NBER WORKING PAPER SERIES

ECONOMIC GROWTH IN THE MID ATLANTIC REGION: CONJECTURAL ESTIMATES FOR 1720 TO 1800

Peter C. Mancall
Joshua L. Rosenbloom
Thomas J. Weiss

Working Paper 17215
http://www.nber.org/papers/w17215

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2011

This research was funded in part by the National Science Foundation Grant SES-0317265. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Economic Growth in the Mid Atlantic Region: Conjectural Estimates for 1720 to 1800
Peter C. Mancall, Joshua L. Rosenbloom, and Thomas J. Weiss
NBER Working Paper No. 17215
July 2011
JEL No. N1,N11,N71,N9,N91,O19

ABSTRACT

We employ the conjectural approach to estimate the growth of GDP per capita for the colonies and states of the mid-Atlantic region (Del., NJ, NY and Penn). In contrast to previous studies of the region's growth that relied heavily on the performance of the export sector, the conjectural method enables us to take into account the impact of domestic sector, in particular the production of agricultural products for the domestic market. We find that the region experienced modest growth of real GDP per capita. Although the rate of growth was modest in comparison to what would materialize in the late nineteenth century, it was faster than that of the Lower South in the eighteenth century, and at times as fast as that for the U.S. in the first half of the nineteenth century. In its heyday of growth from 1740 to 1750—before the dislocations produced by the spread of the Seven Years' War--real GDP per capita rose at 0.7 percent per year, driven by the growth of output per worker in both agriculture and nonagriculture, and by capital accumulation.

Peter C. Mancall
Department of History
University of Southern California
Los Angeles, CA 90089
mancall@usc.edu

Joshua L. Rosenbloom
Department of Economics
University of Kansas
Snow Hall 436
1460 Jayhawk Blvd
Lawrence, KS 66045-2113
and NBER
jrosenbloom@ku.edu

Thomas J. Weiss
Department of Economics
University of Kansas
Lawrence, KS 66045
and NBER
t-weiss@ku.edu

An online appendix is available at:
http://www.nber.org/data-appendix/w17215

There is no doubt that the economy of the British North American mainland colonies was successful. Considerable evidence supports the view that residents of these colonies enjoyed a high standard of living, and this prosperity attracted continuing streams of immigrants, encouraged a high birth rate, and encouraged investment in slave and indentured labor, all of which combined to generate the highest rate of growth of population in the world at the time. Abundant land forestalled diminishing returns so that the high rate of population growth was also transformed into a high rate of growth of gross domestic product and its components, including exports. The levels of wealth achieved by some free colonists were high and had increased over the colonial period. The average stature of those born in the colonies, and thus able to benefit from the cornucopia of produce and the more favorable environment than that in Europe, increased noticeably. As John McCusker put it in his recent survey of colonial statistics, "On the eve of the American Revolution, real per capita gross domestic product in the Thirteen Continental Colonies was: … higher than any other nation in the world at the time."[1]

In contrast to the consensus that exists about the standard of living in the colonies and about the pace of aggregate growth, there is considerably less agreement about the rate of growth of living standards and per capita GDP. Despite McCusker's assertion "that its economy grew at the fastest rate of all known contemporary economies," scholars remain divided about the actual

---

[1] John McCusker, "Colonial Statistics," in Susan Carter, et al, (2006). *Historical Statistics of the United States: Earliest Times to the Present* (Cambridge University Press), vol. 5, p. He also alleged that it was "higher by far than it had been a century or a century and a half earlier," the result of his having assumed a "long-term rate of growth [that] exceeded, perhaps even doubled, the rate of growth of Great Britain." Ibid, p.

rate of economic growth as illustrated in the range of estimated growth rates reported in Table 1.[2] The range of estimated growth rates is especially pronounced for individual colonies and regions reported in the bottom half of the table, ranging from minus 0.8 percent per year for New England from 1700-09 to 1770-79 to 1.6 percent per year for Pennsylvania between 1730 and 1770. Most of the estimates for the mainland Anglo-American colonies as a whole fall between 0.3 percent and 0.6 percent per year, but scholars have placed the rate of growth of real GDP per capita anywhere between 0.05 to 1.0 percent per year.[3] The lower rate implies that however successful the economy might appear to have been, it was a static prosperity. The higher rate means that the colonial economy performed *on average* - over a very long period of time - better than the U.S. economy performed in the first half of the nineteenth century, an age which witnessed the industrialization of the northeast, the expansion of railroads and canals, and more broadly the acceleration of economic growth to modern rates. It is also important to note, that

---

[2] *Ibid*, p. 1. Not only does this assertion rest on his assumption about the rate of growth, but also on the estimated rates of growth in other nations at the time.

[3] In "Estimating Early American Gross Domestic Product, *Historical Methods*, vol. 33, 2000, p. 156, Tables 1 and 2 and accompanying text, McCusker argued that the weight of opinion would narrow this range to between 0.3 and 0.6 percent per year. That range was taken from John McCusker and Russell Menard (*Economy of British North America*, 1985, pp. 52-57) where they argued that the lower rate of 0.3 percent which was that achieved by England, according to estimates current at the time they wrote, set the lower bound for the colonies, while the higher rate reflected their view that because the colonies had started out far behind they likely grew faster than the mother country. In "Measuring Colonial Gross Domestic Production: an Introduction," *William and Mary Quarterly*, vol. 56, Jan. 1999, p. 5, McCusker reaffirmed the view that "the long term rate of growth exceeded, perhaps even doubled, the rate of growth of Great Britain." Such an estimating principle, of course, requires that the colonial rate be revised each time the rate for Great Britain is revised.

since the estimated level of GDP per capita in 1800 is widely accepted, the more rapid the rate of growth supposed to prevail in the preceding decades, the lower the standard of living must have been at the beginning of the period.

A range of opinion on the speed of economic growth is to be expected given the divergent nature of the economies of the various colonial regions and the relative paucity of quantifiable data for the period. In the absence of comprehensive statistics, past efforts to measure colonial economic performance have relied on the behavior of what each individual researcher thought of as either the key economic variable or what they were able to measure. Alice Hanson Jones, for example, used changes in wealth and an assumption about the likely ratio of wealth to income to estimate GDP.[4] Marc Egnal explained that to arrive at his estimates "initial approximations were derived from data on per capita imports. These estimates were then checked against data for long term changes in probate wealth and the value of exports."[5] More commonly, scholars have focused on exports, which were seen as either or both a proxy to quantify growth or as the engine of growth.

Refining our understanding of the dynamics of economic growth in North America before 1800 requires moving beyond estimates based on a single variable or the impressionistic combination of several key indicators. A more systematic approach to integrating the available data is needed. The method of controlled conjectures offers what we believe is a promising method for doing this. This method allows us to produce estimates of GDP per capita that are consistent with all of the available evidence, makes explicit the assumptions we use, and has the potential for assessing the relative importance of different sources of growth.

---

[4] Alice Hanson Jones, 1980. *Wealth of a Nation to Be*. New York: Columbia University Press

[5] Marc Egnal, 1998. *New World Economies*. New York: Oxford University Press, Table 3.6, p. 43.

The initial application of the conjectural method to the colonies as a whole by Mancall and Weiss suggested that the rate of growth of per capita GDP was substantially slower than had been commonly accepted.[6] Such a result for all the colonies need not, however, reflect the performance in any specific region, especially given the extraordinary divergence in the economic systems of the mainland British colonies. Growth rates for New England, which had no large-scale staple exports, might have differed dramatically from the rates in plantation regions of the Chesapeake colonies or the Lower South, or even the grain-exporting sectors of the middle colonies. Moreover the evidence available varies from region to region. Thus, more precise estimates of growth rates during the colonial period need to come from analysis of specific regions.

Here we employ the conjectural approach to develop estimates of the growth of GDP per capita for the colonies and states of the mid-Atlantic—modern-day New York, Pennsylvania, Delaware, and New Jersey . Our earlier analysis of the economy of the Lower South revealed that the region, despite its extensive rice and indigo exports, had a poor record of economic growth. Exports and output (i.e. real GDP) grew quite rapidly, but so too did population, with the result that *output per person* at the end of the colonial period, as well as at the end of the century, was virtually the same as it had been in 1720 – around $59-60 (in 1840 prices). The region experienced some very modest growth between 1740 and 1770, but that could not offset periodic declines in GDP per capita before 1740 and after 1770.[7]

---

[6] See Peter C. Mancall and Thomas Weiss, "Was Economic Growth Likely in British North America?" *Journal of Economic History* 59 (1999), 17-40. Their estimates were made for the colonies as a whole, but were based on bits and pieces of information from various individual colonies.

[7] Peter C. Mancall, Joshua Rosenbloom, and Thomas Weiss "Conjectural Estimates of Economic Growth in the Lower South, 1720 to 1800," in *History Matters: Economic Growth Technology, and Population*,

Until now, there has been no similar analysis of the middle colonies, though a number of previous histories have speculated about the region's economic performance, arguing that it experienced sustained growth with trade as the driving factor for regional economic fortunes.[8] McCusker and Menard argued that "commencing in the 1720s, a long, powerful, sustained expansion characterized the remainder of the colonial period, with perhaps some (but not much) tailing off after 1760."[9] Marc Egnal, though differing in some details, also offered a sanguine assessment, noting that while the pace of development was uneven, "[s]olid long-term growth marked the northern colonies in the eighteenth century."[10]

---

ed. William Sundstrom and Tim Guinnane (Stanford: Stanford University Press, 2003), 389-424. The absence of growth in per capita output in the Lower South reflects to a large extent the changes in the composition of the population, namely a rise in the share of the female and child shares of the population, and after 1770 a decline in the slave share of the population, all of which served to reduce the labor force participation rate.

[8] In some sense, the field has not evolved substantially—at least not in terms of precise quantifiable estimates, for the past thirty years—since the time when Douglas Greenberg suggested that "economic growth and the social change and dislocation that often accompanied it occurred, in the main, more rapidly in New York, New Jersey and Pennsylvania than elsewhere in North America during the colonial period." See Greenberg, "The Middle Colonies in Recent American Historiography," *WMQ* 3rd Ser., 36 (1979), 410-11. For the central role of exports as the engine of growth in the middle colonies see McCusker and Menard, *Economy of British North America*, 190-191, 195-198, 204; Egnal, *New World Economies*, 5, 59; and cf. Daniel Vickers, "The Northern Colonies: Economy and Society, 1600-1775," in Stanley L. Engerman and Robert E. Gallman, eds., *The Cambridge Economic History of the United States*, vol. 1,*The Colonial Era* (Cambridge, Eng: Cambridge University Press, 1996), 209-248.

[9] See McCusker and Menard, *Economy of British North America*, 202. . In "Sources of Investment Capital in the Colonial Philadelphia Shipping Industry." *Journal of Economic History* (1972) 32, no. 1 (Mar.), p. 155, fn 17, McCusker argued that economic growth in Pennsylvania proceeded at the astonishing rate of 1.6 percent per year between 1730 and 1770.

[10] Egnal, *New World Economies*, 46.

Presumably, results for this region would differ from the Lower South, at least in part because the Middle Atlantic's exports of grains figured less prominently in the regional economy than did the Lower South's staple exports of rice and indigo. Further, though there were slaves in the middle colonies, they constituted a far smaller and declining share of the overall population, most likely because farmers involved in cereal cultivation did not have year-round demand for labor.[11] Instead, the family or tenant farm dominated the regional production of wheat and corn. While the majority of these agricultural products were consumed locally, nonetheless the region exported a considerable quantity of these grains, primarily to the West Indies and Southern Europe. Despite the more limited role of exports in the Middle Atlantic we find that the regional economy experienced modest growth of real GDP per capita. Although the rate of growth we find was modest in comparison to what would materialize in the late nineteenth century, it was faster than that of the Lower South, and at times as fast as that for the U.S. in the first half of the nineteenth century. In its heyday of growth from 1740 to 1750—before the dislocations produced by the spread of the Seven Years' War--real GDP per capita rose at 0.7 percent per year, driven by the growth of output per worker in both agriculture and nonagriculture.

Using Controlled Conjectures

Our estimates of per capita GDP growth for the states and colonies of the middle Atlantic region are based on a variant of the method of controlled conjectures pioneered by Simon

[11] See Ira Berlin, "Time, Space, and the Evolution of Afro-American Society on Mainland British North America," *American Historical Review* 85 (1980), 44-78.

Kuznets and popularized by Paul David. [12] As elaborated by David, the controlled conjectures approach begins with the identity that output per person (GDP/P) in any year equals the product of the labor force participation rate (LF/P) and average output per worker (GDP/LF), which in turn can be written as a weighted average of output per worker in agriculture (a) and nonagriculture (n), where the weights are each sector's share of the labor force.[13]

$$GDP/P = (LF/P)\,[S_a\,(O/LF)_a + Sn\,(O/LF)_n] \qquad (1)$$

Because $S_n = (1 - S_a)$, the equation can be further simplified to:

$$GDP/P = (LF/P)\,[S_a\,(O/LF)_a + (1 - S_a)\,(O/LF)_a]. \qquad (2)$$

As equation (2) makes clear the value of per capita GDP in any year can be estimated with data about only four economic variables: the labor force participation rate, average labor productivity in agriculture, average labor productivity in nonagriculture, and the agricultural share of the labor force.

Starting from equation (2) we have introduced one important modification by treating the production of shelter services as an independent sector rather than subsume it in either agriculture or nonagriculture. We do this because we do not want the value of shelter output to influence the calculation of output per worker in either of the other sectors. Although shelter

---

[12] Simon Kuznets pioneered the use of this technique in "Long Term Changes" and has since been used by Paul David, in "The Growth of Real Product," and Thomas Weiss in "U.S. Labor Force Estimates," to estimate output per capita for the U.S in the period 1800 to 1840.

[13] In the earlier works of David "The Growth of Real Product," and Weiss in "U.S. Labor Force Estimates," output per worker in nonagricultural activities was assumed to be a constant multiple of output per worker in agriculture $(O/LF)_n = k(O/LF)_a$, where k was the ratio of sectoral output per worker values in some base year.

output arose in both agriculture and nonagriculture, in neither case was it produced directly by labor. Our revised estimating equation is:

$$GDP/P = (LF/P)\,[S_a\,(O/LF)_a + (1 - S_a)\,(O/LF)_n] + (O_s) \qquad (3)$$

With this modification the estimate of per capita GDP now depends on estimation of five series rather than four.

Our estimation procedure proceeds backward in time, beginning with estimates of the level of each series in 1800 (1770 in some cases) then projecting them backwards on the basis of the available evidence and plausible conjectures. We proceed as if the baseline figures are known values, even though they are not known with the precision or completeness of official statistics. Rather, they are estimates taken from the work of others and, in any case, were not generated by our conjectures.[14] The base-year values of output per capita in the various components for the region are summarized in Table 2 and compared to values for the nation as a whole.

To obtain estimates of per capita GDP for years before 1800 we have had to reconstruct the rates of growth of each of the series that make up the conjectural estimating equation. The construction of each series is described in more detail in the notes to the tables and in an appendix to this paper. In brief, the series were derived as follows. Data on total population, as well as free versus slave populations, were readily available, but the age and sex composition of

---

[14] The GDP per capita figures in 1800 for the region were based on the national estimates by Weiss (1992, Table 1.4). David's (1967) estimates for 1800 are lower than Weiss's and would thus dictate less potential for growth in the preceding century. In both cases, the figures were conjectured in ways that leave the 1800 figures unbiased by business-cycle influences that may have occurred.

the population was estimated using evidence for one or more colonies.[15] Once the age-sex composition was established, the labor force figures could be constructed following procedures that have been used for the early nineteenth century.[16] The distribution of the labor force between agriculture and nonagriculture was also derived following procedures used for estimation in the nineteenth century, and required time series on the urban-rural distribution of the population and labor force, and on agricultural participation rates in rural and urban areas. The value of shelter per capita for 1800 was calculated as 22 percent of the value of the stock of dwellings, which yielded a value of $14.30 in prices of 1840.[17] That value was extrapolated backward to 1720 based on an index of change in the stock of dwellings.[18]

---

[15] Total population data are from Carter, et al., *Historical Statistics of the United States*, 2006, Series Eg: 1- 59; and Series Aa: 2769-71, 4779-81, 4943-45, and 5407-09. Data on the age and sex composition are from New Jersey Censuses of 1726, 1738, 1745, and 1772, and the New York Censuses of 1698, 1703, 1723, 1731, 1737, 1746, 1756, 1771, 1786. The data were reported originally in Evarts B. Greene and Virginia D. Harrington, *American Population Before The Federal Census of* 1790 (NY: Columbia University Press, 1932) and were supplied electronically by Michael Haines.

[16] See Lebergott (1966) and Weiss (1992) both of whom produced estimates for the nineteenth century. The total labor force is the sum of the estimates of the number of free male workers, free female workers, male and female slave workers, all aged 10 and over, where the labor force in each population category is the product of the estimated population in that category and an age-sex labor force participation rate obtained from nineteenth century data for the Mid Atlantic region.

[17] The annual flow of 22 percent is from (Weiss, 1992, Table 1.2). The base year value for the stock of dwellings was based on evidence for 1798 (Pitkin,1967; Soltow, 1989; and Soltow and Land, 1980). The flow was revalued in prices of 1840 by using the deflator for the gross rental value of farm dwellings estimated by Towne and Rasmussen (1960)

[18] We based the index on Jones's estimate of the rate of growth of wealth between 1700 and 1774, and Gallman's estimate of the rate of growth of the real value of structures between 1774 and 1805. Jones, *Wealth of a Nation to Be*, 78 and Gallman, "American Economic Growth," 95. In effect we have assumed

Estimation of Agricultural Output

Measuring agricultural output is essential to constructing plausible estimates of the rate of growth of per capita GDP before 1800 because agriculture was the dominant component of the economy. At the end of the century, agricultural output comprised 51 percent of GDP and 62 percent of non-shelter output (Table 2). No time series of the region's agricultural output is available for the eighteenth century, but we were able to construct one in fairly direct fashion. The output of the agricultural sector is comprised of food that was produced within the region for consumption within the region (f), firewood (w), and those agricultural products that were exported either abroad (x_a) or to other colonies (x_c).[19]

$$O_A = f + w + x_a + x_c$$

As described in detail elsewhere, we have compiled a new and more complete time series on agricultural exports from the region, both to foreign markets as well as to other North

---

that the dwelling share of wealth and of structures remained constant over the period before 1774, and the annual flow of shelter services remained a constant percentage of the value of the stock.

[19] We treat all this agricultural output as though it were marketed in order to place a value on it and to make our estimates comparable in scope to those for the early part of the nineteenth century. Nevertheless, we have not made explicit estimates of the value of home manufacturing and farm improvements. We have not excluded these items because they were unimportant, but rather because they were likely more important in 1720 than in 1770 or 1800. Their inclusion would raise the level of GDP in all years, but more so in 1720, and would thus bias downward the estimated rate of economic growth.

American colonies.[20] The series on firewood (w) was obtained from evidence in a USDA report.[21] Food produced for domestic consumption within the region (f) was the dominant component of agricultural output in the colonies, but there are no time-series data on this item for the eighteenth century. We estimated this output as the difference between the value of food consumed and the quantity of food imported into the region from abroad as well as from other North American colonies. In other words,

$$f = c - f_m$$

where c is the quantity of food consumed, and f_m is food imported into the region. There is no time-series evidence on consumption, but by using the available information about the diets of colonists and slaves we estimated the trend in the value of food consumed from which we could derive values at benchmark dates from 1720 to 1800. Here we provide only a summary of our estimation; the details are presented in an appendix to this paper.[22]

The lower bound for the trend would seem to be no growth in the value of the diet. There is no credible evidence that the value of the diet declined over time, whereas there is evidence on military rations which indicates that the value of provisions provided to troops in New York and

---

[20] See Mancall, Rosenbloom and Weiss, "Commodity Exports, Invisible Exports and Terms of Trade for the Middle Colonies, 1720 to 1775," NBER Working Paper No. 14334.

[21] United States Department of Agriculture,"Fuel Wood Used," table 2. Although the level of firewood consumption may not be precise, the trend in the series should be reasonable. The estimates were made on a regional basis and the underlying per capita consumption rates tried to "take into consideration the climate, the timber, the characteristics of the population, housing conditions, the shift from fireplaces to stoves, and the displacement of wood by mineral fuels."

[22] We also constructed a time series on the import of food from both foreign nations and other North American colonies necessary to estimate food produced in the region.

Pennsylvania stayed roughly constant.[23] And, data on the wages of working class laborers in Philadelphia indicate that while there were short-run fluctuations in earnings there was likely no long-term change in the standard of living for those workers.[24] Real wages may have fallen at times during the colonial period, but were roughly equal in the late 1720s and 1800.[25]

The key pieces of information for estimating a upward trend in the diet are our benchmark estimates for 1800 (see Table 2) and evidence from the Rules for Georgia, which specified in some detail the provisions to be provided to persons on charity who were transported to that colony in the 1730s.[26] Although this information on the diet pertains explicitly to colonists in Georgia, it nevertheless provides a point of reference for free colonists elsewhere.[27] The

---

[23] Gallman (1971, "The Statistical Approach," pp. 71-78) argued that the militia were ordinary members of society serving in the military for a temporary period of time, so military rations seem like a reasonable proxy for food consumption by the colonists.

[24] Gary B. Nash, *The Urban Crucible: Social Change, Political Consciousness, and the Origins of the American Revolution.* Cambridge, MA: Harvard University Press, 1979. Pages 392-94. We extended Billy G. Smith's cost of living index back to 1727 in order to deflate the nominal wages reported by Nash. Billy G. Smith, "The Material Lives of Laboring Philadelphians, 1750 to 1800." *William and Mary Quarterly*, 3rd ser., 38, no. 2 (April 1981), pp. 164-202. The wage data are on pages 184-85, the cost of living indices on p. 173.

[25] The 1800 figure was lower than that of 1727-28, but the average for 1798-1800 was about the same as that for 1727-28

[26] Allen D. Candler, 1904-16. *The Colonial Records of the State of Georgia*. Compilations of transcripts of records in the Public Record Office begun by Allen D. Candler and completed by William J. Northen and Lucian Lamar Knight, 1904-16, vol. 3, 408-09.

[27] The little data available on the value of the diet for charity cases in the Middle Colonies do not yield enough useful information about the trend in consumption. See, "Philadelphia Guardians for the Relief and Employment of the Poor of the City of Philadelphia," *The Accounts of the Guardians of the Poor,*

specified diet included beef or pork, rice, peas, flour, beer, molasses, cheese, butter, spice, sugar, vinegar, and salt. Moreover, quantities of each category of provisions were specified for adult males, adult females, children, and servants. We have calculated that the weighted average value of these provisions for free colonists in prices of 1840 amounted to $24.[28] Since this figure reflects the value of food consumed by those on charity in a newly settled colony we have taken it as a lower bound on the value of per capita food consumption for the more developed Mid-Atlantic region in the 1730s.

Taken in conjunction with the given value of the diet of $30.85 in 1800 (see Table 2), this lower bound value for 1730 yields an upper bound on the rate of growth of the diet of 0.4 percent per year over the period, a rate we think is still too high. This rate of growth seems implausibly high because it rests on such a low initial value of the diet, a value about equal to that for a slave in 1800. It is difficult to believe that the Mid-Atlantic region would have exerted such a strong attraction for settlers if the average colonist in the 1720s and 1730s consumed a diet no better than that of slaves. So, as we explain in the appendix, a more realistic upper bound on the growth rate of the value of food consumed per capita is 0.2 per cent per year on average. And, even this lower rate implies that in 1720 food consumption per capita would have been about $26, still only about 11 percent above the value of the slave diet in 1800.

---

reprinted in *Poulson's American Advertiser*, May 19, 1802; and Peter J. Parker, "Rich and Poor in Philadelphia," *Pennsylvania Magazine of History and Biography*, 1975, p. 5.

[28] The diet for women and children aged 12 and over was 83 percent that of a male; that for children aged seven to twelve was half that for those aged 12 and over; and that for those aged two to seven was one-third. No provisions were provided for those under two years of age (Candler 1904-16, vol. 3, pp. 408-09).

We are confident therefore that the long term average growth rate of the value of the diet between 1720 and 1800 lies somewhere between 0% and 0.2% percent per year, and our most likely estimate is simply the midpoint of this range—0.1% per year.[29] We argue below (and in the appendix to this paper) that the plausibility of our assumption about the rate of growth in the value of the diet is reinforced by the implied rate of growth of agricultural labor productivity that it generates.

The components of agricultural output are summarized in Table 3. Regional consumption of agricultural products and the related regional production comprised the bulk of agricultural output. The region's consumption was equal to roughly 72 percent of the sector's output, and the region's production of food supplied over 90 percent of food consumed within the region during the colonial period.[30] The remainder of the consumption was supplied by imports from abroad and from other North American colonies. The former supplied about 5 percent of consumption, while imports from other colonies accounted for 3 to 4 percent. The share of consumption supplied by imports from abroad was higher after 1790 than it had been

---

[29] We also had to make an assumption about the change in the slave diet over time, but because slaves were relatively unimportant in the region, averaging less than 7 percent of the population for the entire period and dwindling in importance over time, this has little bearing on the growth of GDP per capita for the entire population.

[30] The rate of growth of food consumed per capita differs from the 0.1 percent growth rate we have assumed for the diet of free colonists because of shifts in the composition of the population. The relative level of consumption of free adults is higher than that of children, and that of free colonists is higher than that of slaves, and the rate of growth of the slave diet differs from that of the free colonist. Declines in the slave share of the population raise the weighted average and its rate of growth, while increases in the child share of the population lowers the weighted average and rate of growth. And, the rate of growth of the slave diet differs from that of the free colonist

during the colonial period, and that supplied by other states was noticeably higher in 1800, but still food imports in total amounted to only 10 percent of food consumption in the region. In other words, the region supplied the bulk of its food consumption.

The production of firewood was the second largest component of agricultural output, amounting to 20 to 24 percent of the total, nearly three times as large as the value of agricultural exports abroad and more than five times the value of exports to other colonies. Indeed, the value of firewood production was roughly twice the size of the value of both of those exports combined. Firewood production provided a boost to the growth of agricultural output before 1750, but was a drag thereafter, especially after 1770.

Agricultural exports abroad and to other colonies appear to have been a positive force for growth over both long term periods, with the per capita values having risen at 0.41 percent per year from 1720 to 1770 and 0.47 from 1720 to 1800. It is striking, however, that it was the export of agricultural products to other North American colonies that was the more positive influence at times. Exports abroad on a per capita basis rose at 0.24 percent per year from 1720 to 1770, but declined from 1770 to 1800, while exports per capita to other colonies rose at 0.8 percent per year during the colonial period and 1.7 percent per year after 1770. The latter were a smaller share of exports for most of the period, but by 1800 exports to other states was about equal to shipments to foreign destinations. Although exports, both abroad and to other colonies and states, grew substantially, they comprised a much smaller share of the agricultural sector than did food production or firewood, amounting to around 11-13 percent, except in 1800 when they comprised about 17 percent. Their growth after 1740 offset the impact of the decline in firewood production, but was not large enough to propel the sector's output at a faster rate than that determined by the sluggish growth of food production.

Combining the various elements of agricultural production we find that agricultural output per capita rose during the colonial period at 0.13 percent per year, but declined after 1770 with the consequence that over the entire period 1720 to 1800 there was no growth in the per capita value. Output per worker fared slightly better because the agricultural labor force grew more slowly than population.[31] Over the colonial period, output per worker in agriculture rose at 0.15 percent per year, and then accelerated slightly after 1770. The rate of advance for the entire period 1720 to 1800 was 0.20.

These growth rates of agricultural output per worker are consistent with several pieces of evidence regarding the performance of agriculture.[32] One is the growth of output per worker in the early nineteenth century, which defines the upper bound on the growth of output per worker over long periods in the eighteenth century.[33] A second is the productivity growth implied by changes in the length of indentured servant contracts, the modal value of which suggests little if any gain before 1760 and some increase in servant value after 1770.[34] And finally, our estimated rates of growth of output per worker are very similar to those estimated by Ball and

---

[31] The small decline in the agricultural share of the labor force reflects a very gradual decline in the rural agricultural participation rate of 0.07 percent per year, described further below.

[32] The appendix to this paper contains more detailed comparisons of our rates of growth of agricultural output per worker with these other bodies of evidence.

[33] This point was made by Ball and Walton, 1976, p. 103. There could be a decade now and then in which there was an upsurge in output per worker, but over an extended period of time the growth in output per worker in the eighteenth century could not have exceeded the average increase over long periods in the nineteenth century.

[34] Grubb, (1992) "The Long-Run Trend," pp. 181-82 and 202-25. He argues that the mode is the superior measure of changes in the contract length and the value of adult servants because the mean values were influenced by yearly fluctuations in the age structure of emigrant servants.

Walton for Chester county, Pennsylvania, the only other estimate of output per worker we have been able to find that pertains to the eighteenth-century Middle Atlantic region. Using probate data to calculate indexes of inputs and outputs on farms in four periods across the 18th century, Ball and Walton found that output per worker rose on average at 0.19 percent per year for the period running from 1714-31 to 1775-90. [35] Although our long term period of 1720 to 1800 differs slightly from theirs, our estimated rate of change in output per worker of 0.2 is virtually identical to the rate they found.[36] Overall, we think these comparisons indicate that our implied rates of growth of output per worker are very reasonable and lend credence to our assumption that the value of the diet rose at 0.1 percent per year and to our estimates of agricultural output.

The Results: Economic Growth in the Mid Atlantic Region

We can now turn to the results of interest, the growth of real GDP per capita. Recall that the conjectural estimation framework is structured to allow us to combine the available data with reasonable conjectures about the behavior of those elements of the equation that cannot be directly measured. In addition to our conjecture about the rate of growth of the value of the diet, which is embedded in the resulting estimates of output per worker in agriculture, our estimates of GDP per capita depend on two other time series. The first is the agricultural share of the labor force, estimates of which rest on an assumption about the rate at which the agricultural share of the rural population changed over time. The second concerns the rate of change of

---

[35] Duane Ball and Gary Walton, (1976, Table 3 p. 109-113). In the appendix we show that even over shorter time periods our rates of growth are very similar to those found by Ball and Walton.

[36] The growth of agricultural output per worker in the region over this long term also compares favorably with our estimate for the Lower South. For that region we estimated that output per worker rose at 0.22 percent per year from 1720 to 1800. Mancall, Rosenbloom and Weiss, 2003, p. 403.

nonagricultural productivity. In the absence of any direct evidence about nonagricultural output per worker, David (1967) was obliged to assume that the ratio of non-agricultural to agricultural output per worker (which he denoted by "k") was constant. Fortunately, for the Mid Atlantic case, the availability of a time series of real wage estimates for urban workers (discussed earlier) provides direct evidence on trends in non-agricultural labor productivity.

Our estimates of real GDP per capita at benchmark years from 1720 to 1800 are shown in Table 4. [37] In the figures reported in this table we have assumed that the rural agricultural participation rate declined at the slow rate of 0.07 percent per year, a rate based on the evidence for Chester county, Pennsylvania.[38] It is possible that the rate did not decline at all. Our reading of the literature on the extent to which colonial farmers engaged in production for the market offers no suggestions that farm households were withdrawing their labor from agricultural activities.[39] On the other hand, it is possible the decline was faster than 0.07 percent per year. In the nineteenth century, the rural agricultural participation rate declined more rapidly, but not by much. In the Mid Atlantic region, the rate for the labor force aged ten and over declined at 0.13

---

[37] In an appendix table we show the results of changing each of the three key assumptions.

[38] Ball and Walton's (1976, Table 3 p. 109-113) indexes of labor inputs per farm for Chester county from 1714-31 to 1775-90 appear to have assumed there was no decline in the rural agricultural participation rates, except for children. The rate of 0.07 percent that we use is a weighted average of the decline in the child participation rate and constancy in the rate for adults implicit in their estimates.

[39] See Rothenberg, *From Market Places to a Market Economy*; Henretta, "Families and Farms," 3-32; and Kulikoff, "The Transition to Capitalism," 120-44 and others. Some household members may have left agriculture to seek work in nearby cities, but that effect is captured in our conjectures because the agricultural share of the labor force changes with urbanization.

percent per year between 1800 and 1840. The rate we have calculated for Chester county and assumed in our conjectures is thus about half that of the rate for the early nineteenth century.[40]

As discussed above, agricultural output per worker had risen slightly over both the colonial period and the longer time period from 1720 to 1800. The rate of change in non-agricultural output per worker, based on changes in real wages, was also positive but a bit slower than that in agriculture. Nonagricultural output per worker rose quite rapidly from 1720 to 1740, but then declined sharply in the 1740s, rose again in the following decade and then fell once more in the 1760s. Overall there was virtually no change (0.02 percent per year) over the colonial period. Nonagricultural output per worker fell between 1770 and 1790, but then rose sharply during the 1790s with the result that the 1800 value was about 10 percent above that in 1720. Over the whole period 1720 to 1800 nonagricultural output per worker rose at 0.12% per year. Given the relative changes in sectoral output per worker, the implicit value of k fluctuated from decade to decade, but over the long term there was little change; the 1800 figure was only 6 percent below that for 1720. [41]

If instead of relying on the direct evidence about real wages we made an alternative assumption that the value of k had remained constant, as had been assumed by David and Weiss

---

[40] In the appendix to this paper we show that high rates of growth in the diet yield implausible rates of growth of output per worker in agriculture when the agricultural share of the rural population is assumed to have declined at 0.07 percent per year. The same implausibility would arise if that rural rate declined faster. Any positive effect on the growth of output per worker due to the decline in the rural agricultural participation rate would have to be met by a reduction to the assumed growth in the value of the diet, and thus the growth of gdp per capita would be unaffected.

[41] This finding of virtually no change is consistent with the rates of change in k assumed in earlier conjectural estimates of economic growth for the early nineteenth century. See David, 1968 and Weiss, 1992 and 1994.

in their conjectures for portions of the early nineteenth century, the growth of GDP per capita would be increased by 0.04 percent per year from 1720-70 and 0.02 from 1720 to 1800.[42] If we had assumed instead that the rate of decline in k had been faster than that implied by the Nash-Smith evidence by an additional 0.1 percent per year, the growth of GDP per capita would be reduced by 0.04 percent per year from 1720-70 and 0.02 from 1720 to 1800. In other words, if we think that the actual value of the rate of change in k fell in a range of plus or minus 0.1 around the value implied by the Nash-Smith evidence, then the rate of growth of GDP per capita can be thought of as lying in a range of plus or minus 0.04 percent per year around our point estimate for 1720 to 1770, and plus or minus 0.02 percent per year around our estimate for 1720 to 1800.

The results of our conjectures are that GDP per capita advanced at an average of 0.17 percent per year over the colonial period and 0.11 percent over the period 1720 to 1800. Growth after 1740 was slower than before, due to a downturn in the 1760s and between 1770 and 1790. Any increase in GDP per capita that had occurred before 1770 was lost during the years of the Revolution and the Articles of Confederation. The 1790s, however, witnessed a strong recovery; GDP per capita rose at 1.3 percent per year and made up almost all the gains that had been lost in the 20 years preceding 1790. The decline in the labor force participation rate pulled down real GDP per capita by a small amount in this decade, but this was offset by the positive effect emanating from a small shift in the sectoral distribution of the labor force into the more productive nonagricultural industries. This surge reflects primarily increases in output per

---

[42] A rate of growth in k of 0.2 percent per year is that found for 1800 to 1840 and is maximum rate found for the pre-Civil War era. The rate of increase was only 0.06 percent per year for the entire period 1800 to 1860, and the rate declined at 0.24 percent per year in the shorter interval from 1840 and 1860.

worker. Output per worker in agriculture rose at 1.2 percent per year between 1791 and 1800, that in nonagricultural industries by 3.4 percent.

We have also constructed a terms of trade index for the region, and used it to estimate adjusted values of GDP per capita. The terms of trade improved considerably for the region, having risen on average at an annual rate of 1.1 percent per year from 1720 to 1770 and at 0.96 percent from 1720 to 1800. As a consequence, the purchasing power of the real exports per capita rose at 1.4 percent per year from 1720-70 and 1.0 percent from 1720 to 1800, much faster in both instances than the growth of real exports per capita. But, this adjustment had little impact on the growth of GDP per capita because exports were such a relatively small portion of the economy. GDP per capita adjusted for changes in the terms of trade rose at 0.21 percent per year instead of 0.17 percent between 1720 and 1770, and at 0.14 percent instead of 0.11 percent between 1720 and 1800. Because this adjustment has little impact on economic growth, the discussion below is based on the unadjusted series.

There are two caveats to our conjectural estimates that are well worth bearing in mind when interpreting the results. First, our time series depicts a more smoothly growing economy than that which actually took place. Second, our measures of GDP and GDP per capita exclude any effect arising from increased commercialization and reflect instead the degree of market orientation in the base year of 1800.

Our series shows a smoother time path than likely occurred because we were interested primarily in obtaining a better measure of the long term trend in the growth of real GDP per capita. To do that, we assumed that changes in several of the largest components of GDP were based on linear trends in underlying components. Food production, for example, was based on the assumption that the value of the diet, and thus food consumption, increased at a constant rate

over time. And, the value of shelter services was based on a constant rate of the annual flow of rental services being produced by the stock of dwellings. Because of these sorts of assumptions, there is certainly less variation in our GDP per capita series than actually took place. In our series, deviations of GDP per capita from the long term trend originate for the most part from fluctuations in the value of exports. Although the export series reveals substantial fluctuations from year to year, we do not think those variations capture accurately or completely the variation in GDP or GDP per capita. To the extent they did, the economy of the Mid Atlantic region was on a roller-coaster ride for at least 80 years, with exports per capita having risen by 9 percent between 1720 and 30, falling by 6 percent in the next decade, rebounding by 23 percent between 1740 and 50, only to fall again by 14 percent in the subsequent decade, rise by 14 percent between 1760 and 80, and close out the century with a decline of 38 percent in the 1790s. Those who think that movements in exports are indicative of movements in the aggregate economy must also recognize how unstable the economy was.

The economy may have fluctuated even more than is suggested by exports because agricultural production would have been subject to the vagaries of weather patterns. Because of the importance of agricultural production to the region's economy, fluctuations in the economy might have been driven by climatic changes and variations in rainfall.[43] One measure of such an influence is the Palmer Drought Severity Index which provides annual measures of the fluctuation in net moisture available to plants and trees, and is available for 286 locations in the

---

[43] Winifred B. Rothenberg, "The Productivity Consequences," 1992, pp. 334-36 argues that a climate shift that took place between 1750 and 1850 induced New England farmers to become more market-oriented and to restructure the region's agriculture accordingly, all of which contributed to a productivity turnaround near the end of the 18th century.

United States going back to 1500.[44] The annual moisture levels at specified grid points in the U.S. were reconstructed using tree rings, and those values were then converted to a scale ranging from +6 to -6, with the latter representing extreme drought.[45]

The index values for the colonies and states of the Mid Atlantic in the period 1720 to 1800 fell largely between plus and minus 2.0. The index exceeded minus 3.0 only twice over the period, in 1748 and 1791. See Figure 1. Index values around -2.0 are similar to those found for Kansas during several well known droughts in that state in the late nineteenth century. The average index values during those droughts were -2.7 in 1874-75, -1.7 in 1879-81, but only -1.1in 1882-85, although the peak in 1887 was -1.96.[46] With indexes in the colonial period approaching or exceeding those figures recorded during nineteenth-century droughts in Kansas, the Mid Atlantic may have suffered through a number of poor crop years, and perhaps an equal number of bountiful years. The years for which we have made benchmark estimates of GDP per capita, however, were not years in which the PDSI was unusually low or high, except for 1740 and 1791. The latter was one of the two instances in the period 1720 to 1800 in which the index fell below minus 3.0, although it should be noted that the years just before and after were not unusually low or high. The period from 1734 to 1749, on the other hand, experienced a run of relatively low scores, with the benchmark year of 1740 recording an index value of minus 1.56.

---

[44] Wayne C. Palmer, "Meteorological Drought." Research Paper No. 45. U.S. Weather Bureau, Washington, DC.

[45] A drought this extreme occurred in Utah during the dust bowl era of the 1930s, but such severe conditions were recorded only 7 times in the U.S. between 1500 and 1980; 5 times in Utah (1508, 1580, 1654, 1724 and 1934), and once each in Nevada (1580) and Oklahoma (1772). The data were provided to us by Rick Steckel and were originally obtained at http://www.ncdc.noaa.gov/paleo/pdsi.html.

[46] In the period 1882-85, the state had abundant rainfall and recorded an index that averaged 2.0.

The region may have had a series of poor crop years in that period, and our estimate of GDP per capita for 1740 may be overstating the region's performance.[47]

Changes in moisture may also have influenced the trend in output, although the effect would appear to have been small. The average values of the index are a bit lower near the end of the century in comparison to those at the beginning – minus .96 in the 1790s versus plus 0.65 in the 1720s – but neither seems to be an unusually large deviation from the region's norm. Overall, although our time series of real GDP per capita may have missed some of the fluctuations that must have taken place, we think it captures reasonably well the long term trend for the region.

Second, our measures of GDP and GDP per capita are extrapolated values which rest implicitly on a certain degree of market orientation in the base year and thus do not capture growth that reflected only an increase in the extent to which output was marketed. Over time the degree of market orientation increased, so the base year values in our estimates which were taken from the end of the period reflect a higher degree of market orientation than prevailed in 1720. Thus, our estimates differ somewhat in concept from those that measure strictly the market value of the goods and services produced.[48] We think, however, that such extrapolated values provide a more useful measure of the economic activity of the colonial period. Because there was a great

---

[47] Lane, et al estimate that for the period since 1930, a one unit change in the PDSI index may have changed real farm income by as much as 3 percent in the Northeastern and Southern regions of the United States, and even more in the Midwest. John Landon-Lane, Hugh Rockoff and Richard H. Steckel, "Droughts, Floods and Financial Distress in the United States," p. 159, Table 4, in *Climate Change, Past and Present.*

[48] Of course, not even the Department of Commerce strictly follows such a definition. The national income accounts routinely incorporate some estimate of items that were not marketed, most notably the value of farm production consumed on the farm.

deal of production in the economy of the eighteenth century that was not destined for the market, and much shifting of production from the home to the market over the course of the century, the strict measure of GDP based on only market activity would be a misleading indicator of the aggregate level of economic activity and the standard of living.[49] As Gallman said, "The standard, modern definitions must be modified if they are to be relevant to colonial circumstances."[50]

Does it matter? Should one ever uncover or reconstruct a GDP series based on the strict definition of the concept in each year, the series would almost certainly rise faster than we have estimated it did because of the increasing market orientation that was taking place. This distinction may bear on any comparison of our estimate of growth with higher rates of growth estimated by others. It is possible that those higher rates of growth have implicitly taken this increased commercialization into account, and thus the difference between our estimate of growth and theirs is a measure of the rate at which market orientation increased.[51] Although this is possible, it would be remarkably fortuitous that estimates based on export growth or the growth of GDP per capita in England measured precisely this effect. Indeed, real exports per capita in particular would not be a good measure of the extent to which market orientation

---

[49] Historians remain divided about the extent of the market and the degree of market orientation of the colonists. See for example, Rothenberg, *From Market Places to a Market Economy*; Henretta, "Families and Farms," 3-32; and Kulikoff, "The Transition to Capitalism," 120-44.

[50] See Gallman, "Can We Build National Accounts for the Colonial Period," 110

[51] Farley Grubb raised this issue when he presented estimates of growth of GDP per capita based on the equation of exchange. See his "The circulating medium of exchange in colonial Pennsylvania, 1729-1775: new estimates of monetary composition, performance, and economic growth," *Explorations in Economic History*, 41 (2004), pp. 351-56.

increased in the eighteenth century because exports did not increase by very much, implying there was very little increase in market orientation over time.

Interpretation

What do our estimates of economic growth for the Mid-Atlantic have to say about the region's economic performance? First, in contrast to the early nineteenth century, when the labor force to population ratio was rising, demographic trends in the colonial era were not a positive force for economic growth. In the colonial period, the LFPR held steady for the most part. It dipped in the decades immediately after 1720, but regained its starting value by 1770. It fell noticeably after 1770, and for the entire period 1720 to 1800 changes in the participation rate served to reduce the growth of GDP per capita. Likewise, shifts in the composition of the economy from agriculture to nonagriculture were of little importance. The agricultural share of the labor force rose slightly from 1720 to 1740 and then declined; the 70 percent share in 1800 was only slightly below the 72.5 percent of 1720, so there was very little positive impact on productivity arising from a shift into the more productive nonagricultural industries.[52]

Instead, our conjectures imply that increases in output per worker played an important role in generating the economic growth that did take place. Agricultural output per worker rose on average at 0.15 percent per year from 1720 to 1770 and 0.20 percent from 1720 to 1800. The increase in output per worker from $176 in 1720 to $207 in 1800 would have increased GDP per capita by about $10 if the LFPR had remained constant. Because the participation rate fell from

[52] The small decline in the share of agriculture reflects the decline in the rural agricultural participation rate, not an increase in urbanization. The urban share of the region's population declined from 14.4 percent in 1720 to 9.8 percent in 1800.

.31 to .27, a large portion of this positive effect on productivity was offset. Nevertheless, during the colonial period, the increase in output per worker of $13 accounted for about half the increase in GDP per capita.

The other major source of growth was capital formation. Although we have no explicit measure of capital formation, one component of the economy that grew over the entire period was shelter output, which was determined entirely by growth in the capital stock. If nothing else had held the economy in check, the rise in the stock of housing would have pushed up GDP per capita by more than $2 during the colonial period and by another $2 after 1770. That alone would have generated growth in GDP per capita of 0.07 percent per year.

Finally, these estimates allow us to put this region's performance in perspective. The region turned in a better performance than was found for the colonies and states as a whole and much better than that estimated for the Lower South.[53] For the colonies and states as a whole, Mancall and Weiss estimated likely rates of growth of only 0.08 for the colonial period, 1700-1770, and 0.04 for the entire century. Our estimates indicate that the Mid Atlantic region grew 3 to 4 times as fast as that. For the Lower South, we estimated that real GDP per capita declined slightly – by 0.03 percent per year from 1720 to 1770 and 0.02 percent per year from 1720 to 1800.[54] There is little doubt that the Middle Colonies experienced noticeably faster economic growth than the Lower South.

---

[53] Mancall, Peter C., and Thomas Weiss. 1999. "Was Economic Growth Likely in Colonial British North America?" *Journal of Economic History* 59: 17-40

[54] Mancall, Peter C., Joshua Rosenbloom, and Thomas Weiss "Conjectural Estimates of Economic Growth in the Lower South, 1720 to 1800," in *History Matters: Economic Growth Technology, and Population*, Bill Sundstrom and Tim Guinnane, eds. Stanford University Press, 2003. The poor performance of the Lower South reflects in part the decline in exports per capita, which fell at 0.04

The rate of growth we estimate for the Middle colonies from 1720 to 1770 is below the rate of 0.6 percent that Egnal estimated for the Northern colonies for the period 1713-75. It is possible that these two disparate rates are consistent with each other, but given the 0.17 rate of growth we estimate for the Middle colonies it requires that New England's rate of growth be exceptionally high – roughly 1.0 percent per year - in order to bring up the Northern region's weighted average to 0.6 percent.[55] More notably, our estimated rate of growth is very far below the 1.6 percent figure that McCusker estimated for Pennsylvania for the period 1720 to 1774. This would seem to indicate that the behavior of exports to England, which is the evidence on which he based his estimate, is not a good measure of economic growth more generally.

Our estimate is only slightly below the lower rate of growth of 0.3 percent per year that McCusker assumed for the colonies as a whole, but well below the higher rate of 0.6 percent per year. Again, it may be possible that the other regions could have grown so rapidly that they would have pulled up the weighted rate of growth for all colonies to McCusker's estimated rates. But, since the rate of growth we estimated for the Lower South (minus 0.03 percent) is lower than that for the Middle colonies, it would require that New England and the Chesapeake

---

percent per year from 1720 to 1770 and 0.6 percent from 1720 to 1800. Another important source of the decline in GDP per capita was the changing composition of the region's population, namely a continual increase in the share of the population under the age of 10 and an increase in the free share of the population. These shifts kept the labor force participation rate from rising for most of the period and eventually pushing it down, especially after 1770. If nothing else had changed, this phenomenon alone would have reduced GDP per capita by 0.04 percent per year between 1720 and 1770 and by 0.27 percent per year between 1720 and 1800.

[55] Each subregion had approximately one half the population in the Northern region in 1770. In earlier years, New England had a larger share and the rate of growth needed to bring the region up to 0.6 percent would had to have been in excess of one percent per year.

performed extremely well. Given the population shares in the subregions, New England and the Chesapeake would had to have grown between 0.8 and 1.0 per cent per year.

If, however, there is merit to McCusker's estimating principle and not necessarily his specific numerical results, then new evidence on England's rate of growth may allow for consistency between our estimates for the Middle colonies and the Lower South and the implied rate of growth for the colonies as a whole. Greg Clark has constructed new estimates of national income and product for England from 1200 to 1860, and finds that real national product per person rose at 0.16 percent per year for the period 1720 to 1770, virtually identical to the rate we have estimated for the Middle Colonies.[56] Although the poor performance of the Lower South would pull the weighted average down somewhat, all the British North American colonies combined could have achieved a growth rate equal to that of the mother country if New England and the Chesapeake had grown at the same rate as England. In order to have grown twice as fast as England, however, the Chesapeake and New England would have had to have grown around 0.4 percent per year. Although this seems high in comparison to our estimates for the Middle colonies and the Lower South, it may not be out of the question. [57]

The relative performance of the colonies in the Mid Atlantic regions and the Lower South brings into question the importance of exports as an engine of growth in colonial America. In neither region did exports comprise a substantial portion of the economy, falling well short of the

---

[56] Gregory Clark, "The Macroeconomics Aggregates for England, 1209 to 2008," *Research in Economic History*, 2010, Table 28. The rate for the period 1720 to 1800 was 0.22 percent.

[57] In Clark's time series, the value in 1720 was about the same as that for the preceding 40 years, and then jumped considerably by 1730. If we used the average values for 1710-30 and 1760-80 then the rate of growth was 0.09 percent per year, which would make it that much more likely that the colonies could have grown at twice the rate of the mother country.

25 to 30 percent share that John McCusker thought it accounted for.[58] In the Middle Colonies exports made up roughly 7 percent of GDP, and the per capita value grew around 0.24 per year during the colonial period, about the same rate as that for GDP per capita.[59] In the Lower South, exports figured more prominently, but still did not exceed 14 percent of GDP in most years, and declined on a per capita basis at 0.04 percent per year, about the same rate as the decline in GDP per capita.[60]

Although the long term rates of growth of exports and GDP within each region are alike, this similarity is just coincidence, not evidence of causation. Elsewhere we have shown in detail that the ups and downs of the economy of the Lower South were not correlated with the fluctuations in exports, and the same pattern appears in the Middle Colonies. That is, the decadal changes in exports per capita do not appear to be highly correlated with changes in GDP per capita.[61] Most telling perhaps is that the Lower South, the region in which exports were supposed to have driven economic growth, fared worse in terms of growth of GDP per capita than the Middle Colonies.

---

[58] John McCusker, "Measuring Colonial Gross Domestic Production: an Introduction," *William and Mary Quarterly*, vol. 56, Jan. 1999, p. 4.

[59] The 7 percent figure for the Middle Colonies includes both agricultural and nonagricultural commodities. Agricultural products alone amounted to about 5 percent of GDP.

[60] See Mancall, Rosenbloom and Weiss, 2003.

[61] Luckily so in some instances, such as the 1730s, when exports per capita abroad and to other colonies both declined while GDP per capita rose at 0.13 percent per year due to growth in food production and the value of shelter per capita.

	Table 1			
	Estimates of Annual Rates of Economic Growth per Capita			
	Over Long Time Periods			
	Publication Date	Time Period	Geographic coverage	Rate of Growth
Mancall and Weiss	1999	1700-1770	all colonies	0.05%
Jones	1980	1700-1770	all colonies	0.4%
Egnal	1998	1713-1775	all colonies	0.5%
McCusker and Menard	1991	1690-1785	all colonies	0.3 - 0.6 %
McCusker	2000	1720-1774	all colonies	0.6%
Taylor	1964	1700-09 to 1770-79	all colonies	1.0 % +
	Individual Regions			
Anderson	1979	1700-09 to 1770-79	New England	-0.80%
Mancall, Rosenbloom and Weiss	2003	1720-1770	Lower South	-0.03%
Egnal	1998	1713-1775	Lower South	0.10%
Main and Main	1988	1650-1770	So. New England	0.35%
Kulikoff	1979	1705-1776	Chesapeake	0.40%
Egnal	1998	1713-1775	Northern colonies	0.60%
Egnal	1998	1713-1775	Upper South	0.90%
McCusker	1972	1730-1770	Pennsylvania	1.60%

Notes and Sources to Table 1

These authors did not all measure growth of real GDP per capita. Some specifically described it as such, some as Gross or Net National Product or National Income, while others implied that they were describing change in one of these measures of economic growth, but the specific evidence they used was some proxy measure, such as TFP or imports.

Peter Mancall and Thomas Weiss, 1999, "Was Economic Growth Likely in British North America?" *Journal of Economic History* 59 (1999), 17-40. They measured real GDP per capita.

Marc Egnal (1998) *New World Economies*, New York: Oxford University Press, p. 43. Egnal measured per capita imports as a first approximation, "then checked against data for long term changes in probate wealth and value of exports."

Alice Hanson Jones, 1980. *Wealth of a Nation to Be*, New York: Columbia University Press, p. 78

George Rogers Taylor, 1964. "American Economic Growth before 1840: an Exploratory Essay," *Journal of Economic History*, 24, 437. He examined a variety of evidence and provided an informed opinion about the rate of growth of income per capita.

John McCusker and Russell Menard, 1985. *The Economy of British North America*, pp. 52-57. They estimated the rate of growth of GNP per capita based on estimates of the growth of GNP per capita for England current at the time that they wrote. The lower rate of 0.3 percent was that achieved by England, which they argue set the lower bound for the colonies; the higher rate of 0.6 percent reflected their view that because the colonies had started out far behind they likely grew faster than the mother country.

John McCusker, 2000. "Estimating Early American Gross Domestic Product, *Historical Methods*, vol. 33, 2000, p. 156, Table 2 and accompanying text. Here he revealed his preference for the higher rate of growth of 0.6 percent per year.

Terry Anderson, 1979. "Economic Growth in Colonial New England: 'Statistical Renaissance,'" The *Journal of Economic History*, 39, 253, Table 3 and 255. His estimate of minus 0.8 percent per year is based on his estimate of TFP. If one used output per worker the rate of decline is only minus 0.7 percent per year.

Peter Mancall, Joshua Rosenbloom and Thomas Weiss, 2003. "Conjectural Estimates of Economic Growth in the Lower South, 1720 to 1800," in *History Matters: Economic Growth Technology, and Population*, ed. William Sundstrom and Tim Guinnane (Stanford: Stanford University Press, 2003), 389-424. They measured real GDP per capita.

Gloria L. Main and Jackson T. Main, 1988. "Economic Growth and the Standard of Living in Southern New England," *The Journal of Economic History*, 48, 27-46. Real wealth per capita.

Alan Kulikoff, 1979. "The Economic Growth of the Eighteenth-Century Chesapeake Colonies," The *Journal of Economic History*, 39, 277, measured real wealth per capita in Prince George's county, Maryland.

John McCusker, 1972. "Sources of Investment Capital in the Colonial Shipping Industry," *The Journal of Economic History*, 32, p. 155, fn 17, used growth in exports to England as a measure of growth in NNP.

		Table 2			
Estimates of GDP and Components in the Base Year of 1800: U.S. and Middle Atlantic Region					
	(U.S. dollars, prices of 1840)				
	United States			**Mid Atlantic**	
	Total Output	Per Capita		Total Output	Per Capita
	$000's	$s		$000's	$s
Agricultural Output	203,030	38.26		58,185	39.71
1. Food Production	149,966	28.26		37,615	25.67
1a. food consumption	159,098	29.98		45,206	30.85
1b. interstate food imports	-	-		4,337	2.96
1c. food imports from abroad	9,132	1.72		3,253	2.22
2. Firewood	35,258	6.64		10,942	7.47
3. Agric Exports Abroad	17,806	3.36		5,070	3.46
4. Agric. Exports to Other Colonies	-	-		4,557	3.11
Shelter	44,921	8.46		20,456	13.96
NonAgricultural Output	103,571	19.52		35,799	24.43
1. Invisible Earnings				2,769	1.89
2. NonAgric. Commodity Exports				2,740	1.87
3. Other NonAgric Output	103,571	19.52		30,289	20.67
GDP (Narrowly Defined)	351,522	66.24		114,440	78.10
Labor Force (1,000s of gainful workers)	1713.2			402	
Agricultural	1262.2			281	
NonAgricultural	451.0			121	
Output per worker (Narrowly Defined)					
Agricultural	161			207	
NonAgricultural	230			296	
Ratio NonAgr. To Agr.	1.43			1.43	

Notes and Sources to Table 2

Population figures for the U.S. and the Mid Atlantic region underlying the calculations are from Susan Carter, et al., *Historical Statistics of the United States*, 2006, Series Aa: 2769-71, 4779-81, 4943-45, and 5407-09. The labor force figures are from Weiss (1992)

The figures for GDP and its components for the U.S. in 1800 were taken from Weiss (1992). The GDP figures for the Mid Atlantic region in 1800 were derived by extrapolating backward an estimate of the region's per capita income for 1840. The extrapolating index for per capita income was constructed as the product of indexes measuring changes in the same variables that underlie the estimates of the national figures - changes in the agricultural share of the region's labor force, changes in the region's labor force participation rate, changes in agricultural productivity - and an assumption that the

ratio of non-agricultural productivity to agricultural productivity remained constant over the period at the value established for 1840. It was further assumed that agricultural productivity in the region changed at the national rate between 1800 and 1840. The region's per capita income for 1840 is based on the estimates of Easterlin. (1960, pp. 97-98, Table A-1)

Agricultural output is the sum of Food Production, Firewood, Agricultural Exports Abroad and Agricultural Exports to Other States. Food Production equals food consumption less food imports from other states and from abroad.

Per capita food consumed by free adults (those aged 10 and over) and free children (aged 0-9) in the Mid Atlantic in 1800 was assumed to equal the average of the national figures for those population groups in 1839, 1849, and 1859. The national figures were calculated from data in Gallman, 1960, table, A-2 and U.S. Census Bureau 1975, series U-215 and 216. Food consumption per slave was assumed to equal 75 percent that of free whites. These per capita figures were then multiplied by the population in each group in 1800 to obtain a weighted average value for that year.

We estimated the 1800 values of agricultural imports from other states by extrapolating forward the 1768-72 benchmark figures (described in the notes to Table 3). An estimate of the region's exports to and imports from other states was derived for 1790-92 by multiplying the 1768-72 value of exports per ton cleared (for exports) and per ton entered (for imports) by reported figures for the coastal tonnage entering the ports of New York and Pennsylvania, and inflating these to obtain the value for the Middle Atlantic Region. The average per capita values of coastal exports and imports for 1790-92 were then extrapolated forward to 1802 in two parts, using figures on the stock of registered and licensed tonnage. The 1791 figure was first extrapolated to 1794 based on the gross tonnage engaged in coastal and internal trade. The 1794 figure was then extrapolated forward based on the enrolled tonnage and the tonnage of licensed vessels employed in the coasting trade in the states of the Middle Atlantic. In both cases the extrapolator was a three-year average of tonnage per capita. The tonnage data are from Susan Carter et al, *Historical Statistics of the United States*, Series Df591 and *New American State Papers, Commerce and Navigation*, vol.4 pp. 453-55

Food imports from abroad were estimated by calculating food imports per capita for the US., converting to 1840 prices, then multiplying by the 1768-72 ratio of the Mid Atlantic's per capita food imports to those for the US. We calculated food imports in 1800 as a share of total merchandise imports (*Historical Statistics*, Series Ee 368) less re-exports (Mancall, Rosenbloom and Weiss, 2008, Appendix Table 8). The 1768-72 ratio is from, Shepherd, 1970 "Commodity Imports" (mimeo) Purdue University Working Paper, Tables 1 and 2.

The value of firewood per person for the Mid Atlantic was taken from U.S. Department of Agriculture 1942, Table 2. We used the reported figures on firewood consumed for the Mid Atlantic region (Del., NJ, NY, Penn., DC and Md) for the periods 1790-99 and 1800-1809 to calculate a per capita figure for the entire population. We assumed that slaves consumed one-half the quantity consumed by free persons and solved for the per capita consumption of free persons and slaves. These per capita figures were then multiplied by the free and slave populations in the Mid Atlantic region as defined in this paper.

For agricultural exports, invisible earnings, and nonagricultural commodity exports see Mancall, Rosenbloom and Weiss, 2008 "Commodity Exports, Invisible Exports and Terms of Trade for the Middle Colonies, 1720 to 1775," NBER Working Paper No. 14334 and the associated Appendix.

For the free population, the value of shelter services equals 22 percent of the value of the stock of dwellings in 1798 adjusted for omitted values (Weiss, 1992, Table 1.2; Pitkin, 1967; Soltow, 1989; and Soltow and Land, 1980). The flow was revalued in prices of 1840 by using the deflator for the gross rental value of farm dwellings estimated by Towne and Rasmussen (1960) to obtain a per capita figure for free persons of $14.30. We assumed that the average value of a slave dwelling in each state equaled the

value of those dwellings omitted from the housing survey. That value was calculated for each state as the product of the national ratio of the value of omitted dwellings to reported dwellings times the value of the reported dwellings in each state. This gave a dwelling value per slave of $7.18 in 1840 prices. Using a service flow of 22 percent we obtain the annual value of shelter of $1.58 per slave.

Nonagricultural output is the difference between the total GDP and the estimates of Agricultural Output and the value of Shelter. This residual encompasses all nonagricultural output, except shelter. Thus it includes the output of manufacturing, mining, construction, final services flowing to consumers, the value of government services as well as investment spending. The value of Other Nonagricultural Output is the residual left after deducting the value of invisible earnings and nonagricultural commodity exports.

Table 3

Per Capita Values of Agricultural Output for the Colonies and States of the Mid Atlantic Region

(US Dollars, prices of 1840)

Year	Food Production					Agricultural Exports			Agricultural Output	Agricultural LF share	Agricultural Output per Worker
	Food Consumed	Less Food Imported from		Food Produced	Firewood	Abroad	to Other Colonies	Total			
		abroad	other colonies								
1720	28.16	1.38	0.92	25.86	9.21	3.27	1.25	4.52	39.59	0.72	176.12
1730	28.66	1.69	1.01	25.96	9.86	3.57	1.35	4.91	40.74	0.74	184.61
1740	29.08	1.33	0.77	26.99	9.74	3.48	1.14	4.62	41.34	0.75	186.43
1750	29.65	1.35	0.39	27.91	10.15	3.78	1.89	5.66	43.73	0.73	198.27
1760	30.11	1.24	0.94	27.93	9.47	3.01	1.87	4.88	42.28	0.73	188.83
1770	30.79	1.54	1.49	27.76	8.96	3.68	1.86	5.54	42.26	0.72	189.37
1780											
1791	30.95	2.22	1.27	27.46	7.67	2.10	1.34	3.44	38.58	0.72	186.59
1800	30.85	2.22	2.96	25.67	7.47	3.46	3.11	6.57	39.72	0.70	207.15
	Average Annual Rates of Change										
1720-1740	0.16	-0.18	-0.91	0.21	0.28	0.31	-0.47	0.11	0.22	0.16	0.28
1740-1770	0.19	0.49	2.24	0.09	-0.28	0.19	1.65	0.61	0.07	-0.14	0.05
1770-1800	0.01	1.23	2.31	-0.26	-0.61	-0.20	1.73	0.57	-0.21	-0.08	0.30
1720-1770	0.18	0.22	0.97	0.14	-0.06	0.24	0.79	0.41	0.13	-0.02	0.15
1720-1800	0.11	0.60	1.47	-0.01	-0.26	0.07	1.14	0.47	0.00	-0.04	0.20
	Average Shares of Agricultural Output										
1720-1740	0.71	0.04	0.02	0.65	0.24	0.08	0.03	0.12	1.00		
1740-1770	0.71	0.03	0.02	0.65	0.23	0.08	0.04	0.12	1.00		
1770-1800	0.77	0.05	0.05	0.67	0.20	0.08	0.05	0.13	1.00		
1720-1770	0.71	0.03	0.02	0.65	0.23	0.08	0.04	0.12	1.00		
1720-1800	0.73	0.04	0.03	0.66	0.22	0.08	0.04	0.12	1.00		

Notes and Sources to Table 3

The value of food consumed per capita is a weighted average of the value consumed by the colonists and that consumed by the slaves, and the average for the colonists is a weighted average of that consumed by an adult and that consumed by a child, where the weights are their respective shares of the population. Children are those under the age of 10.

We assumed that the per capita consumption figure for free adult colonists increased at an average annual rate of 0.1 percent per year between 1720 and 1800. The per capita figure for slaves was assumed to equal 75 percent that of a colonist in 1800. Based on Kahn's (1992) estimate of the least-cost diet for slaves, we set the 1700 figure at 75 percent of the 1800 figure and assumed that the value increased at a constant rate between 1700 and 1800.

The estimate of food imports from and agricultural exports to other colonies for 1768-72 comes from Shepherd and Williamson (1992, p. 798, Table 2). We calculated the implicit quantities of most food items, revalued them using dollar prices of 1840, then inflated their sum by dividing it by the share of these food items in the total value of food (in pound sterling) in the original data. We calculated average value per ton of agricultural exports to and imports from other colonies by dividing the base year values by the average tonnage clearing and entering in the years 1768-1772, and extrapolated these values to other years using statistics on tonnage entering and clearing.

Food imports into the Middle Colonies from Southern Europe, the Wine Islands, and the West Indies for 1768-72 are from Shepherd (1970, "Commodity Imports..".mimeo, Tables 1 and 2). Imports of food from Great Britain were calculated as 3 percent of all imports from that source. The total import figure was taken from Susan Carter, et al (2006, *Historical Statistics*, Series Eg452-455). We calculated average value per ton of agricultural imports for three points of origin (Europe, Britain and the West Indies) by dividing the base year values by the average tonnage entering from these other destinations in the years 1768-1772. We multiplied these values per ton by tonnage entering New York and Philadelphia from these three points to estimate the value of food imported from foreign countries. The tonnage data are from Carter, 2006, *Historical Statistics* and Lydon.

Agricultural exports abroad includes only those exports produced domestically. The benchmark figure for agricultural exports from the Middle Colonies to all countries in 1770 is from Shepherd and Walton (1972, 210-227) revalued in 1840 prices of each. We then extrapolated that benchmark figure forward to 1800 and extrapolated it backward to 1720 based on tonnage clearing Philadelphia and New York. See Mancall, Rosenbloom and Weiss, (2008) "Commodity Exports, Invisible Exports and Terms of Trade for the Middle Colonies, 1720 to 1775," NBER Working Paper No. 14334 for details.

The value of firewood per person for the Mid Atlantic was taken from U.S. Department of Agriculture 1942, Table 2. We used the reported figures on firewood consumed for the Mid Atlantic region (Del., NJ, NY, Penn., DC and Md) for the periods 1790-99 and 1800-1809 to calculate a per capita figure for the entire population in each year. We assumed that slaves consumed one-half the quantity consumed by free persons and solved for the per capita consumption of free persons and slaves. These per capita figures were then multiplied by the free and slave populations in the Mid Atlantic region as defined in this paper to get a weighted average value for each benchmark date.

Total agricultural output equals the sum of food produced, firewood and total agricultural exports.

The agricultural labor force is the sum of estimates for the white and black workers residing in rural areas, plus an estimate of the small numbers of the population in farming that were residing in cities. For each of the two rural population groups, the agricultural labor force is the product of the rural population in that group times a rural agricultural participation rate. The 1800 rural agricultural estimating ratios were taken from Weiss's earlier estimates of the U.S. labor force. We assumed those ratios declined over the period 1700 to 1800 at 0.07 percent per year, a rate derived from the labor force evidence for Chester county, Pennsylvania presented by Ball and Walton ((1976, Table 3 p. 109-113). Their indexes of labor inputs per farm for Chester county from 1714-31 to 1775-90 appear to have assumed there was no decline in the rural agricultural participation rates, except for children. The rate of 0.07 percent is a weighted average of the decline in the child participation rate and constancy in the rate for adults implicit in their estimates. That rate of decline is roughly half the rate at which the free labor force aged 10 and over declined in the period 1800 to 1840 (0.131 percent per year). The urban farm labor force was assumed to equal one percent of the urban population aged 10 and over, the percentage used by Weiss in his estimates for the nineteenth century. Evidence for Philadelphia in 1774 and 1780-83 (Jacob Price,) provides some confirmation for this percentage.

Table 4

Conjectural Estimation of GDP per Capita for the Mid Atlantic Region, 1720-1800

	LF Part. Rate	Agric. Output per worker	NonAgric Output per Worker	Intersectoral Shift Effect	Agric. Share of the LF	Estimated Value of K	Extrapolated Value of Non-shelter GDP per capita	Value of Shelter	GDP per Capita
1720	0.31	176.12	268.38	1.14	0.72	1.52	62.50	9.18	71.67
1730	0.30	184.61	308.89	1.17	0.74	1.67	64.50	9.70	74.20
1740	0.30	186.43	318.24	1.18	0.75	1.71	65.12	10.13	75.24
1750	0.30	198.27	286.01	1.12	0.73	1.44	66.79	10.56	77.35
1760	0.30	188.83	330.38	1.20	0.73	1.75	68.99	11.11	80.10
1770	0.31	189.37	270.64	1.12	0.72	1.43	66.19	11.74	77.93
1780									
1791	0.29	186.59	218.85	1.05	0.72	1.17	56.33	13.11	69.44
1800	0.27	207.15	296.30	1.13	0.70	1.43	64.14	13.96	78.10
		Average Annual Rates of Change							
1720-1740	-0.23	0.28	0.86	0.15	0.16	0.57	0.21	0.49	0.24
1740-1770	0.17	0.05	-0.54	-0.16	-0.14	-0.59	0.05	0.49	0.12
1770-1800	-0.43	0.30	0.30	0.02	-0.08	0.00	-0.10	0.58	0.01
1720-1770	0.01	0.15	0.02	-0.04	-0.02	-0.13	0.11	0.49	0.17
1720-1800	-0.15	0.20	0.12	-0.02	-0.04	-0.08	0.03	0.53	0.11
By Decade									
1720-30	-0.41	0.47	1.42	0.26	0.23	0.94	0.32	0.56	0.35
1730-40	-0.04	0.10	0.30	0.04	0.09	0.20	0.10	0.43	0.14
1740-50	0.16	0.62	-1.06	-0.52	-0.21	-1.67	0.25	0.42	0.28
1750-60	0.12	-0.49	1.45	0.70	0.03	1.95	0.33	0.51	0.35
1760-70	0.22	0.03	-1.97	-0.66	-0.25	-2.00	-0.41	0.55	-0.28
1791-1800	-0.54	1.17	3.42	0.83	-0.30	2.23	1.45	0.70	1.31

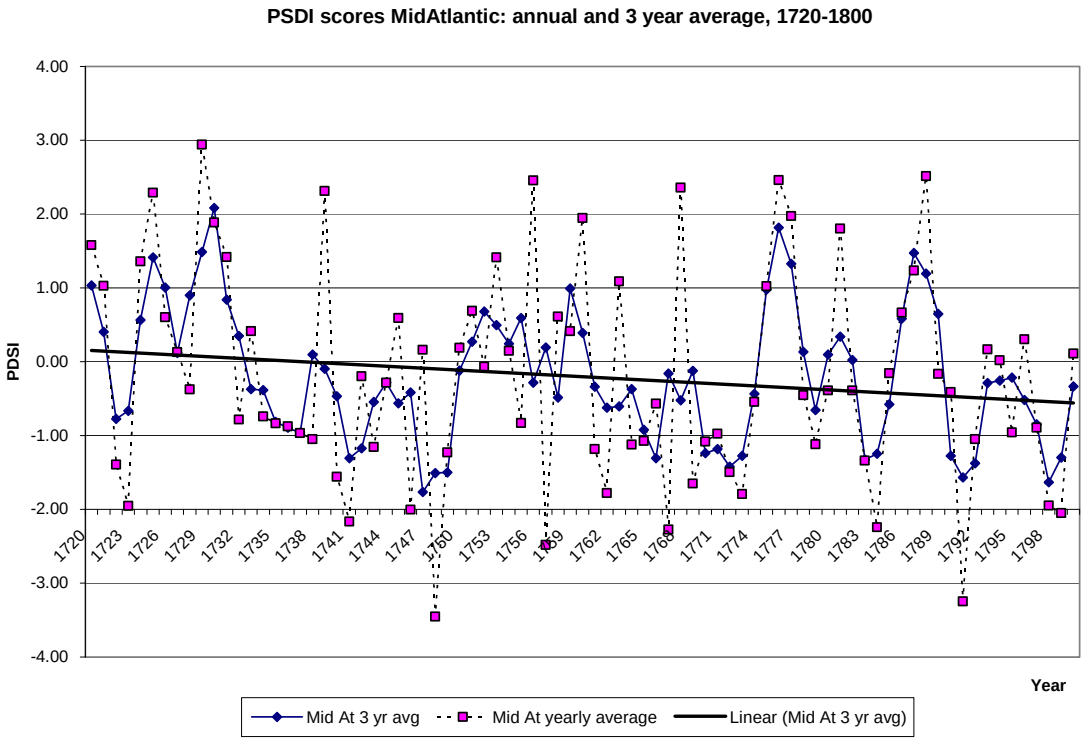
Notes and Sources to Table 4

The Labor Force Participation Rate is a weighted average of that for the free males, free females, and slaves aged 10 and over. The participation rate for each of the population groups are those for 1800 (Weiss, 1992). Agricultural output per worker and the agricultural share of the labor force are from Table 3. The intersectoral shift effect measures the impact of changes in the distribution of the labor force between agriculture and nonagriculture and equals $S_a + (1 - S_a) k$. The value of k, the ratio of nonagricultural to agricultural output per worker, for 1800 is from Table 2. That ratio was assumed to have increased at 0.1 percent per year from 1720 to 1800.

The three input values (cols. 1-3) are multiplied to produce the extrapolated value of GDP per capita. The independent estimate of the value of shelter is then added to the extrapolated value to obtain the full measure of GDP, narrowly defined (i.e. excluding home manufactures and farm improvements).

The per capita value of shelter is a weighted average of that for free population and for slaves. The per capita values of shelter in 1800 of $14.30 for free persons and $1.58 for slaves are from Table 2. We used an index of change in the stock of dwellings to extrapolate the 1800 figures backward to 1700. We based the index on Jones's (1980, p.78) estimate of the rate of growth of wealth per capita between 1700-25, 1725-50, and 1750-74, and Gallman's (1992, p. 95) estimate of the rate of growth of the real value of structures between 1774 and 1799.

Figure 1



Source: The data were provided by Richard H. Steckel and were originally obtained at http://www.ncdc.noaa.gov/paleo/pdsi.html.

SOURCES

Anderson, Terry, 1979. “Economic Growth in Colonial New England: ‘Statistical Renaissance,’” *The Journal of Economic History*, 39, 243-57.

Archives of the State of New Jersey, First Series, Vol. 7, “Administration of Governor Belcher,” pp. 101-401, Newark, NJ.

Ball, Duane and Gary Walton, 1976. “Agricultural Productivity change in eighteenth century Pennsylvania, *The Journal of Economic History* 36, 102-17.

Berlin, Ira, 1980. “Time, Space, and the Evolution of Afro-American Society on Mainland British North America,” *American Historical Review* 85 (1980), 44-78.

Bushman, Claudia L., Harold B. Hancock, and Elizabeth Moyne Homsey, eds 1986. *Proceedings of the House of Assembly of the Delaware State, 1776-1781*, Newark: University of Delaware Press.

Candler, Allen D. 1904-16. *The Colonial Records of the State of Georgia*. Compilations of transcripts of records in the Public Record Office begun by Allen D. Candler and completed by William J. Northen and Lucian Lamar Knight.

Carter, Susan, et al., 2006. *Historical Statistics of the United States*, New York: Cambridge University Press.

Clark, Gregory, “The Macroeconomics Aggregates for England, 1209 to 2008,” *Research in Economic History*, 2010.

Cole, Arthur Harrison (1938). *Wholesale Commodity Prices in the United States, 1700-1861*. Cambridge: Harvard University Press.

Colonial Records of Pennsylvania, Vol. 13, Sept., 1781, Dec., 1781; Mar., 1782; April 1782, Sept. 1782, and Nov. 1782

David, Paul. 1967. "The Growth of Real Product in the United States before 1840: New Evidence, Controlled Conjectures." *Journal of Economic History* 27: 151-97

Documents from the Continental congress, June 10, 1777 (on-line at hdl.loc.gov/loc.rbc/bdsdcc.03301)

Egnal, Marc, 1998. *New World Economies*. New York: Oxford University Press,

Gallman, Robert. "The Statistical Approach: Fundamental Concepts Applied to History," in G.R.Taylor and L.F.Ellsworth, eds. Approaches to American Economic History. Charlottesville: The University Press of Virginia, 1971.

Gallman, Robert, 1992. "American Economic Growth before the Civil War." In R. Gallman and J. Wallis, *American Economic Growth and Standards of Living before the Civil War*. Chicago: University of Chicago Press.

Gallman, Robert. "Can We Build National Accounts for the Colonial Period," in *William and Mary Quarterly*,

Thomas Gordon, *The History of Pennsylvania*, Philadelphia, 1829

Greenberg, Douglas. 1979. “The Middle Colonies in Recent American Historiography,” *William and Mary Quarterly* 3rd Ser., 36 (1979), 396-427.

Grubb, Farley, 1992. “The Long Run Trend in the Value of European immigrant Servants, 1654-1831: New Measuremenets and Interpretations,” *Research in Economic History*, 14, 167-240.

Grubb, Farley, 2004. “The circulating medium of exchange in colonial Pennsylvania, 1729-1775: new estimates of monetary composition, performance, and economic growth,” *Explorations in Economic History*, 41, 329-60.

Jones, Alice Hanson, 1980. *Wealth of a Nation to Be*. New York: Columbia University Press

Kahn, Charles. 1992. "A Linear Programming Solution to the Slave Diet." In Robert Fogel and Stanley Engerman, eds., *Without Consent or Contract. Technical papers*, vol. 3, pp. 522-35. New York: W. W. Norton.

Kulikoff, Alan. 1979. “The Economic Growth of the Eighteenth-Century Chesapeake Colonies,” The *Journal of Economic History*, 39, 275-88.

Kuznets, Simon, 1952. "Long Term Changes in the National Income of the United States of America since 1870." In *Income and Wealth of the United States, Trends and Structure. International Association for Research in Income and Wealth, Income and Wealth* Series II. Baltimore, Md.: The Johns Hopkins University Press.

Landon-Lane, John, Hugh Rockoff and Richard H. Steckel, “Droughts, Floods and Financial Distress in the United States,” Table 3b, in *Climate Change, Past and Present.*

Lebergott, Stanley. 1966. "Labor Force and Employment, 1800-1960." In Dorothy Brady, ed., *Output, Employment and Productivity in the United States after 1800*. Studies in Income and Wealth, no. 30. New York: National Bureau of Economic Research.

Lydon, James, 1967. “Philadelphia’s Commercial Expansion, 1720-1739,” *Pennsylvania Magazine of History and Biography*, 91, 401-19.

Main, Gloria L. and Jackson T. Main, 1988. “Economic Growth and the Standard of Living in Southern New England,” *The Journal of Economic History*, 48, 27-46.

Mancall, Peter C. and Thomas Weiss, “Was Economic Growth Likely in British North America?” *Journal of Economic History* 59 (1999), 17-40.

Mancall, Peter, Joshua Rosenbloom and Thomas Weiss, 2003. “Conjectural Estimates of Economic Growth in the Lower South, 1720 to 1800," in *History Matters: Economic Growth Technology, and Population*, ed. William Sundstrom and Tim Guinnane (Stanford: Stanford University Press, 2003), 389-424.

Mancall, Peter, Joshua Rosenbloom and Thomas Weiss, 2008. “Commodity Exports, Invisible Exports and Terms of Trade for the Middle Colonies, 1720 to 1775,” NBER Working Paper No. 14334.

McConnell, Michael. 2004. *Army & Empire*, Lincoln, University of Nebraska Press.

McCusker, John. 1972. “Sources of Investment Capital in the Colonial Shipping Industry,” *The Journal of Economic History*, 32, p. 155.

McCusker, John, 1999. “Measuring Colonial Gross Domestic Production: an Introduction,” *William and Mary Quarterly*, vol. 56, Jan. 1999, p. 3-8.

McCusker, John, 2000. “Estimating Early American Gross Domestic Product, *Historical Methods*, vol. 33, 2000, p. 156, Table 2 and accompanying text. Here he revealed his preference for the higher rate of growth of 0.6 percent per year.

McCusker, John, 2006. “Colonial Statistics,” in Susan Carter, et al, (2006). *Historical Statistics of the United States: Earliest Times to the Present* (Cambridge University Press), vol. 5,

Menard, Russell, 1976. “Comment on Paper by Ball and Walton,” *The Journal of Economic History* 36, 118-25.

Nash, Gary B., *The Urban Crucible: Social Change, Political Consciousness, and the Origins of the American Revolution*. Cambridge, MA: Harvard University Press, 1979.

New American State Papers, Commerce and Navigation, vol.4

Palmer, Wayne C. "Meteorological Drought." Research Paper No. 45. U.S. Weather Bureau, Washington, DC.

Parker, Peter J., "Rich and Poor in Philadelphia," *Pennsylvania Magazine of History and Biography*, 1975,

Philadelphia Guardians for the Relief and Employment of the Poor of the City of Philadelphia," The Accounts of the Guardians of the Poor, reprinted in *Poulson's American Advertiser*, May 19, 1802

Pitkin, Timothy. [1816] 1967. *A Statistical View of the Commerce of the United States*. Reprint, New York: Augustus Kelley

Rothenberg, Winifred B. *From Market Places to a Market Economy*

Rothenberg, Winifred B. 1992. "The Productivity Consequences," in R. Gallman and J. Wallis, *American Economic Growth and Standards of Living before the Civil War*. Chicago: University of Chicago Press.

Shepherd, James, 1970. "Commodity Imports" (mimeo) Purdue University Working Paper

Shepherd, James, and Samuel Williamson. 1972. "The Coastal Trade of the British North American Colonies, 1768-1772." *Journal of Economic History* 32: 783-810.

Smith, Billy G., "The Material Lives of Laboring Philadelphians, 1750 to 1800." *William and Mary Quarterly*, 3rd ser., 38, no. 2 (April 1981), pp. 164-202.

Soltow, Lee. 1989. *Distribution of Wealth and Income in the United States in 1798*. Pittsburgh, Penn.: University of Pittsburgh Press.

Soltow, Lee, and Aubrey Land. 1980. "Housing and Social Standing in Georgia, 1798." The *Georgia Historical Quarterly* 64: 448<->58.

Taylor, George R. 1964. "American Economic Growth before 1840: An Exploratory Essay." *Journal of Economic History* 24: 427-44.

Towne, Marvin, and Wayne Rasmussen. 1960. "Farm Gross Product and Gross Investment in the Nineteenth Century." In William Parker, ed., *Trends in the American Economy*. Studies in Income and Wealth, vol. 24. Princeton, N.J.: Princeton University Press.

U.S. Department of Agriculture. 1942. "Fuel Wood Used in the United States, 1630-1930." Circular no. 641. Washington, D.C.: U.S. Government Printing Office.

Vickers, Daniel, 1996. "The Northern Colonies: Economy and Society, 1600-1775," in Stanley L. Engerman and Robert E. Gallman, eds., *The Cambridge Economic History of the United States*, vol. 1, *The Colonial Era* (Cambridge, Eng: Cambridge University Press, 1996), 209-248.

Votes of Assembly, Pennsylvania Archives, Series 8, Vols. VI, VII, and VIII.

"The Walker Expedition to Quebec, 1711" *The Publications of the Champlain Society*, Toronto 1953, pp. 251-54.

Weiss, Thomas. 1992. "U.S. Labor Force Estimates and Economic Growth, 1800 to 1860." In R. Gallman and J. Wallis, eds., American Economic Growth and Standards of Living before the Civil War. Chicago: University of Chicago Press.

Weiss, Thomas, 1993. "Long Term Changes in U.S. Agricultural Output per Worker, 1800-1900." *Economic History Review* 46: 324-41.

Weiss, Thomas, 1994. "Economic Growth before 1860: Revised Conjectures." In Thomas Weiss and Donald Schaefer, eds., *American Economic Development in Historical Perspective*. Stanford, Cal.: Stanford University Press.