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THE FARM LABOR FORCE BY REGION, 1820-1860: REVISED ESTIMATES AND IMPLICATIONS FOR GROWTH

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ABSTRACT

This paper sets forth new estimates of the farm labor force covering the period 1820 to 1860, for the United States and the major geographic regions. At the national level, the new figures are noticeably different from the previous estimates. In particular, the new estimates lower the 1820 farm labor force by about 8 percent, while raising the figures for 1840, 1850, and 1860 by 7 to 10 percent. As a consequence, the farm work force grew more rapidly than was previously believed, while farm productivity and per capita income grew more slowly. The impact of the revisions, of course, varied by subperiod.

The new figures also alter our picture of variations in regional economic performance, the more so in some regions. In particular, the pace and timing of the shift out of farming in New England has been changed substantially.

The paper also discusses the reasons for the discrepancies between the new and old series, and provides some assessment of the new evidence.

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The interpretation of several key issues in U.S. economic history rests on the size of and changes in the farm labor force. The simple description of the course of farm productivity over the nineteenth century depends on the labor input, and in turn the time series of farm productivity influences our understanding of other issues. For the nation, the rate of economic growth before 1840 depended crucially on the course of farm labor productivity. In Paul David's conjectural estimates of per capita product for that early period, increases in the farm labor force had a direct effect on measured farm labor productivity, and an indirect effect, by assumption, on the rate of advance in nonfarm industries. At the same time, the labor force estimates determined the interindustry shifts, and their impact on the overall level of productivity. At the regional level, the performance of free and slave based economies, and the effect of the "westward movement" on the nation's performance was determined to a large extent by the relative size and efficiency of the region's farm sectors. The pace and timing of industrialization in older states and regions was closely tied to the slower growth and eventual decline of the farm sector. Moreover, our understanding of these events is determined by the estimates of the true values of these farm statistics.

Over the past decade and a half, Robert Gallman has raised doubts about the extant estimates of the antebellum farm labor force figures. He first questioned the estimates of per capita

product in the years before 1840, on the grounds that the levels of per capita product in the earlier years of the period seem too low, because they implied implausible values for nonperishable consumption and investment. Gallman argued that the conjectures were quite sensitive to David's revisions of Lebergott's labor force figures for 1800, "particularly as the changes affect the distribution of the total between sectors" (1971, p.81).

In a subsequent article, Gallman questioned the time pattern of farm productivity over the nineteenth century implied by the Lebergott-David labor force estimates. In particular, those figures suggested unlikely changes in the number of hours worked per farm worker; a 28-35 percent increase in the first half century, and a 13-29 peercent decline in the second half (1975, p.38). Moreover, farm productivity advanced more rapidly in the first half of the century than in the latter half, a pattern that "runs counter to the burden of the narrative histories of the period," (p.36). In this instance, Gallman argued that the fault lay with the 1850 labor force estimates rather than the 1800, and suggested that the figure for that year was low by as many as 600,000 farm workers, or roughly 12 percent (p.50).

Whether or not Gallman is precisely correct in identifying the years in which the labor force figures may be flawed, or the exact extent of the error, he clearly raised serious questions about the accuracy of the farm workforce series.

Because the farm sector was relatively larger in some regions, and changed in importance at different rates, the biases and their effects could have varied across regions.

I am currently preparing new estimates of the farm and nonfarm labor force by state and region for the period 1800 to 1860. These data will be linked to a set of figures for the postbellum period, so the combined series will contain more industrial and demographic detail than is presently available at the state and regional level for the entire century. As a by-product of careful estimation of these figures at the state level the accuracy of the national totals should be increased.[1]

The estimation is not yet complete, so the discussion in the present paper is confined to four years, 1820, 1840, 1850, and 1860, for which the census provided some occupational data. Because the estimates for the remaining years will draw heavily upon the evidence for these four, it is desirable to establish their accuracy before proceeding.

METHODS OF ESTIMATION

For the most part, my estimation follows Lebergott's approach, but is executed at the state and regional level.[2] In concept and coverage, as well as the levels of the total labor force, the two series are similar.[3] Our estimates of the antebellum agricultural labor force share in common that they are based largely on the existing census statistics. These census counts were not flawless, but they were collected at

specific dates during the antebellum period so represent the actual state of affairs, capturing the economic realities of the time. In my work, I have reassessed and revised the census data for 1820, 1840, 1850 and 1860, producing a clearer picture of the age-sex coverage of each of those censuses.[4] This information in turn has permitted a more reliable revision of the labor force data. In addition, for 1820 and 1840, it is possible to use the revised census data to estimate the number of slaves engaged in farming. Let me summarize the key parts of these assessments and revisions.

The 1850 and 1860 census counts of workers appear quite accurate for the nation and most states, but the figures for several states were extremely flawed.[5] For the U.S., the 1850 count of free male workers aged 16 and over was revised upward by less than one percent, with the Northeast being decreased by one percent, the South being increased by one percent, and the North Central being increased by three percent.[6] The 1860 published census reported a combined figure for free male and female workers aged 15 and over, but greater detail can be found in the manuscript schedules.[7] Samples of evidence taken from the manuscripts suggest that the census figures include a fairly reliable count of female workers, but some undercounting of male workers, and that the biases varied by state. In sum, the U.S. count of free workers was increased by 3.4 percent, with no change in the Northeast, an increase of 6.9 percent in the South, 7.4 percent in the North Central, and a decrease of

5.6 percent in the West.[8]

I assessed the 1820 and 1840 censuses in order to determine which industries were covered, which age and sex portions of the population were included in the counts of workers, and which state counts were in need of revision. Neither census covered all industries, but both reported figures for agriculture, and for other commodity producing industries. However, there appears to be some difference in age and sex coverage. The 1840 census reported on all workers aged 10 and over, including slaves, although the accuracy and completeness varied by county and state. The 1820 counts appear to cover free males aged 16 and over, and slaves aged 10 and over, but they, like the 1840 figures, were imperfect. In principle, then, we have a count of the entire farm work force in 1840, and the bulk of it in 1820. In both years, the worst anomalies in the census figures have been identified and corrected; in 1820 the reported counts were supplemented by estimates of the missing components, females aged 16 and over and free males aged 10 to 15 years.[9]

The revisions were carried out by examining the county and subdivision data, in much the same manner as had been done before by Richard Easterlin (1960) and Stanley Lebergott (1966). While the census counts included most slave workers, they were incomplete so that the farm worker totals in most slave states had to be revised. Fortunately, the reported figures in a large number of counties in the southern states

were accurate and could be used to correct those in other counties, as explained below.

The corrections to the census counts of farm workers amounted to 97,362 in 1820 and 168,195 in 1840; increases of 4.8 percent and 4.5 percent respectively.[10] The adjustments varied by region. For 1820, I made virtually no corrections to the North Central figures, and made the largest change, an increase of 8.3 percent, in the South Central region.[11] In 1840, the New England workforce was reduced by 5.3 percent, while the largest upward correction was 7.5 percent in the South Atlantic.

There are two aspects of my estimation which differ substantially from the earlier work of Lebergott, Easterlin, and David. First, I have increased the farm labor force in 1850 and 1860, and thus indirectly in other antebellum years as well, by the inclusion in that sector of an estimate of some number of "laborers, not otherwise specified." Second, I have produced a different set of estimates of the numbers of slaves engaged in farming, which is based more heavily on the available statistics. The effect of these two factors is discussed below.

RESULTS

The new estimates are presented, by region, in Table 1, along with a set of "previous estimates" for comparison. The latter are a combination of the estimates of Lebergott, David,

and Easterlin. In Table 2 the rates of change are presented.

At the national level, the present figures are higher than the previous ones in 1840, 1850 and 1860, by a fairly uniform percentage; 9 percent in 1840, 8 in 1850 and 7 in 1860.[12] While the levels of the two series differ, they show roughly the same growth over the period, as well as over each of the two decades. This is true for both the absolute increases in numbers of workers and the percentage changes.

There are some notable differences at the regional level. In particular, the present estimates show higher levels of the farm labor force in all regions in 1840, but not in 1850 and 1860. In those latter years the new figures for the northeastern regions are similar or below the previous estimates. In consequence, the shift out of agriculture during the period 1840 to 1860, in New England and the Middle Atlantic regions, occurred more rapidly than in the previous series. In New England the farm labor force declined absolutely in both decades. In the other regions, the rates of change over each of the decades are similar in the two series, the most obvious difference being the slower growth in the North Central region over the decade of the 1850's.

In sharp contrast, the new national totals for 1820 are below the previous figures by approximately 8 percent, but there is substantial variation across regions. The farm labor force in both southern regions is higher than the earlier

estimates, while the northern figures are below the previous ones by 15 to 20 percent. The obvious consequence of these changes, taken in conjunction with those for the period 1840 to 1860, is much faster growth of the farm labor force between 1820 and 1840, and slower growth of farm labor productivity. While the farm workforce grows more rapidly now in all regions, the sharpest difference is in New England, where there is now an increase rather than a small decline.

These are rather striking changes in the statistical record of the United States, and have substantial implications for our understanding of economic growth before the Civil War. Why are the new and previous estimates so different, and which is the more reasonable series?

Differences in 1850 and 1860

The differences in the 1850 and 1860 values are the easiest to explain. In both years, the present estimates are slightly higher due to a difference in the method of estimating the number of farm workers aged 10 to 15 years.[13] To maintain consistency with the scope of coverage in other years, the present figures for 1850 include an estimate of the number of free females aged 16 and over engaged in farming.[14] The chief reason for the higher level in the present series, however, is the allocation of some laborers, not otherwise specified to farming. This is offset to a substantial extent in both years by the smaller number of slaves estimated to be engaged in farming in the present series. The net effect of these two

factors accounts for 79 percent of the difference in 1850 and 67 percent in 1860. It is clear that any judgment about the different series hinges on the acceptance of these two major adjustments, the allocation of some laborers to farming and the different estimate of the share of slaves engaged in farming.[15]

A detailed examination of the census data at the state and regional level makes clear that the category of workers-called "laborers, not otherwise specified" - included some who must have been engaged in farming in 1850 and 1860. Previous researchers recognized this for the postbellum years, but not for the antebellum period, apparently because the presence of large numbers of slaves in farming masked the problem at the national level. When one looks at just the free states, where slavery could not distort the picture, it is evident that some of these laborers must have been employed in farming (Weiss, 1987c).

My allocation of some of these workers to farming raises that sector's labor force by 625,000 workers, or approximately 15 percent, in 1850; and by 584,000, or 10 percent in 1860.[16] These are not trivial amounts, but seem clearly called for. Without such laborers, the ratio of the total farm workforce to rural population in the free states was .15 in 1850 and .159 in 1860, substantially below the average of .192 in the years 1870 through 1910.[17] With the addition of these workers, the 1850 and 1860 ratios are .194 and .189 respectively, very much in

line with the behavior of the ratio in the postbellum years.[18]

The other factor of importance bearing on the difference between the present estimates and those of Lebergott, David and Easterlin is in the number of slaves engaged in farming.[19] In their figures, the number of slaves engaged in farming was estimated by assuming that 95 percent of the slave population aged 10 and over lived in rural areas, 87 to 90 percent of which were engaged in farming.[20] In the present estimates I have placed a smaller share of the rural slaves in farming.[21] I used the county level data on employment and population for 1840 to estimate the share of the rural slave population aged 10 and over engaged in farming, and applied this figure to the 1850 and 1860 rural population data to obtain an estimate of slaves engaged in farming in those years.

Examination of the county level data indicated that the census evidence seemed reliable in a large number of counties in the South; 488 out of 633 in existence at the time. While the census reported the slave and free populations separately, it provided only one figure for employment in agriculture, combining the free and slave workers. These data were used to estimate a regression equation which would yield the implicit participation rates for the free and slave components. These data indicated that only 74 percent of the rural slaves aged 10 and over were engaged in farming.[22] As can be readily seen, this figure differs noticeably from that used by Lebergott and David. The use of this figure to estimate the number of slaves

engaged in farming in 1850 and 1860 yields figures that are smaller than Lebergott and David's by 280,000 in 1850, and 350,000 in 1860. The farm slave figure implicit in the 1840 Census figure (1,158,000) is 203,000 less than Lebergott's estimate.[23]

The revised figures accord more with what we know about the other activities in which slaves were engaged. In the present series, 16 percent of the rural population aged 10 and over, (or roughly 18 percent of the rural slave labor force) was engaged in nonfarm work. This is in stark contrast to the previous estimate that virtually no rural slaves worked at nonfarm occupations, a figure much too low, given all the other activities that took place on the plantation, and in rural areas more generally. This, after all, was a time when not only mining, fishing, and forestry took place in rural areas, but also much, and perhaps most, of manufacturing, especially in the South. The work of Ronald Lewis, John Stealey, and others indicates clearly that many slaves were employed in mining, manufacturing, salt extraction, and lumbering, and that these activities took place to a large extent outside cities.[24] Robert Starobin, the author of the most comprehensive study of industrial slavery claims that "the typical industrial slave lived in a rural, small-town, or plantation setting, where most industry was located, not in a large city." (1970, p.11).

While systematic evidence on the nonfarm occupations of slaves is harder to compile, the 16 percent figure is quite

consistent with what we do know. Sample data from plantation and probate records indicate that 4.2 percent of the male slaves and 17.6 percent of the female, or an average of 10.9 percent of the rural slaves were engaged as domestic servants (Olson, 1983). Some of these may have worked part of the time as field hands, but the nonfield occupation was their primary one, and is likely the one that would have been reported to the census taker. Given the wide range of other tasks to which slaves were set, the figure for domestic servants seems like a reasonable lower-bound to the total number engaged in nonfarm occupations. If we take account of all the other occupations that could be construed as nonfarm, an upper bound can be set at 27 percent of plantation (rural) slaves.[25] The 16 percent figure derived from the county level data falls securely between the 10.9 and 27 percent.[26]

Differences in 1840

The difference of 315,951 in the estimates for 1840 stems from varying judgments about the inaccuracies of the census count. Both series accept that the census counts covered all the relevant population groups, namely those aged 10 and over, both free and slave. The present series reflects a judgment that the census did not count all the workers in those covered groups, and raised the census count by 168,195 workers. The previous estimate of Lebergott rests on the idea that the census undercounted in some locations, overcounted in others, and on balance overcounted. In consequence the census farm

labor force total was reduced by 147,756 workers (1966, pp.152-55). Easterlin, in his original work with the 1840 Census, revised the count upward, although in some states in the Northeast he reduced it. In his subsequent work he accepted Lebergott's farm totals, and thus implicitly the notion that the census count was too high, but gave no reasons for his change of mind.

In my assessment of the census, I judged each state individually, and found that in some the count was too high, but in most it was too low, especially in the South. It is in this region that the crucial difference arises, for Lebergott argued "that the Census enumeration must have counted all slaves aged ten and over in rural areas as engaged in agriculture" (1966, p.152). He estimated the free farm work force as a residual by subtracting the entire rural slave population aged 10 and over from the census count of agriculture. Separately, he calculated the slave farm labor force, as 90 percent of the rural slave population aged 10 and over, and combined this smaller slave figure with the residual estimate of the free farm workers to obtain his revised total. The free workforce of 2,160,000, however, appears too low. The ratio of that figure to the free rural population is only .168, noticeably below the .208 ratio implied by his free farm workforce estimate for 1820, and below that (.192) which prevailed in the free states in the period 1870 to 1910.[27] Moreover, the ratio for the free northern states, based on the

reported census statistics, was .21, while the free southern ratio, derived by deducting the slave labor force from the reported totals, is only .07.[28]

Differences in 1820

The difference of 181,000 between the present and previous estimates for 1820 is a little harder to explain because I did not make explicit, separate adjustments to the free farm or slave workforces that can be compared to Lebergott's estimate. However, for illustrative purposes we can look at the numbers implicit in my revised farm totals for each of these population components.

The larger difference lies in the number of slaves engaged in farming, 127,000 fewer in the present series. The Census did not separate free and slave workers, and I did not make an explicit estimate of either, but by following the same procedures used for 1840 to estimate a regression equation from the cross-sectional data for a subset of counties in which the census counts seemed reliable, I calculated an implied share of 79 percent of the rural slave population aged 10 and over engaged in farming. This means that 788,000 or 87 percent of the rural slave workforce was in farming. In contrast, Lebergott allocated the entire rural slave work force to agriculture (915,000 slaves). As noted earlier, the lower figure is much more consistent with other evidence about the nonfarm activities in which rural slaves were engaged.

If we deduct these slave counts from the farm totals, we

obtain free residuals of 1,500,000 in the present series and 1,553,000 in the Lebergott series. While there is a smaller discrepancy between these two figures than showed up in the slave comparison, the derivation of the free workforce reveals some reasons behind the overall difference. We both increased the total labor force by approximately the same amount in 1820; 688,000 in the present case, 644,000 in the previous series, but Lebergott allocated a substantially larger number to farming, 246,000 versus 400,000.[29] His allocation was based on the distribution of the workers among the subset of industries reported in the Census, from which he calculated that 83 percent of the free males were employed in farming. Since part of the deficiency in the total labor force was due to the census's failure to report employment in the service industries, the share of the total revision going to agriculture should be smaller than that found in the reported figures. Moreover, the inclusion of slave workers in the reported figures gives an upward bias to the farm share.[30] In the present figures, I have not made an explicit estimate of the adjustment to the free farm workforce, but my total correction to the Census agricultural figure of 246,000 is 36 percent of the revision to the entire labor force.[31]

An overall assessment of the two series can be accomplished by comparing the labor force figures to changes in the rural population. This is done in Tables 2 and 3. At the national level, the two labor force series show similar

percentage changes relative to the rural population growth over the decades of the 1840's and 1850's. Over the period 1820 to 1840, however, the behavior of the present estimates is far more consistent with the percentage changes in rural population. The present series also appears more reasonable if compare shifts in the farm share of the labor force with shifts in the rural share of the population (Table 3). The rural share of the population declined by 4 percentage points between 1820 and 1840, and 10 percentage points between 1840 and 1860. The previous estimates show a rather large decline in the farm share of 16 percentage points between 1820 and 1840, and a decrease of 10 percentage points over the next 20 years. In the present estimates, the decline over the period 1820 to 1840 was 5 percentage points, followed by an 11 point decrease between 1840 and 1860. The two series show comparable behavior over the latter twenty years, but in the earlier period, the previous estimates yield a change far out of line with that for rural population.

Implications

One of the most obvious implications of the new figures is that the levels of output per worker in farming in the late antebellum period were lower than previously believed. (Table 4) This is true for the nation, as well as each region, with the sole exception of New England in 1860. Among regions, the output per worker figures have been lowered the most in the South Atlantic and South Central regions. The South Central

region is still one of the most productive, but its edge over the North Central and Middle Atlantic has been reduced in 1840, and eliminated in 1850 and 1860.

At the national level, the growth in output per worker is similar in the two series. The southern regions show virtually identical changes, in spite of the relatively large differences in levels, while the Middle Atlantic and North Central regions now show somewhat faster rates of productivity growth. The most striking disparity is in the growth of output per worker in the New England region, where the new figures show a 12.7 percent increase over the entire 20 year period, in contrast to virtually no growth in Easterlin's figures.

For the period before 1840 we can calculate output per worker figures only at the national level because regional farm output data are lacking. According to Paul David's estimates, farm labor productivity increased by 31 percent between 1820 and 1840 (1967, Table 6). The index of farm output he used to derive the productivity estimate was constructed independent of his labor force figures, so can be used with the present series to obtain the result that farm labor productivity increased by only 11 percent over the twenty year period.[32]

These alterations in the pace of farm productivity change extend to the behavior of per capita income. David's original conjectural estimates showed a growth of per capita income of approximately 2 percent per year between 1820 and 1840,

somewhat higher than the 1.6 percent rate that occurred over the subsequent 20 years. Using the present labor force estimates, the conjectural growth between 1820 and 1840 was .9 percent per year. The revised rate falls below that of the following decades, and leaves open the possibility of a gradual acceleration in the growth of per capita income during the antebellum period.

The level of per capita product implicit in the revised conjecture is $76 in 1820, which is 25 percent above David's figure.[33] This higher level passes Gallman's test of the reasonableness of the implicit flow of non-perishable consumption and investment spending (1971, Table 4). After subtracting Gallman's estimate of the flow of perishable consumption, $43 in 1820, the residual of $33 seems quite plausible in comparison to the $46 of non-perishable consumption that occurred in 1840. By way of contrast, the implicit non-perishable figure in David's estimate is only $18.

With the new figures the effect of the regional redistribution of farming is not very important, even less so than was found by Easterlin.[34] The impact of regional redistribution can be guaged by calculating hypothetical values of the 1860 national average output per worker and comparing them to the actual 1840 figure. In one calculation we weight the 1840 regional productivity figures by the 1860 shares of the farm labor force, while in a second approach we multiply the 1840 regional shares of the labor force by the 1860 values

of output per worker. The first measure reflects the impact of the regional redistribution, and shows an increase of only $3 above the 1840 figure, while the second, which captures the effect of intraregional productivity advance, is $27 higher. The latter effect clearly dominates the overall change, accounting for 90 percent of the improvement.[35]

We can speculate as well on the impact of interregional movement in the period before 1840, by assuming that there had been no changes in productivity within each region between 1820 and 1840, but that farming activity had relocated as it did. The result is that regional redistribution alone would have raised national output per worker by only $6, or a mere 3.3 percent.[36] This slight positive effect of interregional redistribution is nonetheless larger than the $3 change that occurred over the period 1840 to 1860, just the reverse of Easterlin's finding.[37] While the effect of redistribution was not important in either period, it appears to have been relatively more important in the earlier one. If farm labor productivity increased by only 11 percent between 1820 and 1840, then the redistributive effect accounts for 30 percent of that increase, making it three times as important as it was in the subsequent 20 years.

One of the things that stands out in the present figures, especially in comparison to the previous estimates is the picture of agricultural change in New England. The pace and timing of the shift out of farming, and the relative changes in

farm productivity, have been altered. According to the previous estimates the region showed an absolute decline over the period 1820 to 1840, then virtual stability over the 1840's, and a subsequent, but small, absolute decline in the 1850's. Now, it appears that the region shifted out of farming a bit more slowly between 1820 and 1840, and more rapidly thereafter. In the first period the farm labor force increased by 22.6 percent, although the sector's share still declined substantially from 65 percent to 54 percent. In the subsequent decades the farm share declined even more noticeably, falling to 39 percent in 1850 and 31 percent in 1860.

For the period 1840 to 1860, New England was still one of the least productive farm areas, with an output per worker figure well below that in all other regions, except the South Atlantic. But the more rapid shift out of farming during these decades, is reflected in a more favorable picture of productivity change. According to the Easterlin data, the New England states had the smallest advance in productivity over the entire 20 years from 1840 to 1860. Now the region shows a rate of productivity advance in excess of that in the South Atlantic and nearly equal to that of the South Central states.

This pattern of change ties in well with more traditional views of New England's agriculture. While the opening of the Erie Canal had a serious impact on farming in the region, the more devastating effect followed upon the completion and extension of the railroad network (See Field, 1978 and Russell,

1976). In the words of Percy Bidwell, "the establishment of through railroad connection with the West between 1840 and 1850 marked not the beginning, but the culmination of growing pressure on New England producers from cheaper outside sources of supply." (1921, p.689). There is disagreement about the exact timing of the region's shift towards greater commercialization of agriculture, but surely the process was hastened by the opening of the Erie Canal, manifesting itself in important changes in the mix, and locus, of farm production (Bidwell, 1921, pp.686-689; Rothenberg, 1981). These decisions, perhaps especially that to alter the mix of output can be viewed as attempts to capture a part of the region's burgeoning urban market for farm goods. Such efforts could not fend off indefinitely the flood of products from western New York, and the states of the Northwest territory, especially after the improvements in rail connections, and after 1840, those farmers' sons who wished to continue farming migrated West, rather than carry on with the unpromising ventures in New England. Of course, many left farming all together. (Bidwell, 1921, p.700).

CONCLUSIONS

This paper has set forth new estimates of the farm labor force covering the period 1820 to 1860, for the United States and the major geographic regions. These national and regional figures are based on state estimates. The original intent of

the estimation was to produce state and regional series that were consistent with the existing national series. However, examination of the individual state data produced revisions which

yielded national figures noticeably different from the previous estimates. In particular, the new estimates lower the 1820 farm labor force by about 8 percent, while raising the figures for 1840, 1850, and 1860 by 7 to 9 percent.

These differences in the sizes of the farm workforces are due largely to three factors. In all years the new estimates incorporate a smaller number of slaves in farming, roughly 75 percent of the rural slave population of working age as opposed to the previous estimate of nearly 90 percent. In 1850 and 1860 this downward bias is more than offset by the addition to farming of workers who had reported their occupation as "laborer, not otherwise specified." Previous estimates had placed all these workers in nonfarm industries, but careful examination of the state data, and the location of many of these workers in rural areas, argues for the assignment of many of them to farming. In 1820 and 1840 the new estimates differ from the older ones because of varying judgments about how to correct the census deficiencies. In 1840, I raised the census count of farm workers by about 5 percent, while Lebergott reduced it by about the same margin. For 1820, we both increased the census count of the total labor force by approximately the same amount, but Lebergott allocated nearly

twice as many of these added workers to agriculture. Since the original census count was low primarily because of the exclusion of workers in the service industries, a large allocation to farming seems inappropriate.

As a consequence of these changes, the farm work force grew more rapidly than was previously believed, which implies that farm productivity and per capita income grew more slowly. The impact of the revisions varied by subperiod. For the later decades, 1840 to 1860, the size of the sector is larger, but there is little alteration in the pace of growth at the national or regional level. However, we now find a higher level of farm productivity and of per capita income in 1820, and a slower growth in these variables over the ensuing twenty years.

This paper has not addressed the regional differences to any great extent. While the original intent of the estimation was to develop the state and regional figures, the alterations to the national figures were so substantial as to warrant immediate attention. It is clear, however, that our picture of regional variation must change, the more so in some regions. In particular, the pace and timing of the shift out of farming in New England, and changes in farm productivity there vis-a-vis other regions, have been altered substantially. It now appears that the region shifted out of farming more slowly between 1820 and 1840, but quite rapidly thereafter.

The striking differences between the present and previous

series, and their implications for our understanding of the path of American economic development, certainly raise some questions. However, the revised series is more consistent with changes in the rural population, and so seems more secure than the older estimates. This in turn gives a measure of credence to the altered picture of growth presented here. Clearly, both the estimates and the substantive issues warrant further examination.

This paper has benefitted from discussions with the participants of the National Bureau of Economic Research's Summer Institute on the Development of the American Economy, and from the comments of Jeremy Atack, Lou Cain, Stanley Engerman, Peter Fearon, Robert Gallman, Claudia Goldin, and Warren Whatley. The work has been funded by the National Science Foundation (Grant No. SES8308569).

FOOTNOTES

1. In all this work I am proceeding on the assumption that the census counts of population are accurate, or at least equally reliable at the various census dates. Several researchers have concluded that the census undercounted population in the particular years and localities they have studied. Since my labor force estimates are derived as the product of age-sex-state specific participation rates times the population component, it would be straightforward to adjust my labor force estimates to conform to any revised population levels, should reliable estimates of these undercounts be produced.

Coale and Zelnick (1963) have argued that the population enumerations in the postbellum period (actually since 1855) have been low, but so far, the evidence of underenumeration in the antebellum censuses pertains to specific places, and it is not known whether the entire census in any year, much less all years, was subject to the same degree of error. (See Steckel, 1987, for a summary of the case studies pertaining to the antebellum years.)

More troublesome, is the possibility that the undercount fell more heavily on certain population groups which held a disproportionate share of selected occupations, thus giving a relatively larger undercount of the number of workers in those occupations in the census figures (Sharpless and Shortridge, 1975).

2. The total labor force is the sum of the workers in five population components; free males aged 16 and over, free females aged 16 and over, free males aged 10 to 15, free females aged 10 to 15, and slaves aged 10 and over. The estimate of the number of workers in each group is the product of the population in the group times the group-specific participation rate.

My labor force estimates are based on the concepts and coverage used by the decennial censuses of the 19th century. They are more precisely termed "gainful worker" counts, and are known

to exclude workers engaged in certain types of activities, especially married women working as boardinghouse keepers or unpaid family farm workers. Goldin has produced an estimate of these omissions for 1890 (1986, Table 10.5). As yet, there are no such estimates for other years which would permit an adjustment of the census data to a comparable coverage over time, so I have not corrected in any year for these sorts of omissions.

3. The national totals produced from the state estimates differ only slightly from Lebergott's figures, or from my estimates of the national totals (Lebergott, 1966, Table 1; Weiss, 1986, Table 1). The state-based estimates are within two percent of the national estimates in all years except 1800. In that year, the state-based figure of 1,712,000 is virtually identical to David's estimate (David, 1967, Table A-1).

4. This work is described in several working papers titled "The Assessment and Revision of the Antebellum Census Labor Force Statistics: Part I (1850 and 1860), Part II (1840), and Part III (1820)."

5. To a large extent these assessments are based on the behavior of the labor force statistics relative to population. As noted earlier, I am proceeding on the assumption that the census counts of population are accurate, or at least equally reliable at the various census dates.

6. In both 1850 and 1860 I adjusted the census counts from their reported coverage of those aged 15 and over to the smaller base of those aged 16 and over. The percentage changes reported here are based on the count that has been adjusted to cover those aged 16 years and over.

7. So far I have used only the sample for rural northern households (Bateman and Foust,1973). Additional samples have been taken recently of urban households, but as yet I have not made use of them (Moen, 1987; Weiss, 1987).

8. These adjustments were estimated for the total reported labor force. I assumed that each occupation should be revised by the same percentage as the total in each state.

9. No estimate of female farm workers aged 10 to 15 was made for 1820 or for any other antebellum year. Some of these workers may be included in the 1840 and 1860 census counts, but the number must be very small. The available evidence for the postbellum period shows very few such workers.

10. My assessment of the 1840 Census indicated that the reported labor force in the covered industries was low by about 300,000 workers, and that this undercount was largest in the South (161,000), but was also substantial in the Northeast

(128,000). My procedures for revision produced a correction of 206,000 workers, 168,000 of which were in farming. By comparison, Easterlin increased the census figure by 104,000 (1966, p.127). He allocated the entire adjustment to agriculture, so our adjustments to that sector's workforce are less disparate.

11. These corrections are exclusive of subsequent additions of male workers aged 10 to 15 and females aged 16 and over. Moreover, I did correct the North Central figures for an error of addition in the census totals. The sum of the county figures for Indiana gives an agricultural workforce of only 31,074, not the published figure of 61,315. The smaller figure is much more reasonable given the size and composition of the state's population.

12. In his analysis of agricultural productivity change, Gallman argued that the existing estimate of the farm labor force for 1850 was low, perhaps by as much as 12 percent, or 600,000 workers (1975, p.50). The present estimates are much closer to the level that Gallman thinks would be consistent with our other knowledge about the course of productivity change over the nineteenth century.

13. This factor accounts for a difference of 31,000 in 1850 and 17,000 in 1860. Lebergott estimated the number of free males aged 10 to 15 in farming as 17 percent of the population (1966, pp.152-53). I have assumed that all males aged 10 to 15 years in the <u>rural</u> labor force were in farming. For the nation, this means that approximately 21 percent of the rural male population aged 10 to 15 was in farming, and that the national percentage declined over time with urbanization. The two methods would yield equal numbers when the urban share of the population was 20 percent, which occurred around 1860. In that year, the two estimates are quite close, being within 5 percent of each other.

Since my procedure relied on participation rates specific to each state, the estimation of this group of farm workers has differential effects across regions. The number of such males would be lower in New England, and higher in the South, in the present series than is implicit in the previous estimates.

14. This estimate raised the present farm labor force figure by 61,495 in 1850. The Census of 1860 included free females aged 16 and over in the count of farm workers, and it appears that they were also included in the Census count for 1840, thus an estimate seems called for in 1850 in order to have consistent coverage over time. My estimate is based on sample data taken from the manuscript schedules of the 1860 census. That evidence indicates that 1.5 percent of the females aged 16 and over were engaged in farming in the North Central region, and .7 percent in the Northeast (Bateman and Foust, 1973). I assumed that the larger figure of 1.5 percent applied to the South.

15. I also adjusted the original census data in order to obtain a figure covering only those aged 16 and over. The 15 year olds removed by this adjustment were subsequently included in the independent estimate of those workers aged 10 to 15. In addition, some individual state counts were corrected in each year. (See Weiss, 1986b) The net effect of these adjustments and corrections lowered the original census figures by 38,000 in 1850 and raised them by 71,000 in 1860.

There is also a small unexplained discrepancy between the present and previous estimates in each year, 21,000 in 1850 and 46,000 in 1860.

16. My method of allocating this group of unspecified laborers rests on the idea that there was a strong relationship between urban and nonfarm occupations, including nonfarm laborers. The Census of 1910 reported the number of unspecified laborers according to their industry of employment. For earlier years, I distributed the reported number of laborers between farm and nonfarm industries according to the 1910 proportions adjusted for changes in urbanization. (See Weiss, 1987c, for details.)

The adjustment varies by region, with the Northeastern farm workforce being increased by 314,000 (24 percent), the North Central by 155,000 (15 percent) and the South by 148,000 (5 percent) in 1850; and by 195,000 (15 percent), 202,000 (12 percent) and 158,000 (5 percent) respectively in 1860.

17. The ratio is fairly steady as well, .183 in 1870, .199 in 1880, .203 in 1890, .193 in 1900, and .182 in 1910.

18. The adjustment also yields a more believable estimate of the number of laborers, not otherwise specified in nonfarm industries. If all the reported laborers were allocated to nonfarm industries the ratio of such laborers to urban population would be substantially greater in 1850 and 1860 than in postbellum years. The ratios would be .257 in 1850 and .156 in 1860 compared to the postbellum average of .075. The revised ratios are .063 and .075.

19. Implicitly there is a difference between my estimate of slaves in farming in 1840 and Easterlin's original estimate. While we both relied primarily on the census data, I revised the census figures for the South upward by more than he did; 148,000 versus 41,000. (Easterlin, 1960, p.127). In a subsequent article Easterlin adopted Lebergott's national totals, so the comparison discussed in the text pertain to those figures (Easterlin, 1975, p.110).

20. Lebergott's explanation indicated that he intended to allocate only 87 percent of the rural adult slaves to farming, but in the execution the 90 percent figure was used. In 1860, he

used a different figure altogether, namely the participation rates for free males aged 15 and over.

21. A minor difference is that I have estimated directly the urban and rural slave populations aged 10 and over.

22. The equation was fit to the cross-sectional evidence for 488 counties, and had a high R-squared (.952), and the coefficient was highly significant. Moreover, the coefficient for the free population aged 10 and over was .337, quite close to the values of .322 and .333 which prevailed in the rural South in 1850 and 1860. It is also close to the ratio which prevailed in the free northern states in 1840, .306 using the original census data, .312 with the revised figures.

23. A similar procedure was followed in 1820, and a regression equation estimated for that year as well. That equation gave the result that the share of the rural slaves aged 10 and over in farming was 77 percent, slightly above the 1840 figure, but still well below the 90 percent figure underlying the previous estimates. I have used the 1840 coefficient to estimate the farm slaves in 1850 and 1860 because that date is closer in time to the years in question, the sample size used in 1840 is much larger than the 1820, 488 counties versus 274, and as noted above, the estimated coefficient for the free population in 1840 was close to the expected value and gives us some confidence in the estimated value for the slave population.

24. A useful collection of pertinent articles can be found in Newton and Lewis (1978).

25. In addition to servants, 12.9 percent of the male slaves worked as artisans, such as blacksmiths, carpenters, millers, sawyers, masons, shoemakers, tailors, engineers, and even sailmakers; 9.6 percent of the female slaves were engaged in cloth production (seamstresses, spinners and weavers); 6.2 of the males worked in a category titled livestock and transportation, which included carriage and cart drivers, teamsters, and wagoners; and finally 2.1 of the males and 1.4 of the females were classified as semi-skilled, which included many farm occupations, but also mill workers, fishermen, and watchmen.

26. In an earlier work I estimated the number of slaves working in service jobs by using a small sample of plantation records (1975, p.99). After deducting an estimate of urban domestics, that evidence indicated that approximately 16 percent of the rural slaves aged 10 and over worked at service tasks in the period 1840 to 1860.

The evidence from interviews with ex-slaves shows higher percentages were engaged in household tasks (Crawford, 1980).

27. Lebergott judged the 1840 ratio in comparison to that for 1850 (.16), and found it reasonable. However, that ratio, as well as the 1860 figure, is too low because he did not allocate any laborers, not otherwise specified, to agriculture.

28. Lebergott has argued that the rural population figures are suspect becuase there is no reason to believe that the census counted the urban population accurately (1966, p.154). On the other hand, in his approach we must accept that they accurately counted and classified farmers and farm laborers. The presence of large numbers of laborers, not otherwise specified, and the fact that farmers and farm laborers were reported as one occupation in 1850 suggests they had their difficulties in classifying those workers.

29. This difference of 154,000 leaves a discrepancy of 27,000 between the two series, which is explained primarily by the correction of an arithmetical error in the census count for Indiana. A few minor changes were made in the figures for several other states.

30. If we deduct Lebergott's estimate of the number of slaves in farming from the census counts of workers in farming and in all reported industries combined, the remainder of free farm workers to the remaining workers in all reported industries, is only 73 percent. This smaller share would result in 48,000 fewer free workers being allocated to farming.

31. I did make an estimate of the number of males aged 10 to 15 and females aged 16 and over employed in farming, but the males aged 16 and over were combined with the slaves in the census count.

If females are excluded, the farm correction is 48 percent of the total workforce revision.

32. The two labor force series imply similar percentage increases in productivity over the subsequent twenty years; 21 percent using David's figures and 23 percent with the present estimates.

33. The per capita income figure derived using David's labor force estimates is $61. Both his and the revised income figures use the 1840 value of Gross Domestic Product per capita ($91) derived from David's original work, and estimate the 1820 values by multiplying that figure by the growth index number. The index numbers were calculated using the conjectural growth equation developed by David (1967, p.161). See Gallman (1971, Table 1) for a discussion of the estimates of the per capita gross domestic product derived from David's calculations.

34. Easterlin found that productivity growth within regions accounted for about two-thirds of the increase in output per worker between 1840 and 1860, and regional redistribution, explained the rest of the increase. He computed a hypothetical 1860 output per worker figure for the nation by using the actual 1860 productivity figures for each region, and assuming that the distribution of the farm labor force was the same as had existed in 1840. The difference between this hypothetical figure and the actual national output per worker measured the contribution of intra-regional productivity change. He ascribed the balance to the effect of regional redistribution towards higher productivity regions (1975, p.97).

35. The sum of the two hypothetical changes amounts to $30, while the actual increase that occurred between 1840 and 1860 was $35 (Table 3). The difference is due largely to the exclusion of the West from the present calculation. A small part of the difference is the interaction effect that occurs in these index number calculations, and which is usually assumed to be distributed across the factors in proportion to their importance in the explained change.

36. Paul David estimated that the regional shift would have increased average agricultural output per worker by 3.6 percent between 1820 and 1840. This is roughly 12 percent of the total improvement in farm labor productivity that occurred in the 20 years (1967, pp.178-79).

37. Easterlin found that the effect in the period 1840 to 1860 was nearly as large as that for the entire 40 years before 1840, and nearly twice as large as the increase from 1820 to 1840 (1975, Table 1 and p.97).

TABLE 1

FARM LABOR FORCE ESTIMATES BY REGION

REGION	1820	1840	1850	1860
Present Estimates				
New England	317707	389412	369459	348576
Mid Atlantic	570276	854798	915552	969989
No.Central	183904	710156	1056276	1666187
So.Atlantic	805401	1024829	1227792	1403780
So.Central	411218	906756	1288766	1778946
West	0	0	24944	120570
United States	2288506	3885951	4882790	6288049
Previous Estimates				
New England	377910	367200	369400	364400
Mid Atlantic	716300	820100	903000	965800
No.Central	214890	660800	1000600	1640900
So.Atlantic	778050	907400	1064500	1240300
So.Central	382850	814500	1155700	1592700
West			26700	76100
United States	2470000	3570000	4519900	5880200

Notes to Table 1

Delaware and Maryland are included in the Middle Atlantic region.

The construction of the Present Estimates is described somewhat in the text. More detailed descriptions of the procedures may be obtained from the author.

The Previous Estimates are from the work of Lebergott, Easterlin, and David. The U.S. totals are from Lebergott (1966, Table 1). The regional figures for 1840, 1850 and 1860 are from Easterlin (1975, Table B-1). He distributed Lebergott totals among the various regions, so the regional and national figures are consistent. The regional figures for 1820 were obtained by distributing Lebergott's total according to the regional shares estimated by David (1967, Appendix Table II).

TABLE 2

COMPARISON OF CHANGES IN THE RURAL POPULATION
AND THE FARM LABOR FORCE ESTIMATES
Percentage Changes

REGION	RURAL POPULATION	FARM LABOR FORCE ESTIMATES PRESENT	PREVIOUS
A. 1820 to 1840			
NEW ENGLAND	20.7	22.6	- 2.8
MID ATLANTIC	44.8	49.9	14.5
NO.CENTRAL	279.0	286.2	207.5
SO.ATLANTIC	27.3	27.2	16.6
SO.CENTRAL	114.0	120.5	112.7
UNITED STATES	68.2	69.8	44.5
B. 1840 to 1850			
NEW ENGLAND	8.0	- 5.1	0.6
MID ATLANTIC	17.6	7.1	10.1
NO.CENTRAL	52.2	48.7	51.4
SO.ATLANTIC	17.8	19.8	17.3
SO.CENTRAL	40.4	42.1	41.9
UNITED STATES	28.1	25.7	26.6
C. 1850 to 1860			
NEW ENGLAND	2.2	- 5.7	- 1.4
MID ATLANTIC	10.2	5.9	7.0
NO.CENTRAL	58.8	57.7	64.0
SO.ATLANTIC	12.3	14.3	16.5
SO.CENTRAL	32.2	38.0	37.8
UNITED STATES	26.6	28.8	30.1

Source: Table 1 above; U.S. Bureau of the Census, 1975, Historical Statistics of the United States, Series A:195-209.

TABLE 3

SHARES AND CHANGES IN SHARES
OF THE FARM LABOR FORCE AND RURAL POPULATION
BY REGION

Panel A: Percentage Shares

REGION	Farm Labor Force 1820	1840	1850	1860	Rural Poulation 1820	1840	1850	1860
New England	65	54	39	31	90	81	71	63
Mid Atlantic	61	54	42	35	89	81	74	64
No.Central	82	77	67	62	99	96	91	86
So.Atlantic	77	74	74	72	99	96	95	94
So.Central	86	77	75	74	99	95	93	92
United States					94	89	84	79
Present LF	72	67	60	56				
Previous LF	79	63	55	53				

Panel B: Changes in Shares

	Farm Labor Force 1820 to 1840	1840 to 1850	1850 to 1860	Rural Population 1820 to 1840	1840 to 1850	1850 to 1860
New England	- 11	- 15	- 8	- 9	- 10	- 8
Mid Atlantic	- 7	- 12	- 7	- 8	- 7	- 10
No.Central	- 5	- 10	- 5	- 3	- 5	- 5
So.Atlantic	- 3	--	- 2	- 3	- 1	- 1
So.Central	- 9	- 2	- 1	- 4	- 2	- 1
United States				- 5	- 5	- 5
Present LF	- 5	- 7	- 4			
Previous LF	- 16	- 8	- 2			

Sources: Table 1 above and new estimates of the total labor force by region; Lebergott, 1966, Table 1; U.S. Bureau of the Census, 1975, Historical Statistics of the United States. Series A:195-209.

TABLE 4

AGRICULTURAL OUTPUT PER WORKER, BY REGION
1840, 1850, AND 1860
(Valued in 1879 U.S. Prices)

Region	Present Estimates 1840	1850	1860	Easterlin's Estimates 1840	1850	1860
New England	165	146	186	175	146	177
Mid Atlantic	206	203	241	214	206	242
No.Central	201	207	238	216	218	242
So.Atlantic	148	149	160	167	172	181
So.Central	208	197	238	232	220	265
United States	186	184	219	203	199	234
Indexes of Relative Productivity						
New England	89	79	85	86	73	76
Mid ATlantic	111	110	110	105	104	103
No.Central	108	113	109	106	110	103
So.Atlantic	80	81	73	82	86	77
So.Central	111	107	109	114	111	113
United States	100	100	100	100	100	100

Sources: Easterlin, 1975, Table B-1; and Table 1 above.

In both series, the numerator used in the calculation is Easterlin's figures for agricultural income by region, so any differences in the productivity ratio are due entirely to the labor force estimates.

TABLE 5

PERCENTAGE CHANGES IN AGRICULTURAL OUTPUT PER WORKER BY REGION - 1840 TO 1860

Region	1840 TO 1850 New	1840 TO 1850 Old	1850 TO 1860 New	1850 TO 1860 Old	1840 TO 1860 New	1840 TO 1860 Old
New England	-11.5	-16.6	27.1	21.2	12.7	1.1
Mid Atlantic	- 1.5	- 3.7	18.6	17.5	17.0	13.1
No.Central	3.0	1.1	15.6	11.0	18.4	12.0
So.Atlantic	.7	3.0	7.6	5.2	8.1	8.4
So.Central	- 5.3	- 5.2	20.5	20.4	14.4	14.2
United States	- 1.1	- 2.0	19.2	17.6	17.7	15.3

Source: Table 4, above.

The increase for the U.S. can exceed that in each region, as is shown in the last column, due to the effect of a shift of the industry towards regions with higher levels of productivity.

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