REAL INCOME AND ECONOMIC WELFARE GROWTH IN THE EARLY REPUBLIC OR, ANOTHER TRY AT GETTING THE AMERICAN STORY STRAIGHT

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Précis

American economic historians have overlooked the inconsistency between two consensus views regarding the relative productivity position of the agricultural sector during the antebellum era. On the one hand, a long and well-established historiographic and analytical tradition in the study of industrialization on the mainland of North America emphasizes that land abundance resulted in levels of average and marginal productivity in farming that remained so high that scarce and relatively dear labor constituted an obstacle to the growth of other, especially manufacturing employments -- an obstacle that was alleviated eventually, in the post-1815 era, by the combined effects of the imposition of protective tariffs, the substitution of machinery, and the encouragement of labor-saving technological innovations. This has been seen as the actualization of the essential features of the developmental program proposed by Hamilton's *Report on Manufactures* (1791). At the same time, the so-called "controlled conjectures" method for estimating aggregate real gross domestic product introduced by David [1967] to extrapolate the real product estimates of Gallman [1966] backward into the pre-1840 "statistical dark age" of U.S. economic history -- a recipe subsequently followed, with variations in the statistical "ingredients" by Gallman [1971], Weiss [1992, 1994], and others -- presents a different and at least superficially conflicting picture of the position of American agriculture. These studies reinforce the Colin Clark [1940]- Simon Kuznets [1966] view of agriculture as the comparatively backward, relatively low labor productivity sector, and show the secular reallocation of the labor force over the 1800-1840 era as having not simply resulted in a shrinkage in the relative size of the farm sector consistent with a rising trend in real income per capita, but as having contributed substantially to the latter trend by shifting workers from low to higher productivity employments.

The inconsistency is removed in this paper by new calculations of relative sectoral labor productivities for 1839/40, which reject the Kuznetsian generalization inapplicable to the experience of America (and perhaps other regions of recent settlement) in the early nineteenth century. By taking account of the lower intensity of labor inputs, measured in full-time equivalent manhours per worker gainfully employed in agriculture, compared to other pursuits in 1840, a new picture emerges of farming as the relative high average labor productivity sector. It is found that that the corresponding imputed rates of labor earnings in farming were higher than those in the rest of the economy, on both a full-time equivalent persons engaged, and manhours basis, due to a substantial entrepreneurial earnings component in the imputed returns to labor in agriculture. This interpretation is consistent with Hamilton's diagnosis, and the modern view that no pronounced disequilibrium wage differentials prevailed between farm and non-farm sectors in the market for common labor.

A new set of computations of the growth of per capita real GDP are effected, using labor inputs and corresponding agricultural productivity estimates on a manhours basis. These show a high degree of stability in the trend rates of growth over the intervals 1800-1835 and 1835-1855, the end points of which are centered in cyclically comparable (peak activity) years; the magnitudes of the growth rates found for a broad, comprehensive coverage of GDP which includes estimates for home manufactures and farm improvements, are not noticeable lower than either the rates implied for those intervals by Weiss's [1992, 1994] estimates, or the comprehensive scope estimates made on (similarly) on the manhours labor input basis and reported by Abramovitz and David in earlier publications [1973, 1993]. The new per capita real GDP figures, however, continue to show a rhythm of variations around the trend, revealed by overlapping 20-year average annualized rates, that is more pronounced than those appearing in Weiss's latest estimates -- although much more attenuated than were the fluctuations in the early "narrow scope" estimates produced by David [1967].

Far more striking than any differences in the levels and movements of the output measures resulting from this new treatment are the differences in the sources of the growth of per capita real product. The relative transfer of workers into non-farm pursuits represents a contribution to the growth of per capita product from the side of rising labor input per capita. This wholly offsets the *downward impact upon the level of aggregate labor productivity* that was exerted by the same structural shifts, so that growth of intra-sectoral productivity which was dominated by the improvement of manhour productivity in agriculture during the pre-1840 period, constituted the entire source of aggregate productivity gains in the economy. The welfare significance of rising per capita real product during the ante-bellum era is cast into a different light by the implication that more than half of its 0.9 percentage point per annum rate of growth was attributable to the growth of labor effort (manhours) per member of the population.

REAL INCOME AND ECONOMIC WELFARE GROWTH
IN THE EARLY REPUBLIC

Or, Another Try At Getting the American Story Straight

1. Apologia

It is necessary to begin with apologies. There might appear to be something vaguely gauche in my returning, after a lapse of almost thirty years, to further vex "the vexed question of U.S. growth during the 1800-1840 interval" -- that being the phrase by which I described the topic of my paper in the *Journal of Economic History* in June, 1967. Where have I been all this time whilst many were toiling so assiduously in this field? (See e.g., Gallman and Weiss [1969], Poulson [1969, 1994], Galllman [1971, 1972, 1975, 1992], Lindstrom [1979, 1983], Engerman and Gallman [1983], Weiss [1986, 1992, 1993, 1994], Folbre and Wagman [1991].) To be fair, however, it is not the case that I had abandoned the field entirely. Although I have not broached the methodological issues in print explicitly, in the interim there have been several occasions on which a continuing interest in (perhaps here it would be more correct to say "addiction to") the collective cliometric enterprise of enlightening the pre-1840 "statistical dark age" led not only to rethinking and recalculating on my part, but also to results that bubbled to the surface in publications based upon successive revisions and elaborations of my original set of real gross domestic product conjectures (see Abramovitz and David [1973a, 1973b,1994], David [1975, 1977, 1979], Abramovitz [1993]).

But, confessing to secret habits cannot be a very good excuse for having kept quiet so long. Why wait 'til now to show up with a new set of growth rate estimates such as appear in Table 1? Why indeed, when Thomas Weiss has finished gathering in the harvest of revised labor force and real product statistics, fruits of his own and others' patient labors over many years, thrashed out their principal implications for the macroeconomic history of the American economy during the antebellum era, and sent off the precious kernels for storage in one of those imposing statistical edifices erected under the auspices of the National Bureau of Economic Research (Weiss [1992])? Worse than merely awkward, it could appear quite pointless even to broach the subject again, now that Robert

Gallman and John Wallis, the editorial inspectors and weighmen presiding at the NBER storehouse in question, have declared Professor Weiss's new income estimates to be "firmly based", and, accordingly have concluded that "[t]hese estimates will endure" (Gallman and Wallis [1992: p.4]). Whether or not this proves an accurate forecast, one cannot ignore the reasonablness of the impulse to make such a declaration -- in which the shouted *Hosanna!* seems tinged with a fervent expression of hope for surcease from unending revisions and retouchings of the statistical picture of the American Republic's first half-century of economic growth.

So, I have felt it to be incumbent upon me to voice publicly at least a modicum of contrition for the perversity involved in waiting until the dust seemed thoroughly settled, before stirring it up again. In mitigation, it could be said that presenting "another view", and, in some respects, a radically different view may re-introduce a bit more zest into university classroom presentations of the subject -- a certain amount of flying dust always does that.

This much having been said, a more serious, and hence a more difficult part of my *apologia* remains to be offered. I began that notorious article in the *Journal of Economic History* (David [1967: p.151] everso archly, by diagnosing a condition of "latent schizophrenia" in prevailing scholarly opinion on the subject of ante-bellum U.S. economic growth, and went on to propose a course of analysis which, speculative 'though it might be, seemed to hold the promise of a cure. The split-minded condition to which that analysis was directed concerned the conflict between the consensus that the economy was well embarked upon modern economic growth prior to the Civil War, on the one hand, and, on the other, a lingering impression in the literature of stagnant per capita real income over the course of the 1800-1840 period -- which specter-like, had hung on after the profession had agreed to discard the substance of Robert F. Martin's [1939] pioneering but erroneous statistical estimates. Although imperfect in a number of the details of its execution, my basic therapeutic approach has proved to be effective, and I do not think it is necessary for me to offer any apologies on that account.

What I must now own up to is this: in my efforts to rid our collective mind-set of one source of internal conflict, I perpetuated and, indeed, unwittingly reinforced another quite different and no less disturbing form of schizophrenia. Moreover, despite being conscious of this latter problem for quite some time, I

haven't brought it to the fore in a way that would elicit help in either resolving it or dispelling my sense of unease when the topic comes up. Whereas the former alleged condition of schizophrenia concerned the course of aggregate of real income changes, this other, still latent conflict involves the repression of a possibly serious confusion in our conceptualization of the relationship between the pace of modern economic growth and the structural transformation of the economy that was underway during the first half-century of American Republic's history. As soon will be seen, however, the interpretive problem that has worried me for a while now calls for a reopening of the seemingly closed matter of estimating the course of real product growth.

2. The Problem: Can Hamilton and Kuznets Be Reconciled?

The preceding question states the problem in a nutshell, although perhaps too concisely to make the nature of my worries immediately transparent. To unpack it a bit, the thing that has been nagging at me is this: If we believe that an important contribution to the growth of aggregate productivity and real income per capita in the early nineteenth century derived from the shift away from the economy's formerly dominant agrarian basis, and, specifically, from the declining proportion of the labor force engaged in its agricultural sector, how do we square this with the long-held perception of American farming as having been so productive that the high opportunity cost of labor facing other potential lines of employment constituted a serious obstacle to industrial development? We all know very well that this was the view to which many contemporary observers subscribed at the end of the eighteenth century; that it was enshrined in *The Report on Manufactures* (1791) by Alexander Hamilton's statement:

> "Many, whom Manufacturing views would induce to emigrate
> [to the U.S. from foreign parts], would afterwards yield to the
> temptations, which the particular situation of this Country holds
> out to Agricultural pursuits." (See Cooke [1964: p. 132].)

Do we not tell students of American economic history that land abundance resulted in levels of average and marginal productivity in farming which remained so high that scarce and relatively dear labor posed a serious obstacle to the development of other pursuits, especially manufacturing employments? Do we not teach them that this was the obstacle to industrial transformation that, in the post-1815 era began to be alleviated by the combined effects of protective tariffs, the

substitution of machinery, and the encouragement of labor-saving technological innovations -- all of which may be construed as the actualization of the essentials of the developmental program envisaged in *The Report on Manufactures*?

Indeed, were the authority of Hamilton on this not enough to give some force to the question, there is the extensive modern literature that has grown up around the subject of American land abundance, relative labor scarcity, mechanization and Habakkuk thesis concerning the labor-saving bias of early nineteenth century technological change in the U.S. (For a survey and critique of the new economic history literature that developed contemporaneously with the revision of the aggregate growth picture, one may consult David [1975: Ch. 1], and more recently James and Skinner [1985].)

Curiously, to my present way of thinking, at the same time that we are urging our students to penetrate that particular thicket because it is held to surround a central truth about the economy's development, we continue to cling to the insights of Simon Kuznets, whose famous studies culminating in the book *Modern Economic Growth* served firmly to couple the very idea of that process with the phenomenon of structural change. As Barry Poulson [1994: p. 79] recently has observed, Kuznets had memorable precursors in Colin Clark [1940] and A.G.B. Fisher [1939], who drew attention to the changes in industrial structure that were concomitants of "economic progress" gauged in terms of the secular growth of per capita real income. Yet, it was left to his systematic investigations to establish that declines in the agricultural shares of output and inputs and the expansion of the industrial and service sectors "have accompanied the process of modern economic growth in all of the developed countries."

Furthermore, it was from Kuznets' time-series and cross-sectional studies of the developed economies in the late nineteenth and early twentieth centuries (appearing in *Economic Development and Cultural Change* over the years from 1956 to 1967) that we learned that these transformations of industrial structure were, in turn, accompanied by the convergence of productivity levels among the major sectors of the developing economy. Agriculture, where productivity levels were initially lowest, would experience the highest rates of productivity improvement, whereas the service sector, where productivity levels were high, lagged behind the rest of the economy in its rate of productivity advance, with the result that productivity levels in both sectors tended to converge toward that of industry.

I, for one, can testify that by 1966 the effects of a thorough schooling in "Kuznets, Chenery and all that" had predisposed one part of my conscious faculties to suppress everything which, in another part of my head, I had learned about "Hamilton, Habakkuk and all *that*", and so to accept it as utterly natural that labor productivity in American farming would be found to have been lower than it was in the rest of the ante-bellum economy. It was clear at the time, and it is clearer to me still from the vantage point of the present, that my thinking in this was in this regard most powerfully shaped by the earlier work of Kuznets [1952], who had rejected Martin's [1939] results on the basis of just this general consideration and the observation that the agricultural share of the workforce was shrinking in the period between 1800 and 1840. Therefore, when I ran the calculations of the 1840 level of sectoral gross product originating per gainful worker in agriculture, relative to the same productivity measure for the "non-farm" sector of the economy, and found it to lie in the range between 0.399 and 0.511 (depending upon whether one took a narrow or comprehensive definition of "agriculture" (according to David [1967: Table 5]), I accepted those figures without hesitation. I used them, following Kuznets' suggestion, to measure the effect of the intersectoral reallocation of labor on the aggregate level of labor productivity. And so too have the many followers who, while modifying the numbers in one way or another, have embraced the same the basic framework for producing such conjectural income estimates.

So, I ask now: Can Kuznets really be squared with Hamilton? And what would happen to our view of early U.S. income growth were Hamilton to have been right and Kuznets mistaken, as I now have come to believe he was, in applying to the early American context a view of the position of agriculture based on his studies from a much later period in U.S. history and the history of other developed economies? Quite possibly others will not be as intrigued and perplexed as I am by the logical inconsistency that is exposed by the foregoing juxtaposition of views of American agriculture -- cast simultaneously as the "backward", low productivity sector, and the high productivity lure that impeded early industrial expansion. Nevertheless, to call attention to this problematic does strike me as important, however belatedly the call has come. In the context of the quantitative historical enterprise upon which this Conference has embarked, my particular concerns in this essay should readily be perceived to have a direct bearing -- not only upon our understanding of the connections and continuities that existed between economic change in the colonial and early national periods, but also upon our reading of the welfare significance of the acceleration of per capita real product growth that all the statistical reconstruction work of the past three decades assures us was taking place between the Revolution and the Civil War.

3. Another View, Some Things Old and Some Things New

It would be possible to devote some considerable amount of time and space entertaining various theoretical circumstances in which the two views set out above might turn out to be perfectly consistent. To suggest the flavor of these, suppose that as Arthur Lewis [1954] postulated, the marginal productivity of labor in agriculture had been driven to very low levels but the cooperating factors of production kept average productivity sufficiently high that owner-occupiers could live off the land at a level that set a high floor under the supply price of labor to non-agrarian pursuits. Transferring labor out of agriculture would represent an allocative improvement which raised the aggregate level of labor productivity, because to do so would require there to be a positive gap between the marginal productivity of labor outside and inside agriculture. Maintaining that gap in the circumstances envisaged, however, would entail heavy capital formation, or differential technical progress in the non-agricultural sector, and so the reallocation effect would hardly be in the nature of a pure efficiency gain (*pace* Gallman [1971]). But the fantasy of late eighteenth and early nineteenth century America as a closed, labor surplus region along the lines of the Lewis model, is just that -- just a fantasy which need not detail us much longer. If anything could be said for pursuing this line of thinking in the present context, it would be necessary to notice that the economy was open to labor inflows from regions of comparative labor abundance, indeed, possible labor surplus in the Old World, and that during the first half of the nineteenth century it was the foreign-born workers who were successfully drawn into, and retained by the expanding commercial and industrial centers of the of the North American mainland.

Rather than inquiring further in that direction for a resolution of the problem at hand, we can dispel the conflict simply by rejecting the Kuznetsian generalization as one that reflected conditions of a later era, and therefore not relevant to the early nineteenth century experience of America. By the time one

reached the closing decades of the century, which is the period in which Kuznets systematic intersectoral comparisons begin, U.S. industrial productivity had grown rapidly under the influence of increasing plant size, greater capital-intensity and the organizational methods supporting high rates of throughput; whereas the first phase of agricultural mechanization (based on animal draught-power) was far along, but had left an agricultural sector characterized by many small, poorly capitalized and inefficiently run farming units. Indeed, those grand Kuznetian generalizations concerning the nature of intersectoral productivity gaps quite possibly need to be qualified, as being not relevant to the early stages of economic growth of any of the other regions of recent settlement: in Australia, to cite a second instance, well into the present century the expansion of manufacturing involved the relative transfer of resources from high productivity rural sectors to lower productivity industrial pursuits, as Noel Butlin's researches have shown (see, e.g., Snooks [1978]).

If a literary warrant were demanded for entertaining this particular departure, we might well start by attending to Henry Adam's vivid portrayal of rural American in 1800 as a place were free men who labored were neither able to, nor needed to work very hard over the course of the year:

> "...loungers and loafers, idlers of every description, infested the taverns, and annoyed respectable travellers both native and foreign. Idling seemed to be considered a popular vice, and was commonly associated with tippling....but in truth less work was done by the average man in 1800 than in aftertimes, for there was actually less work to do. 'Good country this for lazy fellows,' wrote Wilson from Kentucky [in 1808, who Adams elsewhere describes as a Pennsylvania Scot ornithologist, a shrewd judge, and the most thorough of American travellers]; 'they plant corn, turn their pigs into the woods, and in the autumn feed upon corn and pork. They lounge about the rest of the year.' The roar of the steam-engine had never been heard in the land, and the carrier's wagon was three weeks between Philadelphia and Pittsburg. What need for haste when days counted for so little? Why not lounge about the tavern when life had no better amusements to offer? Why mind one's own business when one's business would take care of itself?" (Adams [1889/1855: pp. 13,40])

To be sure, the United States in 1840 had become a different place from the one described in this passage; the steam-engine's roar already could be heard west of the Allegheny mountains, as well as in the cities and towns of the Atlantic seaboard. But, even so, John Kendrick's [1961: Table A-XXII] statistical studies using data on the length of the work year in each of the major (1-digit SIC) industries during the latter decades of the nineteenth century offer a basis estimating the magnitude of the difference between the farm and non-farm sectors in regard to the length of the work year at earlier dates. The simplest consistent way to do this for the nation as a whole is by backwards extrapolation on figures showing the changing industrial distribution of the U.S. labor force (defined on a gainful worker basis), a starting point for which has been provided for us by the pioneering work of Weiss [1975/1967] and Gallman and Weiss [1969].

It is via that route -- along which, inevitably, there were some minor by-ways and statistical excursions too tedious to be recounted here, that I have arrived at the labor input estimates for 1840 that appear in the middle panel of Table 4. These place the annual number of manhours per full-time equivalent person engaged in agriculture at 2366; stated in relative terms, agricultural manhours per F.T.E. worker was 87.1 percent of the national average and 75.6 percent of the average work year in the non-farm portion of the economy. Moreover, in relation to the number of gainful workers (age 10 and older), the F.T.E. persons engaged in agriculture represented only 68.3 percent of the corresponding figure for the non-farm sector. Putting these figures together one arrives at the view that the number of F.T.E. manhours per gainful worker in farming was barely 52 percent of the level in the rest of the economy . The import of this quantitative conjecture, for all its crude and approximate character, might not have surprised Henry Adams.

By taking account of the lower intensity of labor input measured in full-time equivalent manhours per worker gainfully employed in U.S. agriculture, compared to other pursuits in 1840, and by broadening the conceptual scope of our estimates of gross product originating in agriculture at the time of the 1840 Census, one arrives at a new picture (see Table 3) consistent with the traditional, Hamilton view of farming as the sector of relatively high average labor productivity. Indeed, it now emerges that the relative productivity of labor in agriculture (comprehensively defined) was 1.83 times that of the rest of the

economy when reckoned on a manhour basis, or almost twice the relative level found with these ingredients when the calculation is made on a gainful worker basis!

Following on from this, in Table 4 it can be seen that the corresponding imputed rates of labor earnings in farming were higher than those in the rest of the economy, on both a full-time equivalent persons engaged, and the F.T.E. manhours basis. The source of the differential in favor farming was the substantial entrepreneurial earnings component of the imputed returns to labor in agriculture. This interpretation permits one to accept the persisting applicability of the Hamiltonian vision a half-century after it had been enunciated, and is consistent with the view that no pronounced disequilibrium wage differentials prevailed between farm and non-farm sectors in the market for "pure" labor service, a conclusion for which support is provided by Margo [1995].

4. "Once more into the breach, dear friends...": An Overview of Methods and Results

From the fresh starting point thus gained, a new set of computations of the growth of per capita real GDP can be generated within the familiar framework introduced in David [1967], save for the fact that now it is possible to go beyond the gainful worker measures of labor input that undergirded the original conjectures, and even beyond the subsequent revisions which Weiss [1992] has made in the Lebergott-David figures for the total U.S. labor force. Instead, while absorbing the comparatively small resulting modifications into the latter, gainful worker aggregates for the entire economy (compare Table 2.1, cols. 1-3) I have proceeded here, as previously -- in the work underlying Abramovitz and David [1973a, 1973b], and David [1977] -- to develop the following series for the decennial census dates in the period 1790-1840: (1) F.T.E. manhours-based measures of total labor inputs (Table 2.1, col.4), (2) the shares of total manhours inputs in agriculture (Table 2.2, col. 6), and (3) the corresponding revision (Table 2.3, col.8) of the series for average agricultural labor productivity on a manhours basis. From the notes accompanying the lattermost among these series it will be seen that the resulting new agricultural labor productivity index reflects also my incorporation of the revisions made by Weiss {1993] in the Towne and Rassmussen [1960] estimates of real gross agricultural product.

These fresh ingredients having been assembled, along with the corresponding U.S. population figures, they can be combined with alternative estimates of the 1840 farm-nonfarm productivity differential (from Table 3), by following the well-known recipe (which is reproduced in the Notes on Calculations for Table 5, following Table 5D). The first result is the new pair of conjectural indexes of narrow scope real GDP, which are served up in Tables 5E and 5F. A test of the performance of these two series against the corresponding direct estimates that are available for the period 1840-1860 suggests the slower growing member of the pair (definition 2, from Table 5F) is the more satisfactory. By separately adding in estimates made for the constant (1860) dollar value of home manufactures, and investment in the form of farm improvements, I arrive (in Table 6B) at the finished dish: the present, broad scope estimates for per capita real GDP (Variant II). Index numbers have been calculated from the latter series to facilitate their comparison with antecedent estimates on both the narrow and broad scope basis, as is done in Table 7.

On returning to Table 1 to examine more closely the implied pattern in the average annual growth rates, it will be observed that for the broad, comprehensively defined measure of GDP, which includes estimates for home manufactures and farm improvement investments, the present figures for either of the "long-swing" periods, and for the whole of the "long term trend" period, are not noticeably lower than the rates implied by Weiss's [1993, 1994] estimates. Nor do they differ significantly from the comprehensive scope estimates made (similarly) on the manhours labor input basis and reported by Abramovitz and David in earlier publications [1973a, 1973b, 1993]. Further, it will be observed that the newest entrants in the lists for broad scope estimates of per capita real GDP display a high degree of stability in the pace of growth over the "long-swing trend periods" 1800-1835 and 1835-1855. This was the essential qualitative proposition concerning the early national economic growth record, for which I first argued almost thirty years ago in the context of the debates then taking place about whether or not the beginnings of industrialization in the 1820s was tantamount to a pre-Civil War "take-off" for the economy as a whole.

It may be recalled (from David [1967], and more recently Abramovitz [1993]), that this particular pair of time intervals is of special interest in assessing the long-run growth of the U.S. per capita aggregate production potential; the interval's endpoint dates denote the central years in the cyclically

comparable periods of *peak* economic activity within the antebellum chronology of the "long-swings" of the Kuznets cycle: 1799/1801, 1834/36, and 1853/57. Looking at growth rates between consecutive, or overlapping intervals formed from the arbitary and cyclically incomparable census dates is not likely to be instructive on the question of long-run trend acceleration.

Do the recent estimates appearing in Table 1 suggest that the time has come to think about resuccitating of the long moribund view of the antebellum U.S. economy as having undergone a Rostovian "take off"? According to Diane Lindstrom [1995:436], the verdict already is in:

> "Weiss's {[1992] } data point to trend acceleration in growth between 1800 and 1860. This evidence refutes Paul David's widely reported assertion that the economy grew by fits and starts but with no change in the secular rate."

Now, it is true that there is a 0.11 percentage points worth of acceleration between the long-swing period rates based on Weiss [1992] , whereas the corresponding increase in the Abramovitz-David [1973] figures was only an 0.07 percentage point per annum. But is the former and larger figure really able to bear the weight of an interpretative revolution such as might be read into Lindstrom's remarks? Indeed, can the periodic impulse toward reinterpretation of the past even find firm support in the slightly more pronounced degree of trend acceleration (0.14 percentage points) exhibited by the present estimates? Caution would urge otherwise. Consider that if one were to allow for conventional ±10 percent margins of estimation inaccuracy around each of that pair of long-swing trend rates in Table 1 (i.e., column 3) , the figure for the earlier period might prudently be put as high as 0.88 percent per annum, whereas that for the following period could be placed as low as 0.85 percent per annum.

A pattern of growth rate variations around a gradually rising level is exhibited by the newest per capita real GDP figures, as it was by the antecedent estimates of David and Abramovitz [1973]. This is evident in the movements of the average annualized rates for the overlapping 20-year intervals beginning with 1790-1810 and ending with 1840-1860. The amplitude of the period-to-period movements in the rates calulated from the present estimates is very much smaller than the corresponding 20-year overlapping rates implied by the 1973 estimates (which, partly due to the authors' doubts about their soundness in this particular regard, hitherto had been left unpublished). With respect to their volatility the new

growth rate series may be thought to represent a distinct improvement, insofar as it closely matches the comparable series provided by Weiss [1992]: for the former the mean period-to-period change is 0.36 percentage points (with a range of 0.36 percentage points between the largest and smallest change), whereas for the Weiss [1992] series the mean change is 0.33 percentage points, with range of 0.48 percentage points.

There, however, the resemblance ends. The timing of the fluctuations in the present series -- although much more attenuated than were the fluctuations in the early "narrow scope" estimates produced by David [1967] -- continues to reflect the rhythm of the antebellum process in which recurrent episodes of extensive and intensive development were alternated. These "long swing" instablities generated a slower average pace of growth per capita over the intervals 1810-30 and 1830-50, and a quicken pace during 1820-40 and 1840-60. The "intensive growth fraction" (calculated from the broad scope estimates Tables 6 and 7, as the ratio between the growth rate of real GDP *per capita* and real GDP itself) shows the following oscillatory pattern in these overlapping 20-year intervals:

1810-30	0.204
1820-40	0.268
1830-50	0.226
1840-60	0.304

That rhythm of growth , however, is virtually undiscernable in the rates Table 1 presents on the basis of the corresponding Weiss [1992] estimates.

5. Conclusions, but Doubtless not an Ending

From the comparison of the present estimates with those of Weiss {1992, 1994] in the two foregoing aspects, it would appear that the choice to be made between these two most recent statistical concoctions will not be an issue of much concern for students of the long-run trends in potential output and productivity in the American economy, even if it is a matter of considerable interest and concern to students of the dynamics of business cycles and international flows of labor and capital linked to "development booms" in the north Atlantic economy during this era.

Yet, there really is something else at stake in the revised supply-side account of the antebellum U.S. development process which the newest estimates

presents. Far more striking than any differences in the levels and movements of the output measures resulting from this new treatment are the differences in the *sources* of the growth of per capita real product. The relative transfer of workers into non-farm pursuits now represents a contribution to the growth of per capita product from the side of rising labor input per capita. This wholly offsets the *downward impact upon the level of aggregate labor productivity* that was exerted by the same structural shifts, as can be seen from the calculations in all the variants of Table 5. Consequently, the average growth of *intra-sectoral* productivities, which during the pre-1840 period remained dominated by the improvement of manhours productivity in agriculture, constituted the sole source of aggregate productivity gains in the economy.

The welfare significance of the steady upward trend in per capita real product during the ante-bellum era is thus cast into a rather different light -- by the implication that more than half of the average 0.9 percent per annum rate of growth is accounted for by the growth rate of labor inputs (in F.T.E. manhours) per member of the population. Demographic changes which were the main force driving the rise of the aggregate labor force participation rate, contributed about 0.18 percentage points to the average annual growth rate over the period 1800-1855; much more important quantitatively was the 0.32 percentage points per annum being contributed by the rise in F.T.E. manhours worked per member of the labor force, (see Table 5F). Thus, it turns out that the major part of the antebellum American macroeconomic success story can be said to have been to have been a matter of having a growing population that was "working harder", rather than "working smarter".

By now it will be evident that, in the course of broadening of the scope of the real product series, and due to the introducing numerous revisions of underlying series used in implementing the methodology of "controlled conjectures", there have been notable changes in the resulting growth rate estimates for the long-swing" periods, as well those for the cyclically influenced overlapping twenty-year periods. There is reason to hope that the replacements which now are available for the growth rate estimates that made their debut in 1967 represent a definite improvement, not only upon the original conjectures but upon some of their successors. Yet, it will take some time for the new figures to be absorbed and digested, and for their fuller import to be considered, and the

history of this process would hardly suggest that such qualities of endurance as they may possess should be expected to persist indefinitely.

For the moment, however, it is undoubtedly satisfying (in one particular quarter, at least) that while the foxes in this field will go on needing frequently to update the "many small things" that they know, the hedgehogs appear to be secure in "one big thing" that has emerged as a consensus view among American economic historians during the past three decades. Although the acceleration of the economy's pace of growth after 1790 was a sharp discontinuity from the collective long-run macroeconomic experience of the mainland north American colonies, it represented the first phase of a gradual transition, and not a once-and-all "take-off into modern economic growth". The growth rate real product per capita over the course of the antebellum era underwent recurring, Kuznets cycle-like variations around a trend rate that remained quite stable, rather than immediately continuing to accelerate. Indeed, sustaining a "modern" pace of advance in per capita real product -- which is to say, a trend growth rate in the range between 1.5 and 2 percent per annum -- was an achievement that was left to be accomplished by the post-bellum generations of Americans.

Table 1

Average Rates of Growth of U.S. Real GDP per Capita (Broad Scope), 1790-1860 Percent per Annum

Time Intervals	Abramovitz-David 1973 Estimates (1)	Weiss 1992 Estimates (2)	Present Estimates (3)
	Overlapping 20-year Intervals		
1790-1810[a]	-0.80	0.94	0.41
1800-1820	0.12	0.37	0.20
1810-1830	2.12	0.46	0.76
1820-1840	1.24	0.93	1.08
1830-1850	0.61	1.05	0.88
1840-1860	1.10	1.44	1.37
	Long-Swing Trend Periods		
1800-1835	0.87	0.83	0.80
1835-1355	0.94	0.94	0.94
	Long Term Trend Intervals		
1800-1855	0.92	0.92	0.90
1790/93-1860	0.85	0.98	0.89

Sources: (1) From Table 7, Panel B, Col. 1. Row 1 estimate refers to 1790-1810, etc.
(2) From Table 7, Panel B, Col. 2. Row 1 estimate refers to 1793-1810, etc.
(3) From Table 7, Panel B, Col. 3. Row 1 estimate refers to 1790-1810, etc
Note: [a]Col. (2) estimates shown for intervals beginning in 1790 actually refer to Weiss's [1992:Table 1.4] estimate for 1793. Intervals have been accordingly adjusted in calculating average annualized rates.

Table 2.1

U.S. Labor Input Measures: Alternative Concepts and Sources 1790-1860

Census Year	Gainful Worker (Labor Force): in thousands				Full Time Equivalent Manhours: in billions	
	Lebergott-David [1967]	Abramovitz-David [1973]	Weiss [1986]	[1992]	Abramovitz-David [1973]	Present Estimates
1790	1,263	n.a.		n.a.	2.59	2,59
1800	1,700	1,658		1,712	3.71	3.73
1810	2,330	2,358		2,337	5.01	5.03
1820	3,165	3,126		3,150	7.04	7.01
1830	4,200	4,172		4,272	9.90	10.07
1840	5,707	5,686		5,778	14.10	14.28
1850	8,250	8,199		8,192	21.19	21.04
1860	11,180	11,063		11,290	29.27	29.56

*Source Notes for F.T.E Manhours:
The Abramovitz-David [1973] gainful worker estimates were distributed by 1-digit SIC sectors, and multiplied by the 1900 ratios of F.T.E. manhours per gainful worker (age 10+), and the products were summed to obtain the total F.T.E. manhours estimates in col. 4.. (See Abramovitz [1993: Appendix] for further discussion.)
To derive the Present Estimates for total F.T.E. manhours in col.5, the ratios of col.4 to col.1 were computed and used to multiply the corresponding entries in col.3. This adjustment incorporates the Weiss [1992] revisions of the gainful worker totals, but preserves the sectoral distributions of gainful workers according to Abramovtiz and David [1973]. It should be noticed that Weiss's [1992] estimates are closer to the Lebergott-David [1967] gainful worker figures than were the revisions that appeared in Weiss [1986]. The underlying sectoral estimates of Weiss [1992] for rural non-farm slaves appear doubiously large for the pre-1830 date. The present estimates for manhours, and the corresponding F.T.E. manhours and F.T.E. persons engaged shares in Table 2.2 (and Table 4, below) therefore do not accept the implications of Weuss's much reduced estunates for the absolute and relative size of the agricultural labor force.

Table 2.2

U.S. Agricultural Sector's Share of Total Labor Inputs, 1790-1860: Alternative Concepts and Sources

Census Year	Gainful Worker Basis				F.T.E. Persons Engaged	F.T.E. Manhours
	Lebergott-David	Abramovitz-David	Weiss		Abramovitz-David	
	[1967]	[1973] & Present	[1986]	[1992]	[1973] & Present*	[1973] & Present*
1790	.900	.900	n.a.	n.a.	.861	.812
1800	.826	.827	.768	.744	.765	.698
1810	.837	.837	.762	.723	.780	.716
1820	.790	.790	.788	.714	.721	.654
1830	.707	.706	.706	.698	.622	.551
1840	.634	.634	.619	.672	.542	.472
1850	.548	.548	.536	.597	.458	.393
1860	.532	.532	.526	.558	.440	.374

*Source Notes: See Notes and Sources for manhour labor inputs in Abramovitz [1993: Appendix]; the F.T.E. Persons Engaged estimated were obtained analogously, by multiplying the gainful worker estimates for the agricultural and non-agricultural sectors by the 1900 ratios of F.T.E. Persons Engaged to gainful workers.

Table 2.3

Alternative Indexes of U.S. Agricultural Real Gross Output, Labor Input and Productivity per Manhour, 1790-1860

Census Year	Real Gross Product Indexes 1840 = 100		Agricultural Labor Input Index — Full Time Equivalent Manhours Basis 1840 = 100			Productivity Indexes: Real Gross Agricultural Product 1840 = 100		
	Gross Agricultural Product Revised by David [1967]	Gross Farm Product Revised by Weiss [1993]	Gross Farm Product Revised by Weiss [1993]	Abramovitz-David [1973]	Present Revision	Per Worker Basis David [1967]	Per Worker Basis Abramovitz-David [1973]	Per Manhour Basis Present Revision
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1790	21.9	22.5	22.5	31.4	31.6		69.7	71.2
1800	29.0	30.1	29.8	38.9	38.1	76.3	74.5	79.0
1810	39.7	41.5	40.3	53.9	53.5	73.9	73.6	77.6
1820	52.9	55.6	53.5	69.1	68.5	76.5	76.5	81.2
1830	71.6	74.1	73.3	82.0	81.7	90.1	87.3	90.7
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.9
1850	125.0	143.2	125.0	125.0	124.7	100.0	100.0	114.8
1860	199.9	200.9	199.9	164.5	163.5	121.5	121.5	122.9

Sources: Col. 5 from Table 2.1, col. 5 multiplied by Table 2.2, col. 6.
Col. (8) from this Table: col. (2) divided by col. (5).

Table 3
Farm Versus Domestic Nonfarm Labor Productivity, 1839/40, in the United States

	Gross Product Accounts Estimate Entered for		
Scope of Agricultural Sector and National Accounts Estimates	Farm Sector, GFP	Agricultural Sector (including firewood), GAP	Total Domestic Economy GDP
	(current dollar millions)		
Definition 1: Conventional	634.1		1552.7[a]
		769.0	
Value Added by Home Manufacturers	119.8		137.0
		119.8	
Value of Improvements to Farm Land	73.8		73.8
		73.8	
Rental Income on Shelter	133.0		166.0
		133.0	
Definition 2: Comprehensive	960.7		1763.5
		1095.6	

Note: [a] This estimate includes the imputed rental income on all shelter.
Thus, the GDP entry in line 5 is the sum of the entries in lines 1, 2 and 3

Agricultural vs. Nonagricultural Sector Ratios (current values of 1839/40):	Definition of "Agriculture":	
	Narrow Farm Sector (Definition 1)	Comprehensive Agricultural Sector[a] (Definition 2)
Relative Sectoral Gross Product, V_A/V_N :	.6903	1.6404
Relative Sectoral Share of Labor, $s_A/1 - s_A$,		
on gainful worker basis (W):	1.7322	1.7465
on F.T.E. manhours basis (L):	.8939	.8975
Relative Sectoral Labor Productivity, A/N ,		
on per gainful worker basis:	.399	0.939
on per manhour basis:	.772	1.828

Note: [a] As the agricultural sector is defined to include all firewood products, not simply farm-burned firewood (included in the narrowly defined Farm Sector), the agricultural labor force has been correspondingly augmented by the inclusion of Forestry sector workers.

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Upper Panel:

Farm Sector Estimates: Gross Farm Product Originating in 1839/40 dollars.

Line 1, gives gross farm product inclusive of the value of farm firewood, but excluding the value of improvements made to farm land, and home manufactures, as derived in David (1967), Table 5, line 1.

Lines 2 and 3, give the estimates of the value added by home manufacturing imputed to the rural farm population, and the value of improvements made to farm land, as estimated in David (1967), Table 5, lines 2 and 3, respectively.

Line 4, attributes 0.8 of the imputed rental value of the stock of shelter in the U.S. to the Farm Sector. Gallman (1966), p.58 gives $166 million as the current rental value on the total shelter stock at this date. The proportion of shelter rental value attributed to the farm sector, $H_f/H = 0.8$ was estimated from the relationship:

$H_f/H = 1 / (1 + (H_n/P_n)/(H_f/P_f)((1/(P_f/P)) - 1)$, where P_f/P is taken to be the rural fraction of the total U.S. population in (census year) 1840, equal to 0.89, from U.S. Historical Statistics (1975), Series A-57,69, p.12; the ratio of shelter services per head of population in the nonfarm sector to that in the farm sector is estimated as 2.0 for the date in question. The precise figure is arbitrarily selected on the basis of the following considerations. In 1910 the number of occupied housing units per person in the U.S. nonfarm sector was 1.25 times the corresponding figure for the farm sector, according to U.S. Historical Statistics (1975), series N-240, p.646. The price of housing units in the nonfarm sector, however, was considerably greater than the price of the average farm housing unit, c. 1860, as the evidence in Martin (1970), esp.. pp.120,422-25, suggests. Aggregate figures for the nineteenth century, however, remain unavailable. In 1930 the value of the gross stock of residential structures per head of population in the nonfarm sector of the U.S. was 3.14 times greater than the corresponding per capita value in the rural farm sector, according to the estimates in U.S. Historical Statistics (1975), series N-201 plus 202, and N-205, p.643 (for stock values); series A-73, p.12 (for nonfarm and rural farm population).

Agricultural Sector Estimates: Gross Agricultural Product in 1839/40 dollars.

Line 1, adds nonfarm firewood consumption to GFP estimate in line 1, col.(1), amounting to $134.9 mns. The latter represents the difference between Gallman's (1966), p.47 estimate of the value of all firewood consumed in the U.S. in current prices of 1839/40, and $26.4 mn. estimate of the value of farm firewood at the same date, given by Gallman (1960), Table A-2, line 35, p.47.

Lines 2,3,4, are identical to the Farm Sector estimates

Lower Panel:

Relative Sectoral Product: Line 1

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Definition 1 Ratio V_A/V_N from (GFP)/(GDP-GFP) in Upper Panel, line 1;
Definition 2 Ratio V_A/V_N from (GAP)/(GDP-GAP) in Upper Panel, line 5.

Note that the "Definition" refers to the scope of the gross domestic product measures: Definition 1 matches narrow scope total product and narrowly defined farm sector product; Definition 2 matches comprehensive total product and the broad Agricultural Product concept.

*Relative Sectoral Share of Labor Inputs:*Lines 2 and 3

For Narrow Farm Sector the relative sectoral share of labor inputs in the gainful worker ($s_A(W)$) and the full time equivalent manhours ($s_A(L)$) basis are computed from entries for 1840 in Table 2.2 Cols. (2) and (6), respectively.

For Comprehensive Agricultural Sector, the $s_A(W)$ figure is that from Table 2.2 Col. (2), multiplied by (1.003). The latter factor is the ratio of gainful workers in the Forestry sector to those in the Farm Sector, in 1840, as estimated from worksheets underlying Table 2.2 Col. (2). The corresponding estimate of $s_A(L)$ -- labor input for the agricultural sector on a manhour basis, as a proportion of aggregate manhours input, is given by the $s_A(L)$ entry for 1840 in Table 2.2 Col. (6) multiplied by (1.004). The latter correction factor was derived by adjusting the factor (1.003) by the multiplier (1.319). The latter is the ratio of manhours per gainful worker year in the Forestry sector, to manhours per gainful worker in the Farm sector, in 1900, as estimated from worksheets underlying Table 2.1, Cols. (4) and (5).

Relative Sectoral Labor Productivity:

Line 4: Line 1 (lower panel) entries, divided by line 2 (lower panel) entries in columns 1 and 2, respectively.

Line 5: Line 1 (lower panel) entries, divided by line 3 (lower panel) entries in columns 1 and 2, respectively.

Table 4
Labor Inputs and Earnings by Major Sector, United States Domestic Economy, 1839/40

	Agriculture (including forest products)	Non-Agriculture	Total
Comprehensive income measures:			
Gross domestic product originating ($mn)	1095.6	667.9	1763.5
Gross domestic business product ($mn)	962.6	634.9	1597.5
Gross imputed return to property ($mn)	353.0	209.0	
Less gross imputed rental of housing stock ($mn)	133.0	33.0	
Gross imputed return to business property ($mn)	220.0	176.0	
Imputed labor (including entrepreneurial) earnings ($mn)	742.6	458.9	1201.5
Share of labor in GDBP (including entrepreneurial earnings)	0.772	0.723	0.752
Labor Input Measures: Present Estimates			
Gainful workers (age 10+, mns)	3.662	2.116	5.778
FTE persons engaged (mns)	2.590	2.191	4.781
Manhours (FTE) (mns)	6,128	6,856	12,984
Manhours per FTE year	2,366	3,129	2,716
Earnings rates (including entrepreneurial income, in dollars):			
Per gainful worker year : Present estimates	202.8	216.9	
Per FTE person year : Gallman [1971] estimates	(140.0)	(267.0)	
Per FTE manhour : Present estimates	286.7	209.4	
Per FTE manhour : Present estimates	0.121	0.067	
Per 12-hour manday : Present estimates	1.45	0.80	
Averaged Daily Earnings of Common laborers in 1832 and 1850:	0.75*	0.88	

Sources: Upper Panel: P.A. David Worksheets, January 1980. Middle Panel: Tables 2.1, and 2.2. Lower Panel: Line 6 of Upper Panel and entries in Middle Panel, for Earnings Rates Estimates. Average Daily Earnings for non-farm common labors are based on Lebergott [1964: Table A-25], extrapolating the 1850 rate to 1832 on the figures given for earnings when board was provided.

Note: * Estimated farm equivalent daily earnings of common labor, applying Margo's [1995] farm/non-farm differential to the Lebergott-based figure in col.2.

Table 5A

Structural Changes and the Sources of Real Product Growth: Narrow Scope
Estimates of U.S. Real G.D.P
Indexes 1840 = 100

Real Gross Agricultural Product Source: Towne-Rasmussen
Labor input concept: Full-Time Equivalent Persons Engaged
} δ = 0.584
Agricultural sector concept: Gross Farm Product (GFP)

Census Year		Intersectoral Shift Effect					
	Labor Force Parti-pation Effect (1)	On persons Engaged Per Capita (2)	on Producti-vity Per Engaged (3)	Combined Effect (4)	Intra-sectoral Manhour Producti- (5)	Populat-ion (6)	Real GDP Estimat (7)
1790	96.4	89.5	82.9	74.2	69.7	22.9	11.4
1800	96.3	92.4	88.0	81.3	76.1	30.9	18.4
1810	96.8	91.9	87.3	80.2	73.6	42.2	24.1
1820	98.7	93.6	90.4	84.6	76.5	56.2	35.9
1830	97.7	97.0	95.7	922.8	90.2	75.4	61.6
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1850	106.4	102.4	104.6	107.1	100.0	135.9	154.8
1860	106.4	103.4	105.5	109.0	121.5	184.1	259.5

Fo r details of calculations, see Notes and Sources to Table 5.

Table 5B

Structural Changes and the Sources of Real Product Growth: Narrow Scope
Estimates of U.S. Real G.D.P
Indexes 1840 = 100

Real Gross Agricultural Product Source: Towne-Rasmussen
Labor input concept: Full-Time Equivalent Persons Engaged
} δ = 1.377
Agricultural sector concept: Comprehensive Gross Agricultural Product (GAP)

Census Year		Intersectoral Shift Effect					
	Labor Force Parti-pation Effect (1)	On persons Engaged Per Capita (2)	on Producti-vity Per Engaged (3)	Combined Effect (4)	Intra-sectoral Manhour Producti- (5)	Populat-ion (6)	Real GDP Estimat (7)
1790	96.4	89.5	110.0	98.4	69.7	22.9	15.2
1800	96.3	92.4	107.0	98.8	76.1	30.9	22.4
1810	96.8	91.9	107.4	98.7	73.6	42.2	29.7
1820	98.7	93.6	105.6	98.8	76.5	56.2	41.9
1830	97.7	97.0	102.5	99.5	90.2	75.4	66.0
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1850	106.4	102.4	97.3	99.7	100.0	135.9	144.1
1860	106.4	103.4	96.8	100.1	121.5	184.1	238.2

For details of calculations, see Notes and Sources to Table 5.

Table 5C

Structural Changes and the Sources of Real Product Growth: Narrow Scope
Estimates of U.S. Real G.D.P
Indexes 1840 = 100

Real Gross Agricultural Product Source: Towne-Rasmussen
Labor input concept: Full-Time Equivalent Manhours
} δ = 0.722
Agricultural sector concept: Gross Farm Product (GFP)

| Census Year | Labor Force Participation Effect (1) | Intersectoral Shift Effect | | | Intra-sectoral Manhour Producti- (5) | Populat-ion (6) | Real GDP Estimat (7) |
		On persons Engaged Per Capita (2)	on Producti-vity Per Engaged (3)	Combined Effect (4)			
1790	96.4	82.6	91.3	75.5	69.7	22.9	11.6
1800	96.3	88.2	94.2	83.1	76.1	30.9	18.8
1810	96.8	87.1	93.8	81.6	73.6	42.2	24.5
1820	98.7	90.0	95.4	85.8	76.5	56.2	36.4
1830	97.7	95.4	98.0	93.5	90.2	75.4	62.0
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1850	106.4	103.9	102.0	106.0	100.0	135.9	153.3
1860	106.4	105.9	102.5	108.6	121.5	184.1	258.4

For details of calculations, see Notes and Sources to Table 5.

Table 5D

Structural Changes and the Sources of Real Product Growth: Narrow Scope
Estimates of U.S. Real G.D.P
Indexes 1840 = 100
Real Gross Agricultural Product Source: Towne-Rasmussen
Labor input concept: Full-Time Equivalent Manhours
} δ = 1.821
Agricultural sector concept: Comprehensive Gross Agricultural Product (GAP)

| Census Year | Labor Force Participation Effect (1) | Intersectoral Shift Effect | | | Intra-sectoral Manhour Producti- (5) | Populat-ion (6) | Real GDP Estimat (7) |
		On persons Engaged Per Capita (2)	on Producti-vity Per Engaged (3)	Combined Effect (4)			
1790	96.4	82.6	120.1	99.2	69.7	22.9	15.3
1800	96.3	88.2	113.4	100.0	76.1	30.9	22.7
1810	96.3	87.1	114.4	99.6	73.6	42.2	30.0
1820	98.7	90.0	110.8	99.7	76.5	56.2	42.3
1830	87.7	95.4	104.7	99.9	90.2	75.4	66.3
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1850	106.4	103.9	95.3	99.0	100.0	135.9	143.2
1860	106.4	105.9	94.2	99.8	121.5	184.1	237.5

For details of calculations, see Notes and Sources to Table 5.

Table 5E

Structural Changes and the Sources of Real Product Growth: Narrow Scope
Estimates of U.S. Real G.D.P
Indexes 1840 = 100

Real Gross Agricultural Product Source: Weiss [1993] revision of Towne-Rasmussen
Labor input concept: Full-Time Equivalent Manhours revised after Weiss [1992]
} δ = 0.722
Agricultural sector concept: Gross Farm Product (GFP)

| Census Year | Labor Force Participation Effect (1) | Intersectoral Shift Effects | | | Intra-sectoral Manhour Producti- (5) | Populat-ion (6) | Real GDP Estimat (7) |
		On persons Engaged Per Capita (2)	on Producti-vity Per Engaged (3)	Combined Effect (4)			
1790	95.9	82.6	91.3	75.4	72.2	22.9	12.0
1800	95.8	88.2	94.2	83.1	79.0	30.9	19.5
1810	95.9	87.1	93.8	81.7	77.6	42.2	25.7
1820	97.0	90.0	95.3	85.8	81.2	56.2	37.9
1830	98.1	95.4	98.0	93.5	90.7	75.4	62.7
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1850	104.4	103.9	102.0	106.0	114.8	135.9	172.6
1860	107.4	105.9	102.5	108.6	122.9	184.1	260.7

For detrails of calculations, see Notes and Sources to Table 5.

Table 5F

Structural Changes and the Sources of Real Product Growth: Narrow Scope
Estimates of U.S. Real G.D.P
Indexes 1840 = 100

Real Gross Agricultural Product Source: Weiss [1993] revision of Towne-Rasmussen
Labor input concept: Full-Time Equivalent Manhours revised after Weiss [1992]
} δ = 1.821
Agricultural sector concept: Comprehensive Gross Agricultural Product (GAP)

| Census Year | Labor Force Parti-pation Effect (1) | Intersectoral Shift Effects | | | Intra-sectoral Manhour Producti- (5) | Populat-ion (6) | Real GDP Estimat (7) |
		On persons Engaged Per Capita (2)	on Producti-vity Per Engaged (3)	Combined Effect (4)			
1790	95.9	82.6	120.1	99.2	72.2	22.9	15.8
1800	95.8	88.2	113.4	100.0	79.0	30.9	23.5
1810	95.9	87.1	114.1	99.6	77.6	42.2	31.3
1820	97.0	90.0	110.8	99.7	81.2	56.2	44.1
1830	98.1	95.4	104.7	99.9	90.7	75.4	67.0
1840	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1850	104.4	103.9	95.3	99.1	114.8	135.9	161.2
1860	107.4	105.9	94.2	99.8	122.9	184.1	239.6

For details fo calculations, see Notes and Sources to Table 5.

Notes on Calculations for Tables 5A-5F

Notation:

t: indexes time (where $0=1840$)
i: indexes 1-digit SIC sectors;
:   labor force participation rate
W: gainful workers in i'th sector
P: population
Z: aggregate manhours per gainful worker (based on intersectoral reweighting)
μ_i: sectoral manhours per worker
L_i: sectoral manhours
q: aggregate real product per manhour (based on intersectoral reweighting
$_i$:   sector real product per manhour

(1) $/_0 = (_i W_{it}/P_t)(_i W_{io}/P_0)$.

(2) $Z_t/Z_0 = (_i \mu_{it}[W_{it}/W_t])/(_i \mu_{io}[W_{io}/W_0])$ and $\mu_{it} = \mu_{io} = L_{io}/W_{io}$.

(3) $q_t/q_0 = (_i{}_{it}[L_{it}/L_t])/(_i{}_{it}[L_{io}/L_0])$

$$= \frac{L}{A}[(1/)-(1/-1)S]\frac{L}{A}[(1/)-(1/-1)S]_0,$$

$$\text{where } \frac{L}{A} \frac{L}{N} = (/)_0 ; \frac{L}{A} \text{ and } S = L/L.$$

(5) $(_i{}_{it}L_{io})/(_i{}_{io}L_{io}) = (\ )_t/(\ )_0 \cdot \frac{L}{A} \frac{L}{A}$

Table 5 Source Notes: Unless otherwise noted, the sources are those pertaining to Table 5D. See heading of Tables 5A-5C, 5E-5F for variants.

(1)   Index (1840=100) of gainful workers age 10 and older per head of population residing in the United States, computed for census years 1800-1860 from sources described in David [1967[, Table 3, cols.(1) and (2). (A rounding error in the original published entry put the participation rate at 0.322, instead of 0.321, for 1800. This was corrected.) On the estimate for 1790, see the derivation in David [1967], p.166, n.33. See Tables 5E, 5F for alternative index based on Weiss [1992].

(2)   Index (1840=100) of full time equivalent manhours employed per gainful worker, computed from the estimates above, in Table 2.1, cols.(5) and (3). Note that the aggregate F.T.E. manhours input estimates assume no intrasectoral change in manhours per gainful worker during the period 1790-1860; the ratio of col.(5) to col.(3) in Table 2.1 therefore measures the intersectoral shift effect, i.e., the effect of changes in the sectoral distribution of gainful workers upon aggregate labor input.

(3)   For Table 5D: Index (1840=100) computed from the formula given by the Notes on Calculations for Table 5, using the values for s_A from Table 2.2, col.(6), and the estimate of $_A/_N = \approx 1.828$ from Table 3: lower panel, Definition 2 - Manhours Basis.

(5)   For Table 5D: Index (1840=100) of constant 1839/40 dollar Gross Farm Product Originating per F.T.E. Manhour Employed in the Farm Sector, computed using the real product estimates (V_A) for 1800, 1810, 1820, 1830 and 1840 from David (1967), Table 6, line C.1; V_A for 1850 and 1860 from *ibid.*, Table 2, col.(3) multiplied by the index of gainful workers in agriculture (revised series) derived from Appendix Table I of David (1967); V_A for 1790 was extrapolated from the estimate for 1800 on the index of U.S. population – in column 6 of this table, following the practice described in David (1967), p.187, n.69.

(6)   Index (1840=100) computed from census year figures for Total Resident Population of the United States, from U.S. Historical Statistics (1975), Series A-7, p.8.

(7)   For Tables 5A-5F: Index (1840=100) of Real Gross Domestic Product – Narrow Scope, in constant prices of 1860, computed for 1790-1840 from cols. (1) x (4) x (5) x (6) in corresponding table; for 1840-1860 the index was computed from "direct estimates" excluding the value of inventory change, farm improvements, and home manufactures. The underlying direct estimates were derived in two steps: (i) Gallman's [1966] census year estimates for GNP (Variant 1), in 1860 dollars, were adjusted to take account of the subsequent revision of the estimated gross product originating in the service sector, by Gallman and Weiss [1969]. Gallman did not publish revisions of the underlying annual GNP estimates privately communicated in 1965, but from Davis and Gallman [1973] – available in manuscript in 1968 – Table 1, Col.(3) divided by Col.(4), it was possible to compute trend adjustment factors based on decadal averages of the revised and the original GNP estimates. The so-called "Post Method", due to Frickey (1947), pp.47ff., was employed to use the unpublished Gallman (1965) annual real GNP estimates as interpolators between the revised benchmark levels. (ii) Starting with the revised (Gallman-David) annual GNP estimates, in 1860 dollars, the corresponding GDP, Variant I, series was obtained by adding constant 1860 dollar estimates of the net balance of interest and dividends paid to foreigners. The sources and procedures used in deriving the latter are described in David (1967), Table 8: Notes on Direct Estimates

Table 6
New Conjectural Estimates of U.S. Real GDP: Narrow and Broad Scope 1790-1860

Census Year	RGDP Estimates - Variant I (Narrow Scope) GDP(I) in 1860 $ billions		(3) Direct: Gallman-Weiss	Gross Product of Home Manufactures and Farm Improvements $ billions		RGDP Estimates - Variant II (Broad Scope) GDP(II) in 1860 $ billions		(8) Present Direct
	(1) Present Conjectural: (Def. 1)	(2) (Def. 2)		(4) Abramovitz-David [1973]	(5) Gallman-David [1973]	(6) Conjectural: Abramovitz-David [1973]	(7) Present (Def. 2)	
1790	0.195	0.256	--	0.041	--	0.289	0.297	--
1800	0.315	0.379	--	0.065	--	0.433	0.444	--
1810	0.416	0.507	--	0.087	--	0.454	0.594	--
1820	0.616	0.716	--	0.116	--	0.804	0.832	--
1830	1.017	1.087	--	0.159	--	1.234	1.236	--
1835	(1.281)*	(1.325)*	1.386	--	0.258	--	--	1.644
1840	1.622	1.622	1.622	--	0.213	--	--	1.835
1850	2.800	2.609	2.422	--	0.234	--	--	2.656
1855	(3.441)*	(3.184)*	3.369	--	0.341	--	--	3.710
1860	4.230	3.886	4.102	--	0.334	--	--	4.436

Sources: Col. (1) from Table 5E and 1840 estimate from Col. (3); Col. (2) from Table 5F and 1840 estimate from Col. (3); Col. (3) from Weiss [1992] for 1840, 1850, 1860; 1835, 1855 from David [1967] based on Gallman estimates; Col. (7) from Col. (2) plus Col. (5); Col. (8) from Col. (3) plus Col. (5).

Note: *Geometric interpolation between decennial year estimates.

Table 7
Indexes of U.S. Real GDP per Capita: Narrow and Broad Concepts
1840 = 100

A. Narrow Concept, GDP (I): Alternative Estimates

Census Years	David [1967] (Def. 2)	Abramovitz-David [1973] (Def. 1)	Weiss [1992] (Var. B)	Present [From Table 6][1] (Def. 1)
1790[a]	55.0	50.6	64.8	52.5
1800	64.4	60.8	72.5	63.1
1810	61.9	58.0	75.8	60.7
1820	67.6	64.8	79.1	67.5
1830	84.0	82.2	86.8	83.2
1840	100.0	100.0	100.0	100.0
1850	109.9	109.9	109.9	109.9
1860	137.4	137.4	137.4	137.4

B. Broad Concept, GDP (II): Alternative Estimates

Census Years	Abramovitz-David [1973] (Def. 2)	Weiss [1992] (Var. C)	Present [From Table 6][2] (Def. 2)
1790[a]	68.8	69.3	70.7
1800	76.3	77.2	78.2
1810	58.6	81.2	76.7
1820	78.1	83.2	80.6
1830	89.1	89.1	89.3
1835	103.2	(103.2)[b]	103.2
1840	100.0	100.0	100.0
1850	100.6	109.9	106.5
1855	127.8	(127.8)[b]	127.8
1860	124.5	133.7	131.3

Notes: [a] 1793 estimate from Weiss [1992: Table 1.4] is shown for 1790.
[b] Direct estimates, as used by Abramovitz-David [1973] are inserted.
Sources: [1] See Table 6, col.(1) estimates for RGDP at dates before 1835; col (3) estimates after 1830.
[2] See Table 6, col.(7) estimates for RGDP at dates before 1835; col. (8) estimates after 1830.

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