuznets, *Economic Change* (New York: 1953), Chapter 6.

¹⁰ “Externalities may be positive or negative . . . From a practical point of view the most significant are negative pollution activities.” J. J. Laffont, “Externalities,” in John Eatwell, Murray Milgate, and Peter Newman (eds.), *The New Palgrave: A Dictionary of Economics*, Volume 2, E to J (New York:

Table 1.9. *Average annual rates of growth of real GNP, real GNP per capita, and real NNP per capita, conventional and unconventional concepts, 1834/43–1894/03*

Panel A: GNP		
	Conventional	Unconventional
1834/43–1844/53	5.02	4.28
1844/53–1874/83	4.15	3.93
1874/83–1884/93	4.02	3.91
1884/93–1894/03	3.11	3.02
1834/43–1894/03	4.10	3.83
Panel B: GNP per capita		
1834/43–1844/53	1.92	1.18
1844/53–1874/83	1.52	1.30
1874/83–1884/93	1.72	1.61
1884/93–1894/03	1.16	1.07
1834/43–1894/03	1.56	1.29
Panel C: NNP per capita		
1834/43–1844/53	1.85	1.12
1844/53–1874/83	1.42	1.21
1874/83–1884/93	1.34	1.24
1884/93–1894/03	1.00	0.90
1834/43–1894/03	1.41	1.15

Source: See Tables 1.3 and 1.6. The unconventional estimates are based on Gallman, “Gross National Product,” 35. It was assumed that the ratios of home manufacturing to the value of perishables and semi-durables in current and constant prices were the same.

tion of life that generates additional costs ignored by the standard concept – for example, costs of commuting and the increased costs of policing, which arise with the geographic concentrations of population. There is no good way to allow for these costs in the measurement of nineteenth-century U.S. growth, but it seems improbable that proper adjustments

THE WORK YEAR

The well-being of a population depends not exclusively on output per capita but also on how much must be given up to obtain the output. Modern economic growth has led to shorter work weeks, and some scholars have argued that the free time thus generated should be valued as leisure and treated as a gain stemming from economic growth. Whether or not life in the twentieth century has become more leisured, it is certainly true that the lengths of the work week and work year have declined. In the nineteenth century the probable changes in these measures are more problematical. We know that with emancipation a substantial fraction of the work force was able to work shorter hours and engage in less intense labor. The work year in industry also probably did decline somewhat, but the shift in the structure of the economy no doubt increased the weight of those sectors – mining and manufacturing – that had long work years, and reduced the weight of agriculture, a sector – outside the plantation South – with a relatively short work year. (See Margo, Chap. 5, this volume.) In all likelihood, the average, overall work year at first lengthened, and then possibly shortened. Part of the gains achieved in per capita income in the early and middle decades of the nineteenth century were bought with more intense work routines, but in the later decades these developments may have been reversed.

How should this matter be taken into account? One way would be to attach to non-work time a value, perhaps the opportunity cost of the leisure. To the extent that work time was not chosen – for example, to the extent that farm workers worked short work years only because there was inadequate employment for them and would have chosen to work longer hours for more income, given the choice – this procedure would overestimate the gains from “leisure.”

Similarly, when factory work became available to young women, the opportunities may have importantly improved their lot. Surely at home they had work around the house to do. There they were at the bottom of a work pecking order. In the factory, they not only were able to earn money, but were also thrown in with young women of their own age. The transition from home to factory, then, may not have been just a transition from leisure to work, but from one kind of life to a preferred kind.

These questions identify the tip of an iceberg. How did people judge the changing life styles in which they participated? Were cities places of loneliness for young people, places of limited social support? Or were they

welcome resorts from the gossiping and lack of privacy of small villages, from the sure knowledge that some piece of idiocy one once performed will never be forgotten by the village? Were cities places of bright lights, or were they dark and Satanic? How far would the standard per capita income levels have to be altered to take into account changes in welfare arising out of changes in work routines?

HUMAN CAPITAL

One item that can be measured and added to the GNP consists of the value of schooling. Of course some elements of that value appear in the standard GNP – for example, the incomes of teachers. But we typically ignore the time spent by students in school. In a century in which child labor was common and time in school may have reduced time at work, there is not only a clear connection between schooling and value, but a simple way to estimate the value of the time of children: opportunity cost. Albert Fishlow's estimates show that opportunity cost of the time of school children amounted to:¹¹

24.8 million, in 1860
72.1 million, in 1880
213.9 million, in 1900

That is, there was a substantial increase over time, an increase greater than that exhibited by GNP (see Table 1.3). In 1860, the opportunity cost of schoolchildrens' time came to a value equal to a little more than 5 percent of GNP; the figure rose to 0.7 percent in 1880 and about 1.2 percent in 1900. These are small values, in one sense, certainly not great enough to influence importantly the rate of growth of GNP, were they incorporated into the measurements of GNP. Compared with aggregate savings and investment, however, they are more impressive, as will appear.¹²

Another source of human capital, and one requiring no investment by Americans – although it involved other costs – was immigration. Immigrants consisted disproportionately of young adults, people raised, educated, and trained abroad but with a long work life before them. The

These values came to roughly 40 percent of total school costs, direct costs plus opportunity costs. There was very little variation in the proportion from one year to the next.
Albert Fishlow, "Levels of Nineteenth-Century American Investment in Education," *Journal of Economic History* 26 (1966), 418–36.

numbers of immigrants increased dramatically in the two decades before the Civil War, and returned to the previous high level once the Civil War was over. (See Haines, Chap. 4, this volume.) Paul Uselding argues persuasively that human capital acquired by the United States from immigration was probably almost as large as the volume of conventional investment made in the United States in the twenty-odd years before the Civil War.¹³ Similar calculations for the postwar period would probably show a more limited relative importance for this source of human capital, but it would surely remain large.¹⁴

CONSUMPTION

Finally, the previous comments refer to income and income per capita, defined in various ways. These measures include output consumed by final consumers and output saved and invested. The second component – savings and investment – bears on the prospects of the society more than on its current circumstances. If we are interested in current well-being, a case can be made that we should concentrate on the first component, consumption, and that consumption should be expressed in per capita terms. Table 1.10 contains data concerning various aspects of consumption.¹⁵

Between 1834/43 and 1899/08 real per capita consumption rose by about 1.26 percent per year (computed from data in Table 1.10), a lower rate than the one describing the growth of per capita real GNP. The explanation is that the fraction of national product saved *increased* over time. Necessarily, then, the fraction consumed *declined*, and per capita consumption increased more slowly than did per capita income. Nonetheless, the data suggest that it did increase, and that the rate of increase was by no means negligible: per capita consumption more than doubled, between 1834/44 and 1899/1903.

¹³ Paul Uselding, "Conjectural Estimates of Gross Human Capital Inflows to the American Economy, 1790–1860," *Explorations in Economic History* 9 (1971), 49–61.

¹⁴ The gains to society as a whole were not without their associated costs. The flood of immigrants spoiled the labor market for native workers, reducing employment opportunities and wage rates for native workers. On the other hand, those new Americans, the immigrants, presumably realized very substantial gains – including Irish immigrants who would probably have died in Ireland but survived in America. For a treatment of immigrant gains, see Joseph P. Ferrie, *Yankees Now: Immigrants in the Antebellum United States, 1840–1860* (New York, 1999). See also, Margo, Chap. 5 in this volume.

¹⁵ The figures refer not literally to consumption, but to output minus exports plus imports; they do not allow for inventory changes. For convenience I use the term consumption.

able I.10. *Goods flowing to consumers, 1834/43–1899/08*

Panel A: Percentage distributions among classes of goods and classes of commodities, constant prices

	Goods				Commodities		
	Perishables	Semi-durables	Durables	Services	Perishables	Semi-durables	Durables
1834/43	57%	9%	2%	32%	84%	13%	3%
1839/48	57	11	3	29	80	15	4
1844/53	53	16	4	27	73	22	5
1849/58	51	17	6	26	69	23	8
1869/78	51	17	8	24	67	22	11
1874/83	51	17	8	24	67	22	11
1879/88	51	17	10	22	65	22	13
1884/93	50	18	11	20	63	23	14
1889/98	51	18	11	20	64	23	14
1894/1903	52	18	10	20	65	23	13
1899/1908	50	18	10	22	64	23	13

Panel B: Percentage distribution among classes of goods, excluding and including home manufacturing; current prices

	Excluding			Including		
	Perishables	Semi-durables	Durables	Perishables	Semi-durables	Durables
1839	79%	16%	5%	75%	21%	4%
1849	68	24	8	67	27	7
1859	69	23	8	68	24	7

Panel C: Flows of consumer goods, per capita (\$ of 1860)

	All					
	All Goods	commodities	Perishables	Semi-durables	Durables	Services
1834/43	85%	58%	49%	8%	2%	27%
1839/48	89	63	50	10	3	26
1844/53	99	73	53	15	5	26
1849/58	107	79	55	18	6	28
1859	115	85	59	20	6	30
1869	108	82	56	17	10	26
1869/78	115	88	59	20	10	27
1874/83	137	105	70	23	11	32
1879/88	151	118	77	26	15	33
1884/93	152	121	77	27	17	31
1889/98	153	123	78	27	17	30
1894/1903	170	135	87	30	18	35
1899/1908	192	150	96	34	20	42

Table 1.10. (*cont.*)

Panel D: Ratios of the cost of distribution to the value of commodities flowing to consumers, current prices	
1839	20%
1849	23
1859	24
1874/83	22
1884/93	28
1894/03	29

Note: The estimates make no allowances for changes in inventories, and, therefore, only roughly correspond with the value of goods actually moving into the hands of consumers.

Source: Gallman, "Gross National Product," 27, 35; Robert E. Gallman and Thomas J. Weiss, "The Service Industries in the Nineteenth Century," in Victor R. Fuchs (ed.), *Production and Productivity in the Service Industries*, Studies in Income and Wealth, vol. 34 (New York, 1969), 306.

The rate of increase was substantially greater – 1.47 percent per year – for the somewhat more reliable series “flows of commodities to consumers.” Rates of gain varied widely from decade to decade. There was a slight decline between 1859 and 1869, the legacy of the Civil War, and relatively small gains between 1834/43 and 1839/48 – surely the result of the Great Depression of the early 1840s – and between 1879/88 and 1889/98 – perhaps at least in part due to the Great Depression of the 1890s. (Table 1.10, Panel C). There are marked gains in the antebellum years after 1839/48, in the period 1869–1879/88 – partly recovery from the war – and in the period 1889/98 to 1899/08 – recovery from the Great Depression.

Increases in the per capita real value of commodities flowing to consumers, shown by the data in Table 1.10, should not be regarded as exclusively due to increased quantities of goods flowing to consumers. Remember that the data are unadjusted for changes in inventories; were they so adjusted the short-term fluctuations in consumer commodities per capita would surely be moderated. So far as the trend is concerned, it is no doubt affected by increases over time in the extent to which consumer commodities were processed outside the home and by the growing importance of distribution. Some data that support these views appear in Table 1.10, Panel B. When adjusted to incorporate home manufacturing, the long-term rate of growth of consumer commodities is reduced. Table 1.10

also shows that the cost of distribution rose, relative to the value of consumer commodities, as time passed.

The structure of consumption also changed, particularly in the antebellum years. In general, the consumption of semi-durables (e.g., textiles and clothing) and durables (stoves, cookware, carriages) increased faster than the consumption of perishables. Nonetheless, per capita consumption of perishables, in real terms, increased in every interval in the table but two; across one of these intervals there was no change, and across the other – an interval during which the Civil War was fought – there was a slight decline. Overall, the increase was almost 100 percent between 1834/43 and 1899/08.

In the cases of both durables and semi-durables, the antebellum gains described in the table represent in part a shift of production out of the home and into the factory. For example, the estimates of semi-durables produced in the home that underlie Table 1.9 sum to a value almost half as large as the reported commercial production of semi-durables. By the end of the century these goods were almost exclusively a matter of commercial production.

The relative prices of both semi-durables and (particularly) durables fell quite dramatically, in the antebellum years, reflecting important technical improvements in production. Some of these improvements contributed to the quality of life in ways not fully captured in the output data. For example, in the antebellum years the production and sale of stoves increased dramatically. Stoves vastly improved the quality of the heating of homes and of cooking. Several improvements in construction were introduced. The balloon frame made it possible for a man and a boy to frame a house on their own, with great advantages for farm families. It also meant that buildings could be constructed quicker and cheaper than before, but just as strongly: the boom towns of Chicago and San Francisco were balloon frame towns. Improvements in iron production contributed to the construction of buildings and to the decorative grillwork that became popular in the period. Central heating and inside plumbing began to diffuse.

OTHER MEASURES OF WELL-BEING

There are indexes of material well-being other than measures of real income or consumption. Two have received much attention recently – measurements of height and of expectation of life. Clayne Pope has found

that over the period 1760/69 and 1880/89 there was almost no improvement in the life expectation of native white adults, despite the marked gains in per capita income achieved during this period. (In the twentieth century, rising income and improvements in life expectation seem to have gone hand in hand.) Even more striking, the life expectation of adults fluctuated over time, and Pope finds that forces making for decline were concentrated in the decades 1840/49, 1850/59, and 1860/69.¹⁶ Why there should be this apparent disengagement of mortality from economic growth is still under investigation. The role of the Civil War on mortality in the 1860s cannot be ignored, of course. As to the 1840s and 1850s, these were years of heavy immigration, which apparently put pressure on labor markets, to the detriment of native workers. Immigrants also brought with them diseases that were obviously very destructive (such as cholera in 1849, yellow fever in 1853, and, later in the century, typhoid fever), and others less striking in their immediate impact that were, nonetheless, eventually causes of worsening mortality experience. It has also been argued that the movement of population – to the west, in the 1840s and 1850s, and in various directions, by the armies of the Civil War – led to an efflorescence of malaria, which did not kill on the scale and with the speed of cholera or yellow fever or typhoid fever, but that could and did shorten lives. Anthony Trollope's description of the westerners he visited in 1861 is telling:

Visit him and you will find him . . . too often bearing on his lantern jaw the signs of ague and sickness . . . their thin faces, their pale skins, their unenergetic temperament. . . . He will sit for hours over a stove . . . chewing the cud of reflection . . . [Western women] are generally hard, dry, and melancholy. . . . In the West I found men gloomy and silent.¹⁷

The growth of cities and urban industry, in the absence of a full understanding of the causes of the spread of disease, could also have had unfavorable consequences – Floud, Wachter, and Gregory find that it did in Great Britain.¹⁸ These are issues that call for much more study, but at this stage the differences between trends in mortality and in per capita income seem, in principle, not surprising, even if we do not understand

¹⁶ Clayne Pope, "Adult Mortality in America before 1860: A View from Family Histories," in Claudia Goldior and Hugh Rockoff, eds., *Strategic Factors in Nineteenth-Century American Economic Growth: A Volume to Honor Robert W. Fogel* (Chicago, 1992), 267–96.

¹⁷ Anthony Trollope, *North America* (New York, 1862), 128, 133, 135.

¹⁸ Roderick Floud, Kenneth Wachter, and Annabel Gregory, *Height, Health, and History* (Cambridge, 1990), chaps. 7, 8.

precisely which factors influencing mortality were the crucial ones and exactly how they operated. (See also Haines, Chap. 4, this volume.)

Students of anthropometric measurements tell us that two factors determine the heights at given ages (either sex) in populations, such as that of the United States in the nineteenth century, drawn chiefly from European and African backgrounds: genetics and net nutrition. The genetic influence shows itself in the distribution of a population (one sex) by height at a given age, a roughly normal distribution. The level of this distribution – and sometimes its shape – is affected by the net nutrition absorbed by the population during the crucial growth periods. Good net nutrition in the womb, during infancy, and during the adolescent growth spurt will lead to a tall adult population, and bad nutrition will lead to a short one, *ceteris paribus*.

Net nutrition depends both upon the volume and quality of food intake and upon the claims on nutrition exerted by work and by illness.

Two groups with identical food intake may, nonetheless, ultimately exhibit different average heights, if one of the two has a more demanding work schedule or more trying health conditions during the growth spurt years.

Measurements of height can, then, serve as indexes of certain elements of well-being. These measurements have two clear advantages: (1) Since evidence on heights is more readily available in early times than are income or output data, height indexes can be used to push the quantitative exploration of human material well-being backward in time to historical periods otherwise beyond our reach; (2) Evidence on heights bears on specific elements of well-being and can be used to identify problems that may not – indeed, probably will not – emerge from a study of incomes or outputs alone. Anthropometric measures and income data, then, are complementary approaches to the study of human well-being. While in the very long run these two types of measures typically run in parallel, in the short run that need not be the case. This does not mean that the two measures are inconsistent; they simply refer to different parts of the human experience.

The principal disadvantages of the height-by-age data are also two in number. Since adult height is affected by events occurring over a period of, say, twenty years in the life of a cohort, an increase or a decrease in adult height between one cohort and the next may not be easy to explain: the insult that resulted in a decline in height could have come when the cohort was in the womb, or when it was in infancy, or when it was in its

late teens.¹⁹ Since cohorts can gain back early losses by exceptionally good net nutrition in the teen years, however, it is reasonable to suppose that these years tend often to be the crucial ones. Since height can be affected by food intake, work efforts, and illness, a decline (or rise) in height between one cohort and the next has three possible causes, and the relevant cause(s) are not revealed by the height measurements themselves. These two points come down to the single one that height is an index of net nutrition, but that the interpretation of the index – with respect to the timing and causes of changes – calls for additional study, employing other forms of evidence.

The existing evidence on heights indicates that American white males were already very tall in the late eighteenth century and early nineteenth century, by the standards of the day – around 173 centimeters (see Table 1.11). This figure compares with the late-twentieth-century standard for men of 178 centimeters.²⁰

Between the cohorts of 1830 and 1840, average height declined to about 172.2 centimeters. It continued to fall to the cohort of 1860 – 170.6 centimeters – rose slightly (to 171.2 centimeters) in the 1870 birth cohort, and then cycled mildly, achieving a nadir at 168.9 centimeters in the cohort of the early 1880s. It then rose slowly, finally reachieving the late colonial level in the cohort of 1921.

It should be said that all of these heights qualify as “tall” in the world history of heights, but the decline is by no means small, and it suggests problems in American society in the mid- to late nineteenth century. The sources of these problems are only now beginning to be explored, and no compelling conclusions have yet been reached. The topics discussed above, in connection with adult life expectation – the Civil War,²¹ changes in the disease environment,²² the various impacts

¹⁹ This problem could be minimized by focusing on the heights of young children. Unfortunately there are few such nineteenth-century data, other than those for slaves, and, of course, slave life experiences differed substantially from those of free persons.

²⁰ Personal communication from Richard Steckel. Another way to put it is that 173 centimeters is at the 28th percentile of modern standards.

²¹ The Civil War could easily have affected the height of members of the birth cohorts of the 1850s and 1860s, and even the 1840s, since growth spurt periods of all of these cohorts were located in the 1860s.

²² Cholera and yellow fever were killers. Survivors probably did not suffer long-term effects in their heights. Malaria, on the other hand, was a debilitating disease that was likely to have led to stunting. And while cholera and yellow fever probably did not have important direct impacts on the heights of those who were afflicted, they probably *did* influence the average heights of the whole community, since the deaths caused by these diseases were probably not randomly distributed among height groups: the shorter and weaker people were probably over-represented

Table 1.11. *Adult stature of birth cohorts of native-born white American males, 1780–1931*

Year on which observation is centered	Height (centimeters)
1780	173.2
1785	173.2
1790	172.9
1795	172.8
1800	
1805	
1810	
1815	173.0
1820	172.9
1825	173.1
1830	173.5
1835	173.1
1840	172.2
1845	171.6
1850	171.1
1855	170.8
1860	170.6
1865	171.1
1870	171.2
1875	170.7
1882.5	168.9
1887.5	169.2
1892.5	169.0
1897.5	170.0
1902.5	170.0
1906.5	171.6
1911	172.2
1916	172.9
1921	173.2
1931	175.5

Source: Richard H. Steckel, "Stature and Living Standards in the U.S.," in Gallman and Wallis (eds.), *American Economic Growth*, 288.

of immigration, industrial pollution, urban crowding, problems of public health, water supply, and sewage disposal – anything that increased illness – are all probably relevant.²³ Increases in the intensity of child labor – especially labor in factories – may also have figured in the result, although the numbers of children subject to factory discipline must have been quite small.²⁴ It has been suggested that the structural shifts of the economy were sufficiently pronounced that the agricultural sector was unable to maintain an adequate level of nutrition, especially in the face of increased exports of food late in the century. But the quantitative evidence shows that the level of nutrients available per capita for consumption (output minus waste, minus exports, plus imports) was high by all relevant standards throughout the entire period 1834/43 through 1899/08.

Notice that several of these possible causes of the reductions in heights are endogenous to the economy, and some are exogenous, although it is not always easy to identify the proper location of the line between these two types of causes. Are cholera and yellow fever exogenous, or are they endogenous, since they spread by human contacts associated with international trade and migration? Much work needs to be done on these issues. A particularly promising avenue of exploration has to do with the disease environment.²⁵

among those killed. Oddly enough, then, a bout of cholera or yellow fever might raise the average heights of surviving members of the community, whereas success in dealing with these diseases could, by saving the weak from death, lower the average heights of members of the community.

²³ Two other factors are relevant. The rise of the public schools in the antebellum years brought children together and led to the diffusion of disease. Improvements in transportation increased human contacts, which also spread diseases – to populations particularly vulnerable, because they had previously been relatively isolated.

²⁴ According to Weiss, in the antebellum years roughly 21 percent of white males and 6.6 percent of white females 10 through 15 years of age were in the work force. For blacks, most of whom were slaves, the figure would be much closer to 100 percent. Thomas Weiss, “U.S. Labor Force Estimates and Economic Growth, 1800–1860,” in Robert E. Gallman and John Joseph Wallis (eds.), *American Economic Growth and Standards of Living before the Civil War* (Chicago, 1992), 49.

²⁵ Easterlin has suggested yet another measure of wellbeing: self-reported indexes of happiness. Such measurements are not available, however, for the nineteenth century. Easterlin’s most recent conclusion, based on his work on these topics, is worth reporting, since it bears on the ultimate meaning of measurements of growth: Of this world he writes: “It is a world founded on belief in science and the power of rational inquiry and in the ultimate capacity of humanity to shape its own destiny. The irony is that in this last respect the lesson of history appears to be otherwise: that there is no choice. In the end, the triumph of economic growth is not a triumph of humanity over material wants; rather, it is a triumph of material wants over humanity.” Easterlin, *Growth Triumphant: The Twenty-first Century in Historical Perspective* (Ann Arbor, 1996), 154.

CHANGES IN THE STRUCTURE OF THE ECONOMY

Savings and Investment

PATTERNS

In the decade 1839 through 1848 Americans saved about 14 percent of the gross national product (see Table 1.12, Panel A, column 1), a large savings rate by recent standards. From there on it rose – by three percentage points in the antebellum years, by another two between the decades 1849/58 and 1869/78, by another two by 1879/88, and by yet another two by 1884/93, when it was 23 percent. From the first-mentioned decade to the last the savings rate advanced by almost two-thirds. The first decade, 1839/48, spans a long and deep depression, which may have depressed the savings rate. But even if one measures from the economically prosperous decade 1844/53 to 1889/98, a decade of

Table 1.12. *U.S. investment, 1834/43–1909*

Panel A: Gross investment as a percentage of GNP			
	Conventional measure		Unconventional measure
	Current prices	Constant prices	Constant prices
1834/43		12	19
1839/48	14	14	17
1844/53	16	16	18
1849/58	17	17	20
1859		16	
1869		24	
1869/78	19	24	26
1874/83	19	24	25
1879/88	21	25	26
1884/93	23	27	28
1889/98	23	29	30
1894/03	21	28	29
1899/08	22	29	29
1909		27	

Table 1.12 (cont.)

Panel B: Net investment as a percentage of NNP, constant prices										
Conventional measure					Unconventional measure					
1774/1800					5					8
1800/40					7					8
1834/43					9					15
1844/53					13					15
1874/83					19					20
1884/93					19					20
1894/03					18					19

Panel C: Composition of gross investment (%)									
Conventional measure								Unconventional Measure	
Current prices				Constant prices				Constant prices	
MD	C	Δ INV	Δ CF	MD	C	Δ INV	Δ CF	CL + B	
1834/43				17	63	26	-5	41	
1839/48	19	57	23	+1	16	58	23	+4	22
1844/53	20	60	23	-3	18	62	22	-2	15
1849/58	20	59	23	-2	20	66	17	-3	17
1859				20	60	19	+1		
1869				27	69	15	-10		
1869/78	26	71	9	-6	28	62	15	-4	8
1874/83	26	63	11	-*	33	52	15	- ^a	6
1879/88	25	66	11	-2	39	48	14	-2	4
1884/93	21	73	8	-3	42	55	6	-2	3
1889/98	20	71	8	+1	42	52	6	+1	2
1894/03	25	66	4	+5	46	45	5	+4	2
1899/08	27	65	4	+5	54	41	2	+3	1
1909				54	46	3	-2		

Note: MD = Manufactured durables; C = Construction; ΔINV = Changes in the value of inventories; ΔCF = changes in claims on foreigners; CL + B = Farm land improvements: first clearing and breaking of farm land

^a Less than 0.5%

Source: See the notes to Tables 1.3, 1.8, and 1.9. The unconventional measure here excludes income generated by home manufacturing. Were this income included, the figures in the last column of Panel A would exhibit a more pronounced upward trend. The net investment estimates for 1774/1800 and 1800/40 (Panel B) were made by differencing the capital stock estimates and dividing by the number of years separating them. For example:

$$I = \frac{K_{1840} - K_{1800}}{40}$$

depression, the savings rate is found to have risen by four-tenths. The observed trend in the savings rate, then, is clearly a true phenomenon.

The trend is even more pronounced when savings and GNP are expressed in constant prices. The antebellum savings rates are similar to the current price figures (Table 1.12, Panel A, column 2), except that there is now an observation for the decade 1834/43, a value two percentage points below that for 1839/48. More striking is the fact that the rates for the postwar period are much higher than they were when expressed in current prices. The peak savings rate is now 29 percent, almost two and a half times as high as the value for 1834/43. Clearly, the prices of capital goods *fell* very sharply, relative to the prices of the goods that make up the rest of the GNP. Panel C of Table 1.12 plus Table 1.13 indicate, furthermore, that the price decline was especially pronounced among manufactured producers' durables – machines and tools. Three sources of this improvement in the prices of durables have been suggested: developments in the machine tools industry; innovations in iron and, in particular, steel; and changes in the structure of tariffs. All should have redounded favorably on the prices of machinery, but it should be said that the topic awaits its historian.

The significance of the falling relative prices of capital goods should be evident: a savings rate of 23 percent of current price GNP in 1889/98 would buy 29 percent of the real value of the GNP.

When the GNP is amplified by the addition of the value of home manufactures and investments in farm formation, the picture changes only modestly (Table 1.12, Panel A, column 3). Savings rates become higher, and their increase across time slightly less pronounced. Nonetheless, the figures continue to show a small rise in the antebellum period, a ger one (six percentage points) between the ante- and postbellum periods, and a further rise of three percentage points to 1889/98. The increase across the full period, 1834/43 to 1889/98, is a substantial eleven points, or almost six-tenths of the original value. Once again, Panel C of able 1.12 and Panel D of Table 1.13 show why the rise in rates, in this version, is smaller than in the conventional version. Land clearing and fencing represented a larger investment, per acre, in the 1830s and early 1840s, when much land being brought under cultivation was still forest land, than it did in later decades, when first prairie land, and then the plains, came under the plow. Furthermore, the number of acres being cleared increased much more slowly than did the other elements of investment. Consequently, land clearing and fencing became much less

Table 1.13. *Constituents of the domestic capital stock, expressed as percentage shares in the domestic capital stock, 1774–1900*

Panel A: Current price data (percentages, excluding farmland clearing, breaking, and fencing)				
	Structures	Equipment	Inventories	Animals
1774	39%	13%	23%	25%
1799	33	14	35	18
1805	35	15	34	16
1815	41	13	26	21
1840	45	14	24	17
1850	47	13	26	13
1860	54	12	22	12
1870	54	11	24	11
1880	55	11	24	9
1890	61	13	19	8
1900	60	14	19	7

Panel B: Prices of 1860 (percentages, excluding farmland clearing, breaking, and fencing)				
	Structures	Equipment	Inventories	Animals
1774	40	8	28	25
1799	34	9	35	23
1805	40	9	32	19
1815	41	7	29	22
1840	43	8	26	23
1850	46	9	27	17
1860	54	12	22	12
1870	55	13	22	10
1880	50	16	25	9
1890	49	25	21	6
1900	46	30	19	4

Panel C: Current price data (percentages, including farmland clearing, breaking, and fencing)					
	Structures	Equipment	Inventories	Animals	Land Clearing, etc.
1774	24	8	14	15	40
1799	21	9	23	11	36
1805	26	11	24	12	28
1815	33	10	21	17	19
1840	33	10	18	12	28
1850	35	10	20	10	25

Table 1.13. (cont.)

Panel C: Current price data (percentages, including farmland clearing, breaking, and fencing)					
	Structures	Equipment	Inventories	Animals	Land Clearing, etc.
1860	42	9	17	9	22
1870	44	9	20	9	17
1880	47	10	21	8	14
1890	55	11	17	7	10
1900	55	13	18	6	8

Panel D: Prices of 1860 (percentages, including farmland clearing, breaking, and fencing)					
1774	17	4	12	11	56
1799	19	5	20	13	44
1805	25	5	20	12	39
1815	27	5	19	14	36
1840	29	6	17	15	32
1850	33	7	19	12	28
1860	42	9	17	9	22
1870	44	11	18	8	19
1880	41	13	21	7	17
1890	44	22	19	5	11
1900	42	28	18	4	8

Source: Gallman, "American Economic Growth," table 2.8.

important, relative to other forms of investment, as the nineteenth century wore on.

Finally, Panel B of Table 1.12 shows net savings rates in place of the gross figures so far dealt with. The data have the advantage of extending backwards into the eighteenth century, but they must be regarded as less reliable than the gross figures.

The new series suggest that the increase in the savings rate began much earlier than 1834/43, and this point holds for both the conventional and unconventional measurements. As to the former, the suggestion is that Americans had been saving an increasing share of net national product since at least the eighteenth century; as to the latter, the increase seems to

have been under way since at least the beginning of the nineteenth century. The increases also are very large: almost a fourfold rise, in the conventional series, and a two-and-a-half-fold gain, in the unconventional series, from the beginning to 1884/93.

All of the data discussed so far have related to savings (and investment) by Americans – it excludes investment in the United States by foreigners. Panel C of Table 1.12 indicates that the omission is relatively unimportant, in a quantitative sense – foreign investment typically accounted for only a very small part of investment in the United States. It should be said, however, that foreign investment tended to be concentrated in certain sectors, especially in railways and banks, and that for those elements of the economy it could be important. Furthermore, American investment banks grew up under the tutelage of British merchant banks, acting as agents in the British finance of American railways. Their lessons learned, the American bankers began financing American railroads on their own, and a second and third generation of such organizations served as financiers for the industrial mergers at the end of the century. Thus British interest in American investment opportunities helped to promote a system of American intermediaries that became important in industrial finance. (See Davis and Cull, Chap. 16, this volume.) Finally, as we have seen, foreign investment figured in the long swings of American economic growth, alleviating balance of payments problems during booms and therefore helping to extend these booms.

Three periods of foreign investment can be distinguished: the antebellum period, the immediate postbellum period, and the decades beginning with 1889/98. In the antebellum period Americans were sometimes borrowers abroad, and sometimes lenders. On average, the amount borrowed or loaned was always small, compared with total savings, never running over 5 percent. The decade averages, of course, smooth out investment flows that fluctuated widely, and were sometimes important. For present purposes, however, we need to know about average performance, and that is what the table reports.

The second period is one in which Americans were typically borrowers – 1869 to 1884/93. The values are substantial – 6 to 10 percent of total investment – in 1869 and 1869/78, but they then become again, on average, modest.

In the third period Americans become net foreign lenders. Again, the values are not large, but they do reach 5 percent of total American investment before the end of the period.

WHY DID THE SAVINGS/INVESTMENT RATE RISE?

Many explanations for the rise in the savings/investment rate have been offered. Most are complementary, although there is pronounced disagreement as to the relative weights to be assigned to the different causes. The explanations may be usefully grouped around four potential sources of a change in the savings/investment rate:

- financial changes arising out of the Civil War;
- the development of financial intermediation;
- a rightward shift of the savings function (and an associated movement along the investment function);
- a rightward shift of the investment function (and an associated movement along the savings function).²⁶

The first explanation is that domestically held federal debt (which was built up during the War) was liquidated in the postwar years and the resources thus reclaimed were invested in the U.S. economy, thereby raising the measured private investment rate. This explanation, of course, accounts at best for the rise in the rate between the pre- and postwar periods, but does not show why the rate increased in the decades before the war or why it continued to rise in the postwar years.

Intermediaries help to bring potential savers and investors together, thereby realizing savings and investment plans that otherwise would be unrealized. They reduce search costs, so that the net returns to savers are increased and the net borrowing costs of investors are reduced. These activities tend to raise savings/investment rates. That intermediation improved dramatically during the long nineteenth century is evident (see Davis and Cull, Chap. 16, this volume), and that this development had important consequences seems to be demonstrated by the convergence of regional interest rates, at least since the Civil War, and perhaps for longer than that.²⁷ Econometric efforts to sort out the factors accounting for the upward movement in the savings/investment rate also seem to leave a role for the effects of intermediation.

Several reasons have been given for believing that the savings function shifted to the right and dominated the forces making for higher

A fifth set of explanations, concerning the relative decline in the prices of investment goods, have been previously set out.

There is disagreement with respect to convergence before the war. See the bibliographic essay at the end of this volume.

savings/investment rates. Econometric evidence has been marshaled to support some of these explanations. For example, one study has shown that a decline in the dependency rate is likely to have increased the savings rate by as much as one-fifth or one-quarter. A second study supports this finding, holding that a little more than six-tenths of the rise was accounted for a change in the occupational structure of the work force. The same study concludes that the remaining 16 percent was due to improvements in intermediation.

Still other suggestions have been offered: the distribution of income became more concentrated as time passed, and since the rich save at higher rates than do the poor, the shift in distribution led to rising overall savings rates; the fraction of total income composed of property income rose as time passed, and since property holders probably saved at higher rates than did nonproperty holders (as David Ricardo argued, long ago), the change in distribution led to higher overall savings rates; emancipation meant the loss of property by the former slaveholders, who attempted to recover their former positions by saving at higher rates than before – thus the overall savings rate rose.

None of these explanations can be regarded at present as very powerful. There are very few direct measures of the size distribution of income or wealth; of those that permit comparisons over long reaches of time, the data sources and methods of computation are sufficiently different so that the change over time that they describe must be taken with a grain of salt. Indirect measures have been interpreted by some analysts to imply that the distribution did, indeed, become less egalitarian as time passed; other analysts deny it.

Evidence on the functional distribution of income is a little more direct, and it does suggest that property holders received a growing share of total income. But the data on which these results rest are quite heavily processed.

The argument concerning the savings activities of former slaveholders can help to explain only the rise in the rate between the pre- and postwar periods, not the earlier or later developments. Given the small fraction of total income earned in the South after the war, even pronounced efforts on the part of former slaveholders to replace their slaves with other forms of capital would be unlikely to have a major impact on national savings rates.

Finally, the strongest efforts by this group of analysts have been devoted

to explaining developments between the 1830s and the 1890s, and in particular, the period between the ante- and postbellum years. Much less attention has been devoted to the years before the 1830s, although the arguments developed by those who stress the rise of intermediaries and those who believe that changes in the distribution of income were important are relevant to this period.

Those who believe that the savings/investment rate rose because the investment demand schedule shifted to the right argue for technological change of a capital-using, labor-saving nature, and see the rise of the savings and investment shares as part of a Solow-style neoclassical traverse. Evidence presented to support this view includes the observed stability of the share of income flowing to capital. If the experience is analyzed in terms of an aggregate production function, a result of this type, given the relative rates of growth of capital and labor and the likely elasticity of substitution between the factors, indicates that technical change was labor saving and capital using. The demand for capital, then, it is argued, must have been shifting to the right.

It is certainly true that the capital/output ratio rose as time passed, and that could be interpreted as a result of capital-using technical changes; but it could equally be (and has been) interpreted to mean that a rise in the savings rate flooded capital markets and permitted capital deepening. The factors making for the change in the capital/output ratio are therefore worth exploring.

The increase in the capital/output ratio was virtually universal in the United States – that is, the individual sectoral ratios rose, as did the ratios for individual manufacturing industries. The most obvious shift in the structure of the economy – the rise of manufacturing and the relative decline of agriculture – interestingly enough worked to lower the aggregate, overall ratio, not to raise it – the average ratio was lower in manufacturing than in agriculture. The main force at work to increase the aggregate ratio was the rise of the transportation sector. The capital/output ratio of this sector was high both because it is a capital-intensive sector, and because transportation firms are “faced with indivisibilities [such that] the size of the capital stock is not a good proxy for the annual flow of services it delivers.”²⁸ That is, it took time for the economy to grow up to

Albert Fishlow, “Productivity and Technological Change in the Railroad Sector, 1840–1910,” in Dorothy S. Brady (ed.), *Output, Employment, and Productivity in the United States After 1800*, Studies in Income and Wealth, vol. 30 (New York, 1966), 630.

the transportation network put in place during this period. There is a question, then, as to whether the increase in the aggregate, national ratio should be regarded as a result of technical change, or as due to a shift in the structure of the economy, consequent on the westward movement, urbanization, and industrialization – a set of structural shifts accommodated by a rightward movement of the savings function.

It has been suggested that the way to sort out the relative importance of the movements in the savings and investment functions is to look at the real interest rate: if it rose, then the predominant force at work is likely to have been the movement of the investment function, and if it fell, one must grant the importance of a change in the savings function. That position has been criticized on the ground that international capital markets were working very well, and that therefore the interest rate reflected international, not domestic, forces. This argument would be compelling if foreign capital had been flowing into the United States at rates very large compared with total U.S. investment. As we have seen, this was not characteristically true: investment sometimes flowed in, on balance, and sometimes flowed out, and the fraction of domestic investment it typically accounted for when it flowed in was small. The suggestion is that the impact of foreign influences on the American capital markets – at least trends in capital markets – was not likely to have been typically strong – was not likely to have deflected the risk-free interest rate from the course that would have been determined by domestic forces alone. That argument is weakest, of course, in regard to the period spanning and following the Civil War, when capital inflows were unusually large and the investment rate rose especially far.

A second difficulty with studying the real interest rate for a clue as to the relative importance of savings and investment phenomena is that changes in the interest rate will depend both on the relative movements of supply and demand schedules, and on the elasticities of these schedules. For example, assume that the supply schedule (the savings function) is highly elastic. Then the interest rate would fall if the demand for capital expanded dramatically, while the savings function moved only slightly to the right. As it happens, the disputants in this field have not yet agreed as to the likely elasticity of the savings schedule – one group arguing that it was probably very large, another group holding that, on the basis of modern evidence, it must have been very small.

Finally, there are different ways to measure the real rate of interest, and different nominal rates from which the calculations can be made.

Naturally, then, there are disagreements as to the probable course of the real interest rate. (The bibliographical essay at the end of this volume provides some guidance for the reader who would like to delve more deeply into these questions.)

THE STRUCTURE OF INVESTMENT AND THE
CAPITAL STOCK

By the end of the century, the structure of investment and the capital stock – conventionally measured – had changed quite dramatically, especially if one concentrates on real magnitudes. The biggest shifts involved manufactured producers' durables and inventories (including animal inventories): the former became more important, relative to other components of investment, particularly if measurements are made in constant prices, while the latter became markedly less important. The decline in the relative scale of inventories reflects the fate of the agricultural sector, a sector that held large amounts of inventories – animals and crops.

The Industrial Distribution of Income

Industrialization began for the United States perhaps as early as the 1820s (see Engerman and Sokoloff, Chap. 9, this volume). The next twenty or so years involved a reorganization of industry, with associated productivity improvements, but without heavy reliance on mechanization. Mechanization began in earnest in the last fifteen to twenty years before the Civil war. In the late 1830s and early 1840s, there was a marked increase in the number of new industrial products produced in America, some entirely new, others invented abroad and innovated in the United States during this period.

As Table 1.14 shows, as late as 1840, mining, manufacturing, and the hand trades accounted for only 17 percent of aggregated U.S. output. Were the artisanal hand trades dropped from the industrial total, and were the product of non-market activities more fully represented in aggregate output, the share would be substantially smaller, and this smaller share would represent the contribution of modern industry to the American economy of that time. By 1900, however, industry accounted for almost one-third of aggregate output, a fraction that was close to the maximum share that industry was ever to contribute to total U.S. output. Since industrial prices fell relative to the GNP price index between 1840 and 1900,

Table 1.14. *The sectoral distribution of GNP 1840–1900 (percentages)*

	1840	1850	1860	1870	1880	1890	1900
Agriculture	41	35	35	33	28	19	18
Manufacturing, mining, and hand trades	17	22	22	24	25	30	31
Transportation and public utilities	7	4	6	6	8	9	9
Commerce and all other private business	23	26	26	26	29	32	32
Government and education	2	2	2	2	2	3	3
Shelter	10	11	9	9	8	7	7

Note: The agricultural estimates include land clearing, breaking, and fencing as well as home manufacturing. The estimates, however, are understatements. If they were corrected, the share of agriculture in GNP would decline more pronouncedly over time than do the figures in this table. Mining excludes the important precious metals mining industries.

Source: Gallman “United States Capital Stock,” table 4.8. These are estimates of sectoral value added. “Commerce” includes only the trade in final goods.

the rise in the share of industry in GNP across time, shown in the table, would be even greater if all values were expressed in constant prices. This period of industrial growth – which made the United States by World War I the leading industrial economy in the world – took place in the presence of extraordinary opportunities in agriculture, which might have been expected to distract the United States from industrial concerns. The agricultural sector did, indeed, expand, of course, but at a much lower rate than the remaining sectors of the economy. By 1900 it accounted for less than half as large a fraction of total U.S. output as it had in the antebellum years. Meanwhile, other features of the extraordinary U.S. environment were being exploited; enormous reserves of minerals of all sorts were discovered and technologies innovated to put them to use.

These are the main shifts in the relative importance of the industrial sectors of the economy in the long nineteenth century. The share of shelter in the total declined a little – an Engels curve phenomenon? – and that of transportation, government, and education increased. Commerce and “all other private businesses” – a hodge-podge of construction, finance, professional services, and personal services – show a more marked relative advance, the share in output moving from about a quarter, before the War,

to almost a third at the end of the century. Commerce, construction, and professional services were chiefly responsible for this result. The rapid growth of construction is tied up with the increase in the investment rate; commerce, with the expanding scope of the market; and professional services, with the modernization of the economy and the increasing scale of economic units.

The shift in the structure of the economy affected the *level* as well as the *structure* of output. Output per worker was higher in the secondary and tertiary sectors than in the primary sector.²⁹ Consequently, the shift in the composition of the economy tended to raise output per worker, on average.³⁰ Since the participation rate was rising, output per member of the population, measured in a conventional way, also rose, partly as a consequence of the altered structure of the economy, and partly due to the higher participation rate.

The Regional Distribution of Economic Activity

One of the great themes in American history is the westward movement. The march of population and economic activity to the west followed a sequence of land acquisitions (discussed previously) and was coterminous with the construction of transportation, communications, and financial networks that tied the expanding economy together. The scale of the westward movement is broadly captured in Panels A and B of Table 1.15, which show a persistent decline in the fraction of total income and population claimed by the Northeastern regions, the South Atlantic, and the East South Central. The gainers were the two North Central regions, the West South Central, the Mountain, and the Pacific. The shift was substantial. In 1840, the western regions generated less than one-fifth of total income – 17 percent – whereas in 1920 this figure had risen to 54 percent.

What were the forces driving this redistribution of population and income? Economic opportunity is a frequently cited cause; the west clearly

The tertiary sector includes housing and the transportation industries. Thus the high level of per worker income in this sector is at least in part due to a high capital/labor ratio. Also, a large part of the total income of these industries flows to property, rather than labor. Thus, the table overstates the relative level of well-being of workers in the tertiary sector. Finally, workers in the tertiary and secondary sectors had longer work years than workers in the primary sector, so that differences in sectoral output per worker levels reflect, in part, different amounts of labor time committed per worker in the three sectors.

The shift to the secondary sector also meant a heavier weight for the sector experiencing the highest rate of labor productivity growth.

Table 1.15. *Personal income and personal income per capita, 1840–1920*

Panel A: Percentage distribution of personal income, by region					
	1840	1860	1880	1900	1920
U.S.	100	100	100	100	100
<i>Northeast</i>	58	50	44	41	32
New England	17	14	11	10	7
Middle Atlantic	41	36	33	31	25
<i>North Central</i>	13	20	34	36	32
East North Central	12	15	23	22	23
West North Central	2	4	11	13	9
<i>South</i>	29	26	15	15	21
South Atlantic	14	9	6	5	9
East South Central	11	9	6	5	5
West South Central	4	8	4	5	8
<i>West</i>	—	4	7	8	15
Mountain			2	3	3
Pacific			4	5	12
Panel B: Percentage distribution of population by region					
	1840	1860	1880	1900	1920
United States	100	100	100	100	100
<i>Northeast</i>	43	36	31	30	30
New England	13	10	8	7	7
Middle Atlantic	30	20	23	22	22
<i>North Central</i>	20	29	35	35	32
East North Central	17	22	22	21	21
West North Central	2	7	12	14	12
<i>South</i>	37	33	31	30	29
South Atlantic	20	14	13	12	11
East South Central	15	13	11	10	8
West South Central	3	6	7	9	10
<i>West</i>	—	2	4	5	9
Mountain	—	—	1	2	3
Pacific	—	—	2	3	5

able 1.15. (*cont.*)

Panel C: Personal income per capita as percentage of the U.S. average					
	1840	1860	1880	1900	1920
United States	100	100	100	100	100
<i>Northeast</i>	135	139	141	137	132
New England	132	143	141	134	124
Middle Atlantic	136	137	141	139	134
<i>North Central</i>	68	68	98	103	100
East North Central	67	69	102	106	108
West North Central	75	66	90	97	87
<i>South</i>	76	72	51	51	62
South Atlantic	70	65	45	45	59
East South Central	73	68	51	49	52
West South Central	144	115	60	61	72
<i>West</i>	—	—	190	163	122
Mountain	—	—	168	139	100
Pacific	—	—	204	163	135

Source: Richard A. Easterlin, “Regional Income Trends, 1840–1950,” in Seymour E. Harris (ed.), *American Economic History* (New York, 1961), tables 1, 2, and 3.

had superior agricultural resources, and as time passed, new resources were discovered in this treasure house – coal, iron, lead, zinc, copper, petroleum, silver, mercury, gold. Each discovery led to a boom, some modest, some enormous, as was the California gold rush.

Static theory would suggest that the redistribution of labor and capital in response to this emerging series of opportunities would tend to produce a convergence of per capita income levels, a convergence that might be upset by exogenous events – such as the Civil War – and by the persistent discovery of new opportunities in new areas. Panel C of Table 1.15 assembles some information that is germane.

First, in very broad terms the data show convergences: relative per capita income levels in the Northeast and the West decline over time, approaching the national average (100), although in the cases of three of the four sub-regions the levels of per capita income are well above average in 1920, the end of the period.

The picture in the South is more complex. Before the Civil War the West

South Central converges toward the average, whereas the South Atlantic and East South Central show a modest divergence. All three of these regions, it should be said, enjoyed increases in per capita income; the increases were simply not as rapid as that of the country as a whole. Between 1860 and 1880, all three Southern regions suffered marked declines in relative per capita income – indeed, all were, in 1880, at an absolute level not much different from that achieved twenty years before, in 1860. The explanation for this set of changes is the Civil War and the destruction of the plantation form of agricultural organization. The recovery was long. By 1920 convergence is observable, but per capita income in the South remained well below the average for the rest of the country.

Income per capita levels in the West were substantially above average, so that the attractiveness of the West to migrants is clear. The same could be said for the West South Central before the Civil War. How does one account for the attractiveness of the North Central, in view of the fact that per capita income levels were below average throughout the pre-Civil War years, and only roughly at the average level thereafter? One possibility is that the measures are biased against the North Central. Specifically, they exclude income from home manufacturing and farm making (clearing, breaking, and fencing farm land), elements of income that must have been far more important in the North Central than in the Northeast. Furthermore, the income measures do not allow for differences in the cost of living. Since the cost of living was almost certainly higher in the Northeast and the West than in the North Central, the measures in the table overstate the differences in regional real incomes. Nonetheless, even allowing for these two sources of bias, the per capita income levels were probably lower in the North Central than in the Northeast and the West.

The explanation for the movement into the North Central – especially in the antebellum years – despite the relatively low levels of per capita income is that migrants must have been disproportionately farmers and farm workers, and whereas the average level of income per capita was higher in the Northeast than in the North Central, there is not much doubt that farming opportunities in the North Central – particularly if one takes into account the prospect of capital gains from the appreciation of land values – were much better than they were in the Northeast. That is, for farmers, income prospects were much better in the North Central than in the Northeast.

Finally, the relatively rapid growth of population in the North Central was not exclusively due to migration. The favorable circumstances –

especially for farmers – led to higher birth rates in the North Central than in the Northeast.

CONCLUSIONS

At the beginning of the long nineteenth century the United States had a seaboard economy, largely agricultural and mercantile, smaller than the leading powers in Europe, but by no means tiny; the economy generated a level of living high by the standards of the day. The economy grew rapidly and spread across a continent. Despite the attractions of its rich agricultural resources, by the beginning of World War I it had the largest industrial sector in the world. Of course it also had one of the largest agricultural sectors in the world. The economy in toto produced more than the economies of the three chief belligerents in World War I taken together.

The level of per capita income also grew, not at an extraordinarily high rate, by the standards of other modernizing countries, but for an exceptionally long period, so that by World War I it was among the highest in the world – perhaps the highest. These several features of the American economy gave to the United States in its international dealings a power that had political and military dimensions and that came to shape a substantial part of the history of the United States in the twentieth century, for good or for ill.