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WAGES AND PRICES DURING THE ANTEBELLUM PERIOD: A SURVEY AND NEW EVIDENCE

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ABSTRACT

The purpose of this paper is to survey recent research on wages and prices in the United States before the Civil War. The basic conclusion is that, while much progress has been made in documenting regional, temporal and occupational differentials, further insights will require a large amount of new evidence, particularly on retail prices. The paper also uses existing regional data on wholesale prices to construct new regional indices of real wages for artisans and unskilled labor from 1821 to 1856. The new indices suggest that real wage growth was less than previously thought in the 1930s and that growth was, by comparison with later periods in American history, very erratic in the short-run. The erratic nature of real wage growth was a consequence of persistent effects of price and real shocks.

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1.0 Introduction

Data on wages and prices are fundamental to the study of the economy of the United States before the Civil War. Even economic historians who are unwilling to employ a real wage index -- the ratio of wages to a weighted average of prices -- as a single, summary statistic of the standard of living or the rate of economic growth (Engerman and Gallman 1983; Fogel 1986) agree that evidence on wages and prices should compiled and assessed. The extent to which levels and trends in real wages vary across occupations and regions provides valuable information on levels and trends in inequality, and on the spatial integration of labor markets.[1] Evidence on long-run trends in real wages is also potentially useful for cross-country comparisons (see Williamson, this volume).

The short-run behavior of wages and prices is also of interest. In the long run, one might suppose that the real wages are determined by real forces -- the demand and supply of labor. In the short run, there may be persistent effects of price changes or real shocks (or example, immigration, technological change) on nominal wages, leading to short-run fluctuations in real wages. Whether such "wage lags" existed prior to the Civil War, and if so, what impact they may have had on macroeconomic events, are unsettled issues. Although economic historians have largely focused on long-run trends, short-run fluctuations have commanded the attention of social, labor, and political

historians (Hirsh 1978; Wilentz 1984; Ross 1985; Fogel 1989, 1990).

The purpose of this paper is to survey recent research on antebellum wages and prices, focussing primarily on the four decades before the Civil War, and to present some new evidence on real wages. Section 2.0 briefly discusses some of the problems involved in using real wages as a proxy for living standards. Section 3.0 reviews recent research; it concludes that, while progress has been made in investigating nominal wage patterns during the antebellum period, further insights require additional research on prices, particularly at the retail level. Section 4.0 discusses a new data source on antebellum wages, based on military records, which is used in conjunction with previously collected data on wholesale prices to chart region and occupation-specific movements in real wages from 1821 to 1856. Section 5.0 compares the new estimates of real wages to previously estimates, concluding that previous work has overstated real wage growth in the 1830s and understated real wage declines in the early 1850s. Section 6.0 presents evidence on regional real wage gaps in the North, finding that real wages were higher in the Midwest and that population redistribution raised the northern growth rate above the regional rates. Section 7.0 examines fluctuations in real wages, concluding that "shocks" had persistent effects. A summary is presented in section 8.0.

2.0 Real Wages and the Standard of Living

Economists frequently use real wage indices to measure short and long-run movements in the standard of living. Such analyses, particularly for historical economies like the antebellum United States, pose well-known problems of measurement and interpretation.[2] With respect to measurement, the major issues concern the payment period and variations in wages and prices around the mean or mode.

Ideally the numerator of a real wage index should reflect annual earnings -- the product of a wage rate (hourly or daily) times the amount of time worked. Annual wages are preferable to daily wages because the former implicitly adjust for fluctuations in unemployment or long-run trends in weeks worked. Second, the ideal index is comprehensive: it recognizes that, historically (as well as today), wages, prices, and consumption patterns as reflected in budget shares (used in the construction of price deflators) differ across the population. A narrowly defined real wage index (masons employed in urban areas in the northeastern United States) may accurately represent aggregate trends if wage differentials are unchanging in the short and long-run, but there is no good reason (and considerable contrary evidence) to suppose this was ever true for any historical economy. Provided enough detail is available on the distribution of wages, prices, budget shares and the relevant population weights (eg. the proportion of masons employed in the northeast) the construction of an

aggregate index of real wages is straightforward, if computationally burdensome.[3]

Assuming these measurement problems can be solved, there is the larger question: what does a real wage index mean? The economic content of a real wage index is that it is supposed to represent an individual worker's "budget constraint"; if the constraint moves outward (real wages increase), the worker is "better off". However, even if the index is comprehensive as previously defined, it may be a poor representation of the typical individuals's budget constraint. At best, a real wage index can only measure the budget constraints of wage workers: the self-employed and owners of capital are excluded. Just as it is not wise to assume that wage trends for a narrowly defined population group mimic the average, it is not wise to assume that trends in incomes of the non-wage labor force closely resembled real wage movements. In many historical economies wages were a small share of workers' total compensation: they were paid in-kind, or were paid by the piece, not by a money wage per unit of time. In principle, such payments should be included in a real wage index; in practice, it may be difficult to find reliable data. Individuals spend all or part of their working lives as part of households in which other members may contribute income; thus an individual's consumption possibilities may differ drastically from his wage earnings.

Subtler issues of interpretation involve the relationship between real wage growth and economic development. According to

some scholars, the introduction of the factory system led to deleterious changes in work organization and increasing intensity of work. To accept these changes, workers required higher real wages; unadjusted for them, real wage indices overstate the degree to which economic welfare was rising. Rapid urbanization in the nineteenth century, which was associated with industrialization, led to reductions in nutritional status and health, at the same time that real wages may have been increasing (Fogel 1986).

As will become apparent as the paper unfolds, research on the antebellum United States is very far from meeting these ideals. With the exception of Lebergott (1964), Adams (1982), and Sokoloff (1986a), most studies have examined daily wages, not annual earnings, despite evidence that the length of the work year differed not only between agriculture and manufacturing but also increased over time in the non-farm sector (Gallman 1972; Adams 1986). In addition, there is indirect evidence that annual fluctuations in the length of the work year (unemployment) were significant (Keyssar 1986; Goldin and Margo 1989). Little is known about the effects of personal characteristics (eg. literacy, age, work experience, ethnicity) on wages.[4] Although evidence is mounting that health and nutritional status deteriorated in the late antebellum period at the same time that real wages were rising (Margo and Steckel 1983; Fogel 1986) there has been little work at reconciling these different measures of living standards, or at measuring the impact of changing working

conditions and work intensity on wages.

Lest the discussion seem too pessimistic, my opinion is that the situation is not hopeless. There is a (very) long historiographic tradition of using real wages as a proxy for living standards, and tradition counts for something. As pointed out in the Introduction, data on wages and prices are useful for many purposes, not just to construct welfare proxies. As recent work on the British industrial revolution has demonstrated (Lindert and Williamson 1983), none of the problems are intractable; what is really needed in the American case is a great deal more evidence. With that goal in mind, I now turn to a survey of previous work on antebellum wages and prices.

3.0 Antebellum Wages and Prices: A Survey

3.1 Wages

Except in a few scattered years, no comprehensive national surveys of American wages were taken before the Civil War. In their place scholars have turned to late nineteenth century government documents containing retrospective evidence, and to archival records. Although this effort has yielded a significant amount of valuable information, there are still major gaps in the historical record to be filled.

The most famous compilations of wages for the nineteenth century United States are two federal government documents: the

Weeks report, published as part of the 1880 census (Weeks 1886); and the Aldrich report, published in conjunction with a Senate investigation in the early 1890s (Aldrich 1893). The two reports differ somewhat in details, but their basic structures are the same: they were collected from payroll records of firms, and both are retrospective surveys -- the data are time series of average wages paid by firms that existed at the time of the survey.[5] Because many of the firms in the surveys had been in business for many years, one can use either report to estimate time series of nominal wages going back well into the nineteenth century (Abbott 1905; Hansen 1925); the best-known modern studies based wholly or in part on either report are David and Solar (1977) and Williamson and Lindert (1980). In both sources wages are disaggregated by firm (thus industry), occupation and frequency of payment (daily or hourly), but the Weeks report does not give the number of observations underlying the firm averages.[6]

Although a fairly strong case can be made that either report can be used to study late nineteenth century wage movements their usefulness in studying antebellum patterns is quite limited, particularly before 1850. The numbers of observations per year declines very sharply before 1840 (for example, for common labor in 1830-32 the Weeks report contains one firm observation). Although it is unclear a priori whether the selection induced by retrospective data produces bias, selectivity is potentially a problem for the antebellum period simply because the number of firms with antebellum data is small. The antebellum data in both

reports pertain almost solely to the Northeast; almost nothing can be learned from the Weeks or Aldrich reports about wages in the Midwest or the South, at least prior to the 1850s.

Partly in response to the inadequacies of both surveys and partly for other reasons, economic historians have turned to archival records. One such study is Walter B. Smith's (1963) well-known compilation of wages paid on the Erie Canal. Drawing on Canal payroll records, Smith constructed annual estimates of the modal daily and real wages of common laborers, carpenters, masons, and "teamwork" on the Canal from 1828 to 1881.[7] In addition to Smith, important archival contributions have been made by Layer (1955), Lebergott (1964), Zabler (1972), Adams (1968, 1970, 1982, 1986), Sokoloff (1986a), and Rothenberg (1988). Layer used firm payrolls to construct estimates of wages for textile manufacturing workers beginning in the 1830s. Lebergott pulled together wage estimates for various occupations from a wide array of government documents and even presented a long time-series of seamen's wages but stopped short of constructing an annual index of real wages (Lebergott 1964, 150, provides educated guesses at real wage movements over medium-length periods, such as 1835-50). Zabler used firm records to estimate occupation-specific wages in the iron industry in rural Pennsylvania from 1800 to 1830.

Without a doubt the most prolific scholar in this area has been Donald Adams. In his 1968 and 1970 papers Adams used account books and firm records to estimate occupation-specific

nominal wages in Philadelphia from 1780 to 1830. Adams also used wholesale prices for Philadelphia to construct indices of real wages over the same period. Adams (1982) used business records to estimate daily and annual earnings of manufacturing and farm labor in the Brandywine region around Philadelphia from 1800 to 1860. He concluded that, while there was substantial long-run increases in real daily wages and annual earnings, there were also significant short-run fluctuations. He also found rather large wage gaps between agriculture and manufacturing, suggesting that the sectoral shift of labor out of farming raised per capita income; later I discuss an analogous effect involving interregional migration. Adams (1986) presents estimates of wages of farm labor for Maryland from 1750 to 1850, finding an absence of real wage growth for farm labor from roughly 1820 to 1850.

Using the 1832 McClane report and the manuscript schedules of the federal manufacturing censuses of 1820, 1850 and 1860 Sokoloff (1986a) estimated average annual earnings of manufacturing workers at four benchmark dates. In addition to finding large increases in nominal and real earnings, Sokoloff also discovered a narrowing of rural-urban wage gaps in the Northeast, suggesting an improvement in the spatial efficiency of labor markets. Rothenberg (1988) used account books to estimate nominal and real wages of farm labor in Massachusetts from 1750 to 1855. Similar to Sokoloff, Rothenberg also found evidence of an improvement in the spatial efficiency of farm labor markets.

These various studies illustrate the pluses and minuses of

archival evidence on wages. Use of archival records solves the problem of retrospectiveness involved in using the Weeks and Aldrich reports. Archival records frequently contain great detail on the characteristics of worker and jobs, which is necessary for constructing wage estimates free of compositional changes over time or for regression studies of the cross-sectional determinants of wages (Sokoloff 1986a; Margo and Villaflor 1987). Unfortunately, the archival records that have been examined to date typically have pertained to a single or a small number of employers located in the Northeast. Work on the Northeast would still be valuable, but archival research would make the greatest contribution by shifting attention to the Midwest or the South.

3.2 Prices

In comparison with wages, studies of prices have received less attention recently by economic historians; the major exceptions are Rothenberg (1979) which gives a price index (farm-gate prices) for rural Massachusetts; and Adams (1986), which provides evidence on meat and grain prices in Maryland. Although much is known about wholesale prices in a few key markets, very little is known about retail prices. Available evidence on both is discussed in turn (see also Hoover 1958).

3.2.1. Wholesale prices. Relatively early in American history

wholesale markets developed in several ports and inland cities located on navigable waterways. The activities of these markets generated an abundance of quotations of wholesale prices reported in newspapers, in documents known as "Prices Current", and in government and firm records (Hoover 1958). A vast amount of such data were compiled by Benzanson, Cole, Warren and Pearson, and their various associates (Cole 1938). From these data wholesale price indices for New York, Philadelphia, Charleston, and Cincinnati have been calculated (U.S. Department of Commerce 1975). Because the wholesale price data are of high quality (compared with quantity data from the period) inferences about antebellum business cycles has frequently been gleaned from them their annual movements (Smith and Cole 1935).

The general course of wholesale prices before 1860 is well-known, and need not be described in detail here. Although the long-term drift in prices was downward (at least from the early 1820s), short-term movements were highly variable. Prices rose in the mid-1830s, peaked in the late 1830s, and then declined sharply during the early 1840s. The next big upward surge in prices occurred in the early 1850s, followed again by a decline. Perhaps the major exception to a long-term downward drift occurred in the Midwest. Because of vast improvements in internal transportation, the Midwest experienced a long-term rise in its terms of trade -- prices of agricultural goods produced in the Midwest rose relative to the price of non-agricultural goods (Berry 1943). Although the improvement in the terms of trade

raised the incomes of Midwestern farmers, it appears to have hurt non-farm workers in the region, who produced substitutes for non-farm goods imported from the Northeast and for whom food was a major item of household budgets. Real wages in the Midwest grew less rapidly before the Civil War than in the Northeast, in part because of the terms of trade effect (Ross 1985; Margo and Villaflor 1987).

Studies of real wages have frequently used wholesale price data to construct price deflators (Hansen 1925; Adams 1968; Williamson and Lindert 1980). The major problems in doing so are discussed later in the paper. For now, I would simply note that, although the cities covered by the wholesale data were the major wholesale markets, they were far from the only wholesale markets. Thus, for example, using New York price data to deflate nominal wages in Syracuse or Albany (the Erie Canal) presumes that markets in the two locations were spatially integrated. Rothenberg's (1981) finding of a strong positive correlation between her price index for rural Massachusetts and wholesale prices in New York City and Philadelphia suggests this assumption is not totally unreasonable, at least for markets in close geographic proximity. However, it remains to be seen if the assumption is valid for other parts of the country, such as the Midwest or the South.

3.3.2. Retail Prices. In comparison with wholesale price data, antebellum data on retail prices are extremely sparse. Virtually

all attempts to construct an antebellum "cost-of-living" index based on retail prices have relied on T.M. Adams (1939) pioneering study of prices paid by Vermont farmers. Although Adams' study is extremely valuable there are, nevertheless, serious (and well-known) problems with the Vermont data. Foods consumed by working class non-farm households are not covered in the Vermont data (meat, flour). The Vermont data show a steep long-term downward trend in prices from the early 1820s that some scholars (Lebergott 1964) believe to be exaggerated. Price deflators based on Adams' data thus might be expected to produce relatively large increases in real wages, at least compared with deflators based on wholesale prices (see section 5.0).

Other significant contributions have been made by Brady (1966) and Hoover (1960). Using data compiled originally by the Massachusetts Department of Labor and by herself from Pennsylvania account books and store records, Brady calculated average retail prices for a large number of goods for six benchmark dates: 1809, 1834, 1836, 1839, 1844, and 1849. Based on data from the Weeks report, Hoover (1960) constructed a retail price index covering the period 1851 to 1880, later extending the index back to 1800 (U.S. Bureau of Census 1975).

David and Solar (1977) used the Vermont data, Brady's benchmark figures, Hoover's index, and wholesale prices from Philadelphia to construct a cost-of-living index going back to 1774. Because neither the Vermont data or Brady provided evidence on housing prices, David and Solar constructed a proxy

for "reproduction costs" of housing using data on common labor wages and building materials prices. David and Solar's index (1821 to 1860) is plotted in Figure 1.

Although carefully constructed from the available evidence, the David-Solar index has serious limitations. To fill the gaps between Brady's benchmark dates, David and Solar interpolated using the Vermont data. The interpolation was trend-corrected (adjusted for the different long-run trends in the Vermont and Brady's data), but it is unclear whether the Vermont data should be used for this purpose (see section 5.0). The David-Solar index is a hybrid between a Northeastern (pre-1850) and a national (post-1850) price index. Thus, while it may be used to deflate nominal wages for the Northeast (at least before 1850) using it to deflate wage estimates for other regions is highly dubious, especially in light of known regional differences in wholesale price trends (Berry 1943).

The most serious problem with the David-Solar index is their proxy for housing costs. David and Solar justify the proxy by arguing that most housing during the period depreciated very rapidly (for example, the balloon frame house); consequently an index of annual reproduction costs would appear to be appropriate. Even if this assumption were tenable, the adequacy of a proxy based on common laborers' wages and building materials remains to be demonstrated (see David and Solar 1977, 45-46 for an attempt to do so). However, much of the wage data for the Northeast pertains to urban locations, or to locations where

housing was of a more permanent nature. There is considerable qualitative evidence that rental prices of housing deviated from reproduction costs in the short run, particularly during periods of high immigration (Lebergott 1964; Fogel 1989; Blackmar 1989). There is also evidence that the rental component of Hoover's price index grossly understates increases in housing prices in the Northeast in the early 1850s (Fogel, Galantine, and Manning 1990). Thus the applicability of David and Solar's proxy for housing costs, particularly in the short-run, is questionable.

4.0 Civilian Wage Data in Military Records

Since its inception the United States Army has hired civilians to perform various tasks at military installations.[8] Quartermasters were responsible for the hiring, and they also were required to keep duplicate monthly records, one copy of which was sent to Washington. Extant civilian payrolls covering the period 1818 to 1905 are known as the Reports of Persons and Articles Hired, and are currently lodged at the National Archives in Record Group 92. A large sample of payrolls covering the period 1818 to 1856 has been sampled and put on computer tape (Margo and Villafor 1987). The unit of observation is a "person-month" -- for example, if a person was hired as a teamster for three months at $15 per month, he contributes three observations to the sample.

Because the army was charged with forging a path to the

frontier, the composition of the Reports sample with respect to location, timing, and occupation differs from what a purely random sample of the antebellum population would yield (Margo and Villaflor 1987, 875-76). For example, frontier locations -- the West North Central and West South Central regions -- are over-represented. The number of observations per decade is generally large, except in the 1820s and in the Northeast and South Atlantic regions in the 1850s. Although most of the tasks civilian workers were employed at the forts had their counterparts in the civilian economy, occupations in the building trades (and clerical occupations) are over-represented relative to the civilian population.

Perhaps the most serious issue in working with the Reports is whether the Army paid competitive wages. The forts were not competitive firms; quartermasters had few incentives to hire the best workers at the lowest cost. This issue can be investigated by comparing wages at the forts with wages in the same location from purely civilian records. Based on comparisons made thus far it appears that wages at the forts were similar in level to purely civilian wages (Margo and Villaflor 1987, 877). However, I stress that this conclusion is a limited one; systematic comparisons have been made only for a few locations (for example upstate New York forts and the Erie Canal) or for isolated years (between the Reports and 1850 census data). Far more work needs to be done comparing the Reports to purely civilian sources, particularly for locations in the Midwest and the South.

By comparison with other archival sources for the antebellum period, the spatial, temporal, and occupational coverage of the Reports sample is far better.[9] It is not good enough, however, to produce finely disaggregated wage series for the entire 1821-1856 period, for example, by simple averaging of the original data. Instead, hedonic wage regressions were estimated, and the regression coefficients form the basis for annual dollar estimates of nominal wages of common laborers/teamsters, and skilled artisans for the four census regions (Northeast, Midwest, South Atlantic, and South Central). Because the regressions reveal a good deal of information about the cross-sectional determinants of antebellum wages and because the underlying computation departs somewhat from methods used in previous research on antebellum wages, the details are reported in an appendix (Section 9.0).

To convert one of the nominal wage series into an index of real wages, one must divide by an index of prices. Since the wage series are region-specific, so should the price indices. The only available region-specific price data pertain to wholesale prices (see section 3.2.2). Using these data, Goldin and Margo (1989) estimated region-specific price deflators.[10] For the purposes of deflating nominal wages, the new price indices are superior to those previously constructed from wholesale price data, because the new indices are based on a set of commodities consumed by households (for example, flour, pork, coffee) and exclude commodities like iron bars, etc. that were

not consumed by households (but which were included in other wholesale price indices).[11]

The limitations of the new price indices are serious and should be kept in mind. No adjustment has been made for housing prices. It is assumed in the construction of the indices that wholesale price data for, say, New Orleans, provides a usuable price deflator for the entire South Central region. The wholesale price data do not give prices of finished textile products; it is therefore necessary to assume, for example, that long-term trends in retail prices of shoes were the same as long-term trends in wholesale leather prices. This assumption is false, because it neglects considerable productivity growth in textile manufactures (Sokoloff 1986b). Fuel prices are proxied by the wholesale price of coal even though wood was widely used in rural areas and wood and coal prices diverged in the long run (David and Solar 1977). Budget shares are assumed to be the same in every region, even though relative prices differed across regions.

The real wage indices are graphed in Figures 2-5 (the indices are reported in Appendix Table 6). In general, real wage growth was less in the South than in the North. Real wages also grew more slowly in the Midwest than in the Northeast, but the opposite pattern occurred in comparing the South Atlantic and South Central regions. Real wage growth was more rapid in the 1840s than in the 1830s or early 1850s.

Williamson and Lindert (1980; see also Kuznets, 1955 and

Lindert and Williamson, 1982) investigated whether income inequality in the United States worsened between 1820 and 1860. Because there are no income statistics for the period, Williamson and Lindert used skill differentials -- the ratio of skilled to unskilled wages -- as a proxy for inequality, arguing that skill differentials increased in the late antebellum period (for a contrary view see Grosse 1982). Data from the Reports, however, suggest that real wages of common laborers/teamsters grew faster (or at about the same rate) as the real wages of artisans, and thus provide no evidence that a "surge" in skill differentials took place.[12]

Table 1 gives estimates of the long-run rate of growth of real wages. Three different methods are used to estimate the long-run growth rate: a regression of the (log) real wage on a linear trend, a straight line interpolation between decadal averages (1851-56 compared with 1821-30), and the mean of the growth rates (the mean of the first difference of the log wage). Using the regression method, the estimated growth rates range from a low of 0.4 percent per annum (Midwestern artisans) to a high of 1.6 percent (laborers in the Northeast). The regression method gives higher growth rates than either the decadal averages or mean of the growth rates; this difference reflects the fact that real wages in every region fell in the early 1850s. Regional and occupational differences, however, are generally the same regardless of the method used to estimate the long-term trend.

The new data, then, suggest that real wages in the United States were higher in the 1850s than in the 1820s. Growth, however, was uneven geographically and differed across occupations. Further, real wages did not increase in a steady fashion from year to year. Rather, growth was highly erratic, sometimes rising or falling very sharply in short periods of time (similar results were reported by Adams 1982). I shall return to the erratic nature of real wage growth in section 7.0.

5.0 Comparing Different Estimates of Real Wage Growth

Because there are no other alternatives for the antebellum South or Midwest, it is difficult to assess the novelty of the insights provided by the real wage indices presented in the previous section. It is possible, however, to compare the new index of unskilled wages for the Northeast to previously constructed indices.

The basic issues are as follows: the Margo-Villaflor (hereafter MV) index shows relatively little real wage growth in the 1830s, considerable growth in the 1840s, and a sharp decline in real wages in the early 1850s (see also Hansen 1925). By comparison, the index of unskilled wages constructed by David and Solar (1977; hereafter DS) shows a steady rise from decade to decade. The unskilled index constructed by Williamson and Lindert (1980; hereafter WL) shows considerable growth in the 1830s and a decline in the early 1850s.

These discrepancies lead to very different pictures of the antebellum economy. The 1820s and 1830s (before the Panic of 1837) are frequently characterized as years of economic expansion yet the MV index implies that unskilled non-farm workers gained little from that expansion. The decline in real wages in the early 1850s shown by MV and WL indices (but not the DS index) has recently been given considerable weight in explanations of the political realignment of the 1850s (Fogel 1990).

Table 2 shows the differences in decadal averages between the three series. The MV index shows a smaller increase in nominal wages in the 1830s than either the DS index or especially the WL index. In the 1840s, the MV index shows another increase while the DS and WL indices both show declines. Growth in nominal wages from 1841-50 to 1851-56 is about the same in the MV and DS indices but is smaller in the WL index.

The remainder of the table shows decadal average of real wages using either the DS or Goldin and Margo (1989; hereafter GM) price deflator. Clearly the major difference between the MV and DS indices in the 1830s is a consequence of the price deflator. If the DS price deflator is used with the MV nominal wage index, real wages growth is just slightly less than shown by the DS real wage index. However, the WL nominal wage index shows much greater real wage growth in the 1830s than either the DS or MV indices.

Comparing the 1840s to the 1830s all of the indices show much less real wage growth using the DS price deflator than the

GM price deflator. The GM price delator is also primarily responsible for the decline in real wages in the early 1850s; if the DS price deflator is used instead, all of the indices show growth. It is also clear that the GM price deflator gives a somewhat lower long-run rate of growth (comparing the 1850s to the 1820s) than the DS price deflator.

As a first step towards reconciling the differences across the real wage indices, I consider how the WL and DS indices of nominal wages were derived. For 1821-1830 DS used data originally collected by the Massachusetts Bureau of Labor Statistics. For 1831-39 DS used geometrically weighted averages of Erie Canal and Abbott's (1905) calculations of average wages from the Weeks report. From 1840 to 1880 DS spliced into the Weeks data. For 1821-1834 the WL index consists of quotations from Adams' Vermont data. For 1835-39 WL spliced into Layer's (1956) wage series for manufacturing workers. From 1840 to 1860 the WL index consists of observations on common labor drawn from the Aldrich report.

It is likely that splicing accounts for the differences between the MV and the DS and WL nominal wage estimates. Although DS purport to rely on wage observations from the Northeast for the pre-1830s part of their index, the Weeks quotations for 1836-38 (from Abbott 1905) actually pertain to St. Louis, which had much higher-than-average nominal wages (see the Midwest regressions in the appendix). The WL index shows an abrupt increase in nominal wages in 1835 (the point of the splice

to Layer), an increase not present in the other indices. The DS and WL indices overstate nominal wage growth in the 1830s; this overstatement, in turn, causes both indices to show less real wage growth from the 1830s to the 1840s than does the MV index.[13]

Differences in nominal wages, however, do not fully account for differences in real wage growth. As pointed out above, the choice of a price deflator is crucial. As pointed out previously, to construct the pre-1850 portion of their price index, DS relied on Vermont data and Brady's (1966) retail price quotations at benchmark dates. After 1850 DS spliced into Hoover's (1960) index, which was based on retail price quotations from the Weeks report.

Part of the difference between the DS and GM price deflators could be explained if wholesale prices were more variable in the short and medium-run than retail prices. DS purport to show such a difference by graphing their index against the Warren and Pearson wholesale price index, and by estimating a regression of their index on an index of Philadelphia wholesale prices. These comparisons are questionable because the DS price index and the wholesale price indices are not based on a common set of goods (this is particularly true for the non-benchmark years, since the Vermont data does not include price quotations for many of the goods regularly traded in wholesale markets). The correlation between short-run movements in wholesale and retail prices is discussed further in section 7.0; here I simply wish to note again the necessity of more and better retail price data in order

to properly measure the relationship between retail and wholesale fluctuations.

This point aside, the basic reason the DS price deflator shows much larger real wage increases in the 1830s can be traced to two aspects of the index. First, the DS price index shows a much greater decline in prices from 1821-1823 to 1831-33 than does the GM index. This is a consequence of the use of the Adams series as an interpolator, which shows an extremely steep rate of decline, much steeper than the decline in wholesale prices over the same period. Although DS corrected the Adams interpolator for its excessive downward trend relative to Brady's benchmark dates, they had no benchmark date for the early 1820s. Indeed, that the Adams interpolator gives too steep a rate of price decline is confirmed by DS's regression of their index on Philadelphia wholesale prices; the predicted DS index from the regression shows a smaller decline in prices between 1821-23 and 1831-33 than the actual DS index. Until more evidence on retail prices from the early 1820s is found, it seems prudent not to rely on the DS price index for those years.

Second, the DS price index shows a smaller increase in prices from 1834-1839 (especially 1834-1836) than does the GM price index. Comparing 1834 to 1836, the GM index increases from 84.6 to 110.2; the increase in the DS index is much less, 103 to 112. Some of this difference can be traced Brady's data and to DS's expenditure weights. Brady's data show sharp declines in prices of coffee and tea (two consumption staples) between 1834

and 1836, declines not present in wholesale price data. Brady's data also show extraordinary short run declines in the prices of several clothing items, such as hosiery, buttons, and cotton thread. In constructing their price index, DS gave a lower weight to food (39.5 percent) than is customary in nineteenth century price indices; this tends to dampen price increases in the mid-1830s because Brady's data show larger increases in food prices between 1834 and 1839 than do her non-food prices.[14] If one uses Brady's data, substitutes wholesale prices for coffee and tea, and excludes clothing items with extremely steep price declines, the revised DS index shows an increase in prices between 1834 and 1836 of about 18 percent. This is still less than the GM index; the remaining difference may be due to short-run differences in wholesale and retail price changes, as discussed above.

The next issue concerns the decline in real wages in the early 1850s. As is clear from Table 2, this difference, too, is a consequence of the choice of a price deflator. The basic reason why the DS price index results in an increase in real wages while the GM deflator results in a decrease turns on the behavior of the sub-indices making up the Hoover (1960) price index. First, the Hoover food price sub-index shows a much smaller increase in food prices from 1851 to 1856 than does the GM price index and virtually no change in clothing prices over the same period, despite a 39 percent rise in the wholesale price of cotton and a 70 percent rise in the wholesale price of leather

in the Northeast. Second, the Hoover index includes a rent component, which displays very little increase in housing prices between 1851 to 1856. Yet there is considerable anecdotal evidence of rising housing prices, particularly in Northeastern cities in the early 1850s, due to massive immigration. The problem, as Lebergott (1964) observed some time ago (see also Fogel, Galantine, and Manning 1990), is that much of the Weeks data pertained to company stores and company-owned housing in small towns. Price movements in the Weeks data may be artifically dampened because of the nature of the sample; thus use of the Weeks price data leads to too rosy a picture for real wages in the early 1850s.

Thus far I have argued that the discrepancies between the various indices arise primarily because of biases in the DS and WL nominal wage indices and in the DS price index. Yet not all of the problems rest with the DS and WL indices. Because the MV index was derived from an hedonic regression that did not fit the data perfectly, some of the year-to-year variability in real wages is merely noise (Margo and Villaflor 1987). The number of observations underlying certain estimates is small; indeed, sometimes smaller than the number available in the Aldrich or Weeks reports for particular years (this is especially true in the late 1840s and early 1850s). Even in light of these problems, however, the benefits of the new indices are considerable: they are not spliced from disparate data sources and they control for changing sample composition from year to

year.

In sum, the MV indices suggest that real wage growth may have been less than previously thought in the 1830s and that real wages fell in the early 1850s. It is important to stress, however, that these conclusions rest heavily on the choice of a price deflator. Although a case has been made here against the DS price deflator, the GM price deflator is far from perfect: it lacks a housing price component and one is forced to assume that yearly changes in wholesale prices mimicked yearly changes in retail prices. Further work is necessary, then, to determine if the conclusions implied by the new indices are sustained with better price deflators.

6.0 Regional Differences: The Northeast and the Midwest

The indices presented in section 4.0 do not show how real wage levels differed between regions. In this section, I estimate the ratio of real wages in the Midwest relative to the Northeast. Real wages were generally higher in the Midwest, and that there was a slight, but erratic downward trend in the Midwest/Northeast ratio of real wages. This downward trend is consistent with the direction of internal migration in the North, and also suggests the (modest) beginnings of regional labor market intergration. The fact that real wages were higher in the Midwest implies that population redistribution raised the northern growth rate above the rate experienced in the northeast

or the midwest.

To estimate the ratio of real wages in the Midwest relative to the Northeast, it is necessary to construct an index of relative regional prices. This index, like the ones used earlier, is based on wholesale price data.

Basic findings are shown in Figures 6 (artisans) and 7 (common labor/teamsters). Among artisans, real wages were almost always higher in the Midwest than in the Northeast. The wage gap increased in the late 1820s but then declined in the early 1830s, consistent with the sharp increase in immigration into the Midwest during that period. The gap also declined in the early 1840s; the Midwest was hit harder by the depression of the early 1840s than the Northeast was (North 1963). The gap then increased in the late 1840s as recovery occurred; the decline in the gap in the early 1850s was a consequence of rising in-migration plus the temporary glutting of Midwestern labor markets due to the ending of the railroad building boom (Fogel 1989).

The results for common labor/teamsters indicate greater regional similarity, but this conclusion is heavily influenced by the inclusion of Pittsburgh in the Midwest; unskilled wages were much lower in Pittsburgh than at other forts in the Midwest (see the appendix). If Pittsburgh were included in the Northeast, the real wage gap would have been subtantial.

The notes to the figures show regressions of the regional real wage relatives on a time trend. The negative coefficient on the time trend for artisans suggest the beginnings of regional

labor market integration. Rosenbloom (1990) recently has investigated labor market integration in the North in the late nineteenth century. If one uses the regression in Figure 5 to predict the regional wage gap in, say, the mid-1870s, the gap is predicted to be about 7 percent, which is quite close to Rosenbloom's estimate of the regional gap (8.5 percent for building tradesmen). Thus, while integration of regional labor markets for skilled artisans began in the antebellum period, the pace at which integration took place was rather slow. For common labor/teamsters, there is little evidence of regional integration at all.

The principal implication of these results concerns the difference between aggregate (northern) rates of growth of real wages and regional rates of growth. Because real wages were higher in the Midwest than in the Northeast, the shift of population from the Midwest to the Northeast raised the overall growth rate of real wages in the North.[15] The result confirms other research showing that per capita income growth in the North was accomplished with the aid of inter-regional migration (Fogel 1989) and that the existence of sectoral shifts in the context of wage gaps contributed to antebellum growth (David 1966; Adams 1982).

7.0 The Short-run Behavior of Wages and Prices

It is clear from the evidence presented earlier that the

growth rate of real wages fluctuated a great deal in the short and medium-run. Antebellum growth in real wages was not a continuous affair; rather, growth was uneven from year to year, punctuated by periods of sharp increases and equally steep declines.

These fluctuations were not randomly timed over the antebellum period. Rather, the fluctuations were correlated with short-run movements in prices and with real shocks. Nominal wages did not adjust instantaneously -- when prices rose, as in the mid-1830s real wages fell; when prices fell in the early 1840s, real wages rose sharply.[16] Declining real wages in early 1850s appears to have been a combination of nominal wages lagging behind rising prices and downward pressure on nominal wages caused by a sudden wave of immigration (Fogel 1989).

The short-run behavior of wages and prices may have important implications for understanding the antebellum economy. Even if, in the long-run, real wages followed an equilibrium growth path, determined by "real" factors (productivity growth and the growth of factor supplies) real wages in the short run could have been persistently below or above their long-run level. If they were, it is possible that fluctuations in employment could have been large. Although some economic historians have argued against such a view of antebellum cycles (Temin 1969), others have attached great importance to short-run fluctuations (Fogel 1989, 1990).

In a recent paper, Goldin and Margo (1989) examined the

time-series properties of the MV real wage series. The basic issue was whether real wages followed a long-run growth path dictated by long-run movements in real factors, which were captured by a linear time trend or by a proxy for per capita GNP.[17] No evidence was found against the view that real wages did follow such a path. But Goldin and Margo also found that short run deviations from the long-run path were quite persistent -- for example, up to 5 years were needed to restore equilibrium after a price (or other) shock.[18] Deviations were more persistent in the Northeast than in the North Central region, and for skilled labor than for unskilled labor. We also found evidence that deviations were transitory for agricultural labor, which suggests that the large farm sector may have served as an important buffer against urban unemployment during economic downturns (Temin 1969; Keyssar 1986).

The persistence of shocks to real wages may not be very surprising, given similar evidence for the post-1860 period (Decanio and Mokyr 1977; James 1989; Hanes 1990). But it leaves open the question as to why, in an economy previously characterized as satisfying textbook properties of flexibilty (Temin 1969), persistent effects of shocks should be present at all.

One possibility is imperfect information (Lucas 1981). Antebellum firms may have confused absolute price changes -- inflation or deflation -- with relative price changes. Thinking that absolute change was specific to their industry, firms may

have been led to adjust real quantities (labor) rather than nominal quantities (wages). Although we commonly think of the Northeast as having the most developed markets of the period, the difficulty of distinguishing relative and absolute price changes may have been greater in regions, such as the Northeast, with more heterogenous goods, than in simplier economies such as the Midwest.

With modern data, a common way of testing for such an effect is to examine the relationship between average price changes (inflation or deflation) and changes in relative price dispersion (the variance of relative prices). If average price changes were "neutral" they should bear no relationship with the variance of relative prices. Recent work tends to reject this conclusion, generally finding a significant positive relationship between the variance of price changes and the mean price change (see the references cited in Quddus, Liu and Butler 1988).

Using wholesale price data for New York City, relative price dispersion is defined to be the variance of the first difference of the logarithm of annual price changes for 10 commodities. The overall rate of price change is the square of the unweighted average of the individual price changes, or the rate of change of the Warren-Pearson price index.

A positive correlation between average price change and relative price dispersion is confirmed in simple regressions of the variance of price changes (VR) on the squared mean price change (unweighted average, UA or Warren-Pearson, WP):

$$VR = 0.004 + 0.679\ UA \qquad R^2=0.47$$
$$(4.459)\ (7.336)$$

$$VR = 0.005 + 0.287\ WP \qquad R^2=0.16$$
$$(4.851)\ (3.507)$$

A positive correlation, however, is not the same as causation. Causation can be investigated using a Granger causality test. If the theory were correct, one would expect the causality to run from average price changes to increased relative price dispersion. However, the results are exactly the opposite -- causality runs from relative price dispersion to average price changes.[19]

Although the causality result may appear puzzling, it is consistent with accounts of antebellum business cycles, particularly the Panic of 1837. During the 1830s, for example, the U.S. was on a specie standard together with "free" banking. In the early 1830s favorable harvests in Great Britian and rising British prices led to capital exports to the U.S. and a trade deficit. To restore equilibrium U.S. prices -- particularly cotton prices -- had to rise. For prices to rise the money supply had to increase, and the record shows that most of the increase (in the mid-1830s) resulted from an inflow of specie. The increase in the money supply, in turn, caused wholesale prices to rise, with a slight lag. Thus the causality ran from a real "shock" in Great Britian -- good harvests -- to relative price dispersion in the U.S., an increase in the money supply,

and ultimately to a higher U.S. price level (Temin 1969).

The causality test does not rule out an imperfect information explanation of persistence, but it does suggest that other factors were involved as well. One possibility involves the time-series properties of the antebellum price level. Recent work suggests that antebellum price level can be appoximated by an integrated time series (Goldin and Margo 1989). An integrated time series is non-stationary -- it does not return to a fixed mean, unlike a stationary series. An example of an integrated time series is a random walk. Were the price level a true random walk, price changes -- inflation or deflation -- would be white noise -- a mean-zero, serially uncorrelated time series. In interpreting the result, it is important to keep in mind that it is virtually impossible to statistically distinguish an integrated series from a "near" integrated series (which is still stationary), yet this distinction may have been crucial to behavior. Specifically, standard tests can reject stationarity even if the series is stationary over sub-periods but the mean shifts from one sub-period to the next (see below).

It is easy to see how random walk-like movements in prices could lead to wild short-run measured fluctuations in real wages. Consider a worker hired for, say, a six-month period. During the period of the contract the worker may consume all sorts of goods whose prices fluctuate unpredictably in the short run. Even if it were costless to continuously renogotiate labor contracts these price fluctuations will be tolerated by the worker because

(if average price changes were truly white noise) the real wage will be constant, on average, over the period of the contract. Ex post, the real wage fluctuates a great deal within the period. However, if it is difficult to determine if a particular sequence of price changes is serially correlated (i.e. is persistent) and it is costly to renegotiate labor contracts, one might observe persistent deviations in real wages from long-run "equilibrium" values. Only when inflation or deflation became abundantly clear to every economic agent would nominal wages "adjust", possibly abruptly.

This explanation may be quite relevant for the antebellum period. Although labor contracts were generally quite brief during the period, in the sense that workers might be hired by the day or the month, it does not follow that all parameters of such contracts, such as the nominal wage, would be renegotiated continuously. This is especially true if, as was the case during the antebellum period, the price level might be close to stationary (or stationary around a downward trend) for several years, only to suddenly shift upwards or downwards. During the inflation of the mid-1830s strikes by journeyman cabinetmakers in New York are said to have been motivated by the fact that "the price book [giving journeymen's wages] used by their masters was more than a quarter of a century old ... the old book failed to keep up with the cost of living" (Wilentz 1984, 231). It is these sudden shifts, due to international events (the 1830s) or gold discoveries (1850s), that led first to confusion, then to a

revision of price expectations, and ultimately to nominal wage adjustments.

Nor is the point relevant for just the antebellum period. In the late nineteenth century (1870-1897) steady deflation became a fact of economic life. Then in 1898, gold discoveries led to rapid price increases. Expectations did not adjust immediately, and real wages fell. The adjustment lag was not necessarily irrational; as Barsky and DeLong (1988) have recently shown, sophisticated economic agents, given the information available at the time, might have concluded there was no necessary positive relationship between changes in specie production and changes in the price level.[20] Ex post they were wrong, but not necessarily ex ante.

8.0 Summary

This paper has surveyed recent work on prices and wages before the Civil War. Although there are serious shortcomings in the available data, the evidence suggests that, with notable exceptions, long-run growth in real wages was substantial before the Civil War. Growth was somewhat lower than previously thought in the 1830s, somewhat higher in the 1840s, and real wages declined in the early 1850s. Because real wages were higher in the Midwest than the Northeast, population redistribution raised the average rate of growth of real wages in the North.

But the work also suggests that real wage growth was erratic

in the short-run, and that shocks to real wages had persistent effects. Historians have emphasized the importance of these fluctuations to the social, labor, and political history of the period, and rightly so. But a comprehensive explanation of the persistence of shocks to real wages during the antebellum period remains to be developed.

9.0 Appendix: Nominal Wage Estimates

This appendix describes the nominal wage estimates used in the construction of the real wage indices (see Appendix Table 6).[21] The hedonic wage regressions are reported in Appendix Tables 1-4.

9.1. Weighting Procedure. The basic idea behind the weighting procedure is to attach to each fort location a decade-specific share of the region's population and to each occupation (within the skilled and unskilled groups) an occupational share. The weight for the variables MONTHLY, HIGH, LOW, and SLAVE (South Atlantic and South Central) is zero; for SPRING, SUMMER, FALL the weight is 0.25.[22] The wage estimates refer to ordinary skilled or unskilled workers, hired on a daily basis, averaged over the year to account for seasonal variations. The fort location and occupation weights are shown in Appendix Table 5.

The fort location weights were derived from population figures in U.S. Department of Commerce (1975, Series A 195-209) and are decade-by-decade averages. For example, the fort

location weight for southern New England for the 1820s (0.244) is the average of the share of the northeastern population living in Massachusetts, New Hampshire, Connecticut, and Rhode Island in 1820 and 1830. Similarly, the 1830s weight is an average of the 1830 and 1840 population shares; the 1840 weight, the 1840 and 1850 population shares; the 1850 weight, the 1850 and 1860 population shares.[23]

The occupational weights are derived from the 1850 Census. For example, the weight for teamsters (0.04) reflects the fact that, of all persons in the Northeast reporting an occupation of teamster or common laborer in 1850, 4 percent were teamsters.

The principal advantage of the weighting procedure is that it adjusts for the geographic and regional differences between the sample and the antebellum population. The procedure is crude: it assumes that the labor market to which the fort belonged was proportional in size to the population of the area in which the fort was situated, and no adjustments are made for changes in the occupational distribution over time. A key advantage of the hedonic approach, however, is that other economic historians are free to use whatever weights they wish to generate a different set of estimates from the regressions (for example, estimate wage series for each fort and then produce regional series by taking <u>unweighted</u> averages of the fort-specific estimates).[24]

9.2. <u>Step-by-step calculation of estimates</u>. To derive the wage estimates, multiply the fort location coefficients by the decade-specific fort location weights, the occupational coefficients by

the occupational weights, and the seasonal coefficients by the seasonal weight (0.25), and add together. Take the sum and add the constant term to it: call the result α. To α add the coefficient of the time period dummy, and exponentiate the result.

As a specific example, the wage estimate for unskilled labor in the Northeast in 1822 is \$0.78. Multiplying the coefficients of the fort location dummies by the fort location weights for the 1820s [-0.068 x 0.291 + 0.079 x 0.043 + 0.008 x 0.260 - 0.017 x 0.244 + 0.353 x 0.118], the teamster coefficient by the teamster weight [0.104 x 0.04], and the seasonal coefficients by the seasonal weight [-0.125 x 0.25 -0.015 x 0.25 - 0.046 x 0.25] and adding together with the constant term gives α = 0.200. Adding to α the coefficient of the 1822 time dummy (-0.445) and exponentiating gives the estimated wage of \$0.78 (= exp (-0.245)).[25]

This procedure must be modified when the time period dummy refers to a group of years rather than a single year. If the group refers to two years (for example, 1824-25), the estimated wage is assumed to refer to the second year (1825) and the estimate for the first year is a linear interpolation of the preceding year's estimate (1823) and the second year's estimate (1825). If the group refers to three or more years (1824-26), the estimated wage is assumed to refer to the mid-point of the group of years (1825.5), and the estimates for surrounding years are again calculated by linear interpolation. All estimates for

1849 are interpolated because no reports have been found for that year.

9.4. Northeast: Adjustment of 1835-37 estimates. Based on an extensive analysis of the original data and other evidence, the Northeast coefficients of the time dummies for 1835-37 for skilled labor and for 1836 for unskilled labor were deemed to be unreliable. To estimate wage changes from 1835 to 1837 data pertaining to workers at the Boston Naval Yard was used ("Naval Hospital Payrolls," Bureau of Yards and Docks, Record Group 71, the National Archives). It is important to note that these workers were building hospitals and other buildings at the yard, not ships (ship carpenters earned a premium above ordinary carpenters). Average wage rates for skilled artisans (carpenters, masons, painters and plasterers) and common laborers were calculated for each year at the yard, and the resulting percentage changes in wages were used to generate new estimates of the coefficients of the time dummies. The coefficient estimates are:

Year	Skilled	Unskilled
1835	-0.236	
1836	-0.167	-0.206
1837	-0.218	

9.5. South Central: Adjustment of Fort Location Coefficients, Unskilled Regression. Based on extensive comparisons with the original data, it appears that the unskilled regression significantly overpredicts wages at forts in Kentucky, Tennesse,

Alabama, and Mississippi. New coefficients for these forts were derived directly from the data, by forming the ratio of wages at the forts to wages at New Orleans for specific years. The new coefficients are:

Location	Coefficient
Kentucky	-0.484
Tennessee	-0.484
Alabama-Mississippi	-0.471

NOTES

1. Occupational wage differentials are also important to the debate over the labor scarcity hypothesis. According to Habbakuk (1962), skilled labor was relatively more abundant in the United States than in Great Britain, and this alleged relative abundance influenced the choice of technique in American manufacturing. Little evidence has been found, however, to support Habakkuk; see Adams (1968), and Margo and Villaflor (1987). For a contrary view, see Zabler (1972).

2. For useful discussions of some of the problems, see David and Solar (1977) and the various papers in Scholliers (1989).

3. "Straightforward" is meant in a practical sense, not in the sense that all problems associated with the construction of real wage indices can be solved in a believable fashion; for example, even if the wage and price data were ideal, there still would be the classic "index number" problem of valuing new products.

4. Gender is an exception; see Goldin and Sokloff (1982) and Adams (1986).

5. Some firms had been in business longer than others, and one can study, in part, whether the length of time firms were in business affects the calculation of, for example, real wage changes. Suppose one is studying wage growth between (say) 1870 and 1880. By varying which firms are in the sample (i.e. only firms in existence for those ten years, versus those in existence prior to the 1870s) one can gauge the importance of the length of time firms were in business. But, one cannot study how firms that came into existence prior to either survey and failed to survive until 1880 or 1983 affect the calculation.

6. Early work favored the Aldrich report on these grounds (Abbott 1905) but Lebergott (1964) worked instead with the Weeks data, arguing that its coverage was better and it was less affected by sampling variability.

7. Smith's estimates are modes, not means, which complicates comparisons with other studies as well as any time-series analysis of the Erie Canal data (i.e. the mode is more stable than the mean).

8. In addition to data on civilian wages at Army installations, there is considerable wage data for arsenals and naval yards; see Heppner and John (1968).

9. The Reports are not, however, comprehensive with respect to the variety of occupations found in the antebellum United States, for example, in the 1850 census. Thus the Reports cannot be used to reconstruct the antebellum wage structure in fine detail.

10. The price indices are geometrically-weighted aggregates of price indices of specific goods; the indices are discussed in Goldin and Margo (1989) and in an appendix to that paper, available from Robert Margo on request.

11. In this respect they are similar to the price deflators employed by Hansen (1925), Adams (1968), and Williamson and Lindert (1980).

12. Goldin and Margo (1989) show, however, that wages of clerks increased more than wages of common laborers/teamsters, providing some support for the "surge" hypothesis.

13. The level of the WL real wage index in the 1840s (using the GM deflator) is higher than the MV real wage index level. This difference is primarily due to WL's use of Vermont nominal wages, which are lower in the 1820s than indicated by other sources.

14. For example, Hoover's (1960) budget share for food was 59 percent.

15. Because regional differences disappeared by the early twentieth century (Rosenbloom 1990) the findings also suggest that improved labor market integregation contributed to economic growth in the North over the entire course of the nineteenth century. Calculating the importance of this contribution, however, would be extremely difficult, because it would be necessary to determine how much of the regional wage gap was a disequilibrium rather than, say, a compensating differential for transportation costs. Rosenbloom (1990) argues that disequilbria were important in the late nineteenth century, which suggests the effect could be large.

16. The stability of nominal wages in the face of wide fluctuations in commodity prices is a very old (and apparently universal) problem in economic history; see, for example, the various papers in Scholliers (1989).

17. Posed somewhat differently, this question was also investigated by David and Solar (1977, 37-39), Sokoloff (1986a), and Rothenberg (1988). Using very different methods, similar results were obtained for a number of nineteenth century European economies by Bairoch (1989).

18. Williamson (this volume) speculates that the result may be an artifact of the use of hedonic regressions to construct the nominal wage indices. But a regression is merely a particular way of obtaining an average. Hence, if nominal wages are stable from year to year while prices fluctuate and the fit of the regression is less than perfect (which was the case) it follows that some wage changes at the individual level were opposite in sign to contemporaneous price changes. Disaggregating to the individual level will not answer the question why shocks were persistent on average, which is the question posed by Goldin and Margo (1989). As pointed out in the text, the persistence of shocks is largely the consequence of a few episodes in which large nominal or real shocks occurred.

19. Tests of Granger causality from mean price changes to relative price dispersion yielded F-statistics of 0.24 (UA) and 0.56 (WP). Tests of Granger causality from relative price dispersion to mean price changes yielded F-statistics of 5.01 (UA) and 2.82 (WP). The latter two statistics are significant at the 5 percent level. The lag length for the tests was set at 3 (3 years).

20. As Barsky and DeLong (1988) demonstrate, it is this adjustment lag that causes late nineteenth century interest rates to violate the "Fisher" equation; namely, that the real interest rate equals the nominal rate plus the expected rate of change in the price level.

21. The estimates themselves are reported in Margo and Villaflor (1987, 893-894).

22. Rations were valued at 12 cents each; see Margo and Villaflor (1987, 878). The only exception was the South Central common labor-teamster regression, in which the number of rations was included as an independent variable. In constructing the South

Central wage estimates, the rations weight was set equal to its sample mean, 0.055.

23. The notes to the fort location tables give the geographic areas identified with each coefficient in the construction of the fort location weights. For example, in the Northeast table, the coefficient for Carlisle, Pennsylvania is identified with "rural PA"; this means the Carlisle coefficient was weighted by the share of the northeastern population living in rural Pennsylvania.

24. Or no weights at all: because the dependent variable is the log of the daily wage, the coefficients of the time dummies can be used directly to construct nominal wage indices (relative to a value of 1.0 for the base year, 1856). For example, the index number for artisans in the South Atlantic states in 1823 is 0.826 (=exp(-0.191)).

25. This procedure ignores the fact that, while the prediction error, $\underline{e}$, of the regression has a mean value of zero ($E(\underline{e})=0$), $E(\exp(\underline{e}))$ is non-zero. The appropriate adjustment was too small to affect the results, however, and was ignored throughout.

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Table 1

Real Wage Growth During the Antebellum Period

1. Coefficient on Trend ($\ln w = \alpha + \beta t$)

	Common Labor/Teamsters	Artisans
Northeast	0.0155	0.0114
Midwest	0.0142	0.0038
South Atlantic	0.0059	0.0043
South Central	0.0120	0.0140

2. Decadal averages (1821-30/1851-56)

Northeast	0.0121	0.0081
Midwest	0.0107	0.0036
South Atlantic	0.0001	0.0039
South Central	0.0106	0.0112

3. Mean of Growth Rates

Northeast	0.0113	0.0156
Midwest	0.0027	0.0081
South Atlantic	0.0077	0.0062
South Central	0.0067	0.0082

Figures are average annual changes in (log) of real daily wage, 1821-1856.
Source: see text

Table 2

Explaining Different Estimates of Real Wage Growth:
Unskilled Labor, 1821-1856

1. Nominal Wages

	Margo-Villaflor	David-Solar	Williamson-Lindert
1821-30	100.0	100.0	100.0
1831-40	108.9	109.6	130.0
1841-50	119.8	104.5	129.0
1851-56	138.1	121.5	141.8

2. Margo-Villaflor real wage index with different price deflators

	David-Solar	Goldin-Margo
1821-30	100.0	100.0
1831-40	122.4	103.7
1841-50	153.9	152.8
1851-56	171.0	140.5

3. David-Solar real wage index with different price deflators

1821-30	100.0	100.0
1831-40	122.7	104.1
1841-50	133.3	132.8
1851-56	150.6	123.9

4. Williamson-Lindert real wage index with different price delators

1821-30	100.0	100.0
1831-40	146.0	123.6
1841-50	164.8	163.0
1851-56	175.4	143.9

Appendix Table 1

Regressions of Nominal Daily Wage Rate, Northeast

	Artisan		Common Labor-Teamster	
Variable	ß	t-stat	ß	t-stat
Constant	0.558	13.558	0.219	3.385
Fort Location:				
Upstate NY	-0.0001	-0.008	-0.068	-2.040
Philadelphia	-0.025	-1.065	0.079	2.650
Carlisle, PA	-0.176	-8.358	0.008	0.214
Southern NE	0.148	5.862	-0.017	-0.360
Northern NE	0.340	17.277	0.353	6.483
Worker and Job Characteristics:				
High	0.391	22.597	0.664	4.454
Low	-0.569	-15.275		
Paid Monthly	-0.159	-7.137	-0.096	3.885
Season:				
Spring	0.088	3.978	-0.125	-1.865
Summer	0.016	0.815	-0.015	-0.291
Fall	0.071	3.599	-0.046	-0.868
Occupation:				
Mason	0.118	11.474		
Painter-Plasterer	0.086	5.188		
Blacksmith	0.017	0.809		
Teamster			0.104	4.324
Year:				
1820	-0.231	-3.627		
1821	-0.574	-4.665	-0.410	-3.527
1822	-0.339	-4.084	-0.445	-3.587
1823			-0.445	-3.587
1823-24	-0.351	-4.063		
1824			-0.449	-3.730
1825-26	-0.432	-5.216	-0.281	-4.242
1827	-0.297	-3.714	-0.335	-4.545
1828	-0.373	-6.697	-0.442	-6.230
1829	-0.420	-9.376	-0.499	-5.428
1830	-0.463	-9.992	-0.493	-5.340
1831	-0.409	-4.719	-0.507	-6.920
1832	-0.372	-5.924	-0.458	-6.274
1833	-0.388	-6.667	-0.471	-5.844
1834	-0.266	-4.854	-0.292	-3.078
1835	-0.349	-5.396	-0.292	-3.078
1836	-0.473	-9.442	-0.298	-3.093
1837	-0.395	-7.456	-0.126	-1.499
1838	-0.253	-6.847	-0.221	-3.716
1839	-0.192	-5.089	-0.335	-6.040
1840	-0.254	-6.632	-0.527	-9.280
1841	-0.254	-6.652	-0.313	-5.397
1842	-0.346	-9.044	-0.296	-5.057
1843	-0.282	-6.958	-0.204	-3.401
1844	-0.400	-9.748		

Appendix Table 1 (continued)

1844-45			-0.204	-3.072
1845	-0.223	-4.202		
1846	-0.263	-5.985	-0.181	-3.636
1847	-0.243	-4.102	-0.365	-5.603
1848	-0.301	-6.605		
1848-50			-0.132	-2.426
1849-50	-0.287	-5.947		
1851	-0.299	-6.162	-0.214	-2.016
1852			-0.116	-1.539
1852-53	-0.229	-3.182		
1853			-0.127	-1.276
1854			-0.079	-1.111
1854-55	-0.106	-2.440		
1855			-0.046	-0.782
N	3,555		2,364	
R^2	0.61		0.44	

Notes: Artisan: constant term represents an ordinary carpenter, hired on a daily basis without rations in the winter at a fort in or nearby New York City in 1856. Common Labor-Teamster: constant term represents a common laborer hired on a daily basis without ratios at a fort in or near New York City in 1856.

Appendix Table 2

Regressions of Nominal Daily Wage Rate, Midwest

	Artisan		Common Labor-Teamster	
Variable	ß	t-stat	ß	t-stat
Constant	0.867	25.427	0.022	0.895
Fort Location:				
Pittsburgh	-0.223	-2.967	-0.382	-8.872
Cincinnati	-0.081	-1.432	0.031	0.432
Detroit	-0.319	-9.359	0.118	3.933
Michigan (other than Detroit)	-0.122	-4.234	0.280	4.127
Iowa-Wisconsin-Minnesota	-0.088	-4.088	0.143	3.998
Ft. Leavenworth	-0.135	-6.491	0.365	16.829
Kansas (other than Ft. Leavenworth)	-0.050	-2.020	0.346	9.504
Worker or Job Characteristics:				
High	0.470	20.106		
Low	-0.485	19.122		
Paid Monthly	-0.113	-6.598	-0.389	-19.341
Season:				
Spring	-0.025	-0.839	0.049	1.799
Summer	-0.016	-0.646	0.047	2.213
Fall	-0.007	-0.247	0.150	6.122
Occupation:				
Mason	0.043	3.012		
Painter-Plasterer	0.091	3.908		
Blacksmith	0.106	6.757		
Teamster			-0.025	-2.126
Year:				
1820			-0.168	-1.812
1821			-0.147	-1.382
1822	-0.361	-5.000	-0.350	-3.999
1823			-0.399	-4.974
1824			-0.423	-6.885
1823-26	-0.388	-5.688		
1825			-0.427	-6.879
1826-27			-0.450	-7.245
1827-29	-0.163	-4.369		
1828			-0.382	-5.133
1829			-0.341	-4.783
1830	-0.152	-2.606	-0.304	-2.886
1831	-0.044	-0.746	-0.360	-4.903
1832	-0.064	-0.821	-0.304	-4.911
1833	-0.125	-3.476		
1833-34			-0.069	-1.822
1834	-0.141	-2.834		
1835			-0.071	-1.276
1835-36	-0.172	-2.312		

Appendix Table 2 (continued)

1836			-0.248	-3.851
1837	0.134	2.917	0.160	6.442
1838	-0.075	-1.534	-0.121	-1.889
1839	-0.175	-7.078	0.071	3.467
1840	-0.166	-5.843	-0.161	-4.493
1841	-0.229	-9.279		
1841-42			-0.268	-10.450
1842	-0.306	-9.581		
1843	-0.481	-15.105	-0.190	-5.990
1844	-0.420	-14.113		
1844-45			-0.257	-9.253
1845	-0.359	-9.275		
1846	-0.509	-15.708	-0.118	-3.200
1847	-0.372	-9.561	-0.303	-6.539
1848	-0.316	-8.809	-0.097	-2.155
1849-50	-0.236	-8.768	-0.194	-7.489
1851	-0.110	-2.818		
1851-52			-0.089	-3.400
1852	-0.134	-2.694		
1853	-0.066	-2.524	-0.130	-5.956
1854	-0.053	-1.850	0.005	0.222
1855	-0.019	-0.664	0.037	1.546
N	3,494		4,900	
R^2	0.574		0.620	

Notes: Artisan: constant term represents an ordinary carpenter, hired on a daily basis without rations during the winter at a fort at or near St. Louis in 1856; Common Labor-Teamster: constant term represents a common laborer hired on a daily basis without rations in the winter at a fort at or near St. Louis in 1856.

Appendix Table 3

Regressions of Nominal Daily Wage Rate, South Atlantic States

Variable	ß	t-stat	ß	t-stat
Constant	0.519	4.689	0.140	1.410
Fort Location:				
Baltimore	-0.108	-3.091	0.279	6.484
Savannah, GA	0.089	2.364	0.142	2.196
North Carolina	0.022	0.456	-0.226	-3.514
South Carolina	0.141	3.790	-0.254	-5.210
Worker or Job Characteristics:				
High	0.406	15.083	0.750	3.608
Low	-0.775	-22.669	-0.019	-0.328
Paid Monthly	0.141	2.578	-0.053	-1.492
Slave	-0.246	-9.952	-0.108	-4.517
Season:				
Spring	-0.0005	-0.013	0.050	0.928
Summer	-0.023	-0.683	-0.028	-0.590
Fall	0.056	1.463	-0.089	-1.908
Occupation:				
Mason	0.014	0.629		
Painter-Plasterer	0.071	2.521		
Blacksmith	0.137	2.798		
Teamster			-0.170	-5.747
Year:				
1823	-0.191	-1.645		
1824	-0.236	-2.118		
1824-26			-0.275	-2.629
1825-26	-0.043	-0.377		
1827	-0.010	-0.090	-0.251	-2.420
1828	-0.122	-1.051	-0.231	-2.228
1829	-0.066	-0.599		
1829-30			-0.351	-3.398
1830-31	-0.037	-0.323		
1831-32			-0.406	-3.928
1833-34			-0.449	-4.600
1832-34	-0.044	-0.399		
1835	-0.015	-0.124	-0.392	-3.871
1836	-0.095	-0.714	-0.171	-1.728
1837			-0.132	-1.341
1838			-0.297	-3.015
1837-39	-0.069	-0.539		
1839			-0.209	-1.894
1840-41	-0.077	-0.617	-0.243	-2.378
1842	-0.046	-0.417	-0.501	-4.394
1843	-0.174	-1.604	-0.324	-2.889
1844-46	-0.163	-1.369	-0.267	-2.108
1847	-0.186	-1.114	-0.254	-2.345
1848	-0.151	-1.204	-0.276	-2.628
1849-50			-0.327	-3.160

Appendix Table 3 (continued)

1849-51	-0.115	-1.021		
1851-53			-0.352	-2.507
1852-55	0.161	1.411		
1854-55			-0.112	-0.490
N	1,906		2,071	
R^2	0.60		0.54	

Notes: Artisan: constant term represents an ordinary carpenter hired on a daily basis without rations during the winter at Fort Monroe, Virginia, in 1856. Common Laborer-Teamster: constant term represents an ordinary carpenter hired on a daily basis without rations during the winter at Fort Monroe, Virginia, in 1856. Slave=1 if the person was a slave, 0 otherwise.

Appendix Table 4

Regressions of Nominal Daily Wage Rate, South Central States

Variable	ß	t-stat	ß	t-stat
Constant	0.734	10.982	0.424	22.678
Fort Location:				
Baton Rouge, LA	0.069	2.804	-0.445	-31.543
Arkansas	-0.132	-5.806	-0.343	-26.715
Kentucky	-0.348	-9.992	-0.272	-10.846
Tennessee	-0.577	-8.826	-0.015	-0.564
Alabama-Mississippi	0.075	1.268	-0.328	-10.639
Worker or Job Characteristics:				
High	0.495	21.056	0.425	10.890
Low	-0.674	-20.674	-0.720	-17.129
Paid Monthly	-0.108	-4.784	-0.191	-17.642
Number of Rations			-0.066	-3.537
Slave	-0.220	-5.119	-0.073	-3.930
Season:				
Spring	-0.032	-1.050	-0.004	-0.194
Summer	0.014	0.553	0.048	2.667
Fall	-0.019	-0.718	-0.017	-0.982
Occupation:				
Mason	0.013	0.740		
Painter-Plasterer	0.031	1.110		
Blacksmith	0.080	3.374		
Teamster			0.025	2.502
Year:				
1820	-0.221	-1.914	-0.302	-7.716
1821			-0.225	-6.334
1821-22	-0.131	-1.435		
1823	-0.042	-0.389		
1822-24			-0.208	-7.236
1824	-0.059	-0.716		
1825-26			-0.262	-4.092
1826-28	0.110	1.612		
1827-29			-0.049	-1.202
1829	-0.106	-1.096		
1830	-0.051	-0.641	-0.023	-0.304
1831			-0.096	-1.288
1831-32	-0.086	-1.150		
1832			-0.102	-1.360
1833			-0.121	-1.748
1833-34	0.028	0.428		
1834			-0.079	-1.639
1835	0.077	1.215	-0.176	-6.278
1836	0.147	1.965	-0.002	-0.120
1837	0.084	0.928	0.022	0.544
1838	-0.103	-1.634	-0.163	-10.847
1839	0.101	1.623	-0.044	-2.202

Appendix Table 4 (continued)

1840			-0.096	-1.288
1840-41	0.219	3.614		
1841			0.011	0.488
1842	0.106	1.707	-0.008	-0.461
1843	-0.129	-2.177	-0.023	-1.257
1844	-0.167	-2.512	-0.074	-0.875
1845	-0.036	-0.564		
1845-46			-0.310	-14.615
1846	-0.128	-1.993		
1847	-0.008	-0.111	-0.322	-9.831
1848	-0.069	-0.825	-0.241	-7.899
1849-50	0.090	1.335	-0.092	-4.393
1851			-0.032	-1.696
1852			0.077	2.561
1851-53	0.099	1.520		
1853			0.055	0.919
1854	0.063	0.849	0.009	0.511
1855	0.082	0.862	0.048	2.678
N	2,898		4,728	
R^2	0.65		0.65	

The constant term represents an ordinary carpenter hired on a daily basis without rations during the winter in New Orleans in 1856.

Appendix Table 5

Weights for Nominal Wage Estimates

A. Fort Location Weights

	1820s	1830s	1840s	1850s
Northeast				
Upstate New York	0.291	0.294	0.275	0.239
Philadelphia	0.043	0.050	0.066	0.090
Carlisle, Pennsylvania	0.260	0.255	0.251	0.241
Southern New England	0.244	0.221	0.212	0.210
Northern New England	0.118	0.120	0.111	0.097
Midwest				
Pittsburgh	0.629	0.517	0.410	0.304
Detroit	0.000	0.002	0.004	0.008
Other Michigan	0.015	0.042	0.069	0.076
Iowa-Wisconsin-Minnesota	0.000	0.011	0.057	0.130
Kansas (other than Ft. Leavenworth)	0.000	0.000	0.000	0.060
Ft. Leavenworth	0.000	0.000	0.000	0.000
South Atlantic				
Baltimore	0.036	0.041	0.053	0.068
Savannah	0.003	0.004	0.007	0.011
North Carolina	0.234	0.219	0.203	0.197
South Carolina	0.253	0.272	0.277	0.269
South Carolina				
Baton Rouge	0.041	0.038	0.045	0.054
Arkansas	0.013	0.026	0.046	0.074
Kentucky	0.385	0.305	0.264	0.246
Tennessee	0.346	0.318	0.275	0.244
Alabama-Mississippi	0.203	0.297	0.352	0.362

B. Occupational Weights

	Northeast	Midwest	South Atlantic	South Central
Masons	0.21	0.19	0.18	0.17
Blacksmiths	0.16	0.04	0.08	0.03
Painters-Plasterers	0.10	0.06	0.08	0.03
Teamsters	0.04	0.03	0.02	0.02

Notes to Panel A:
Identification of fort location coefficients with population shares: Upstate New York: rural New York; Philadelphia: urban Pennsylvania (eastern) and New Jersey; Carlisle: rural Pennsylvania; Southern New England: Massachusetts, New Hampshire, Connecticut; Northern New England: Maine, Vermont; Pittsburgh: western Pennsylvania and rural Ohio; Cincinnati: urban Ohio and Indiana; Detroit: urban Michigan; Baltimore: urban Maryland and District of Columbia; Savannah: urban Georgia; Baton Rouge: Louisiana except New Orleans; North Carolina, South Carolina, Arkansas, Kentucky, Tennessee, Alabama-Mississippi: state population shares.
Source: see text

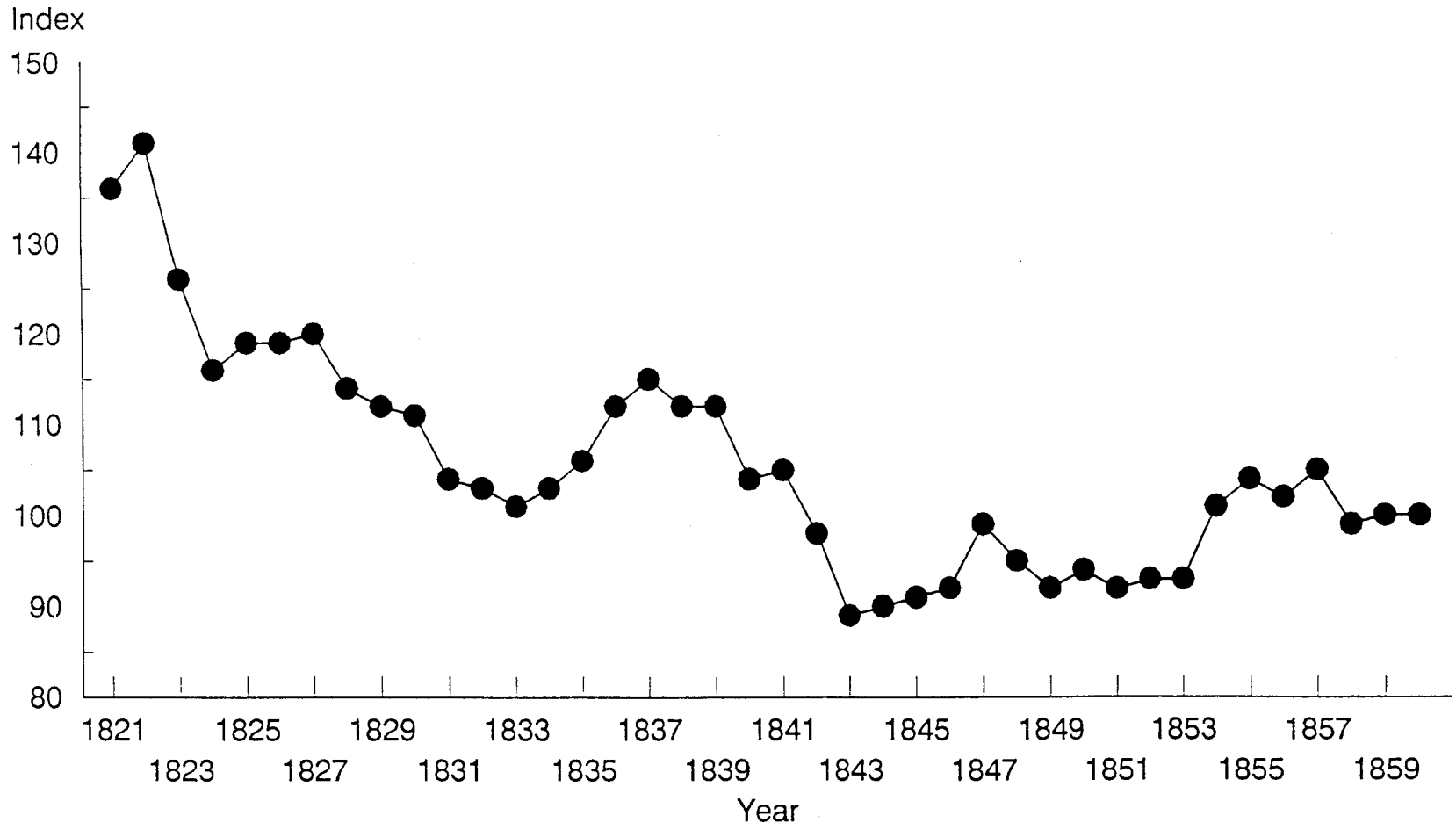
Appendix Table 6

Real Wage Indices

	Artisans				Common Labor-Teamster			
	NE	MW	SA	SC	NE	MW	SA	SC
1821	91.4			130.5	67.4	90.9		79.1
1822	110.6	162.4		120.7	62.1	69.7		69.9
1823	117.5	188.4	145.7	146.2	66.9	77.5		78.7
1824	120.7	193.4	149.4	153.9	68.7	78.2		82.9
1825	112.9	186.3	161.5	148.5	73.6	74.5	78.7	74.3
1826	120.3	216.1	197.0	174.4	87.2	85.5	90.4	82.2
1827	139.9	236.5	205.6	178.9	83.6	86.7	91.8	92.9
1828	132.1	250.3	192.1	174.6	77.0	90.6	96.6	97.4
1829	129.8	235.1	207.2	153.0	75.1	81.9	93.7	103.5
1830	127.7	261.1	205.8	186.6	76.9	97.7	85.4	116.2
1831	129.8	286.9	219.0	179.8	73.5	90.8	88.6	105.0
1832	129.1	260.2	206.0	167.6	74.3	89.4	81.4	99.9
1833	120.0	234.2	192.8	172.0	69.1	96.7	75.1	95.4
1834	144.3	239.6	192.3	186.9	88.2	112.5	71.4	102.1
1835	130.9	195.9	167.5	167.3	77.4	93.5	66.6	78.8
1836	121.9	162.7	127.8	147.6	78.8	66.0	66.7	77.2
1837	123.2	235.2	147.7	152.5	84.6	105.7	79.7	87.3
1838	125.3	207.7	157.3	127.1	81.4	87.2	71.1	72.9
1839	126.2	179.0	153.6	164.3	68.6	100.2	75.8	85.9
1840	144.6	242.9	197.4	226.4	69.4	111.0	96.9	99.1
1841	155.9	256.3	206.7	240.2	92.6	118.3	98.4	126.0
1842	164.3	301.1	279.0	246.3	109.2	140.9	99.5	131.2
1843	192.3	242.0	248.8	240.0	131.8	145.9	119.4	154.6
1844	174.3	234.5	238.9	220.0	134.1	130.0	117.8	141.4
1845	186.2	238.3	219.2	245.0	120.2	119.1	110.3	124.1
1846	178.2	198.0	205.7	218.7	122.1	132.5	105.0	106.4
1847	150.2	186.8	174.5	197.5	84.0	90.8	91.4	84.3
1848	168.1	255.9	238.8	232.6	109.4	144.5	117.8	112.5
1849	163.1	245.3	219.3	233.0	115.6	128.7	103.4	113.8
1850	152.3	231.6	196.5	222.4	109.4	113.0	91.5	107.0
1851	156.8	261.5	190.9	242.7	108.6	119.2	87.6	122.7
1852	153.9	243.4	207.7	242.4	113.4	119.8	86.5	136.9
1853	145.1	246.5	213.8	224.1	102.5	108.4	82.8	124.8
1854	143.2	239.1	223.0	216.8	98.7	119.5	93.5	118.0
1855	146.4	217.0	207.7	189.5	99.1	108.0	88.0	105.1
1856	158.1	213.9	179.0	174.2	100.0	100.0	100.0	100.0

Note: the artisan indices are relative to a region-specific base of 100 for common laborer-teamsters in 1856. For example, the 1854 index number for northeastern artisans (143.2) means that real wages of artisans in 1854 were 43.2 percent higher than the real wage of common laborers-teamsters in 1856.
NE: Northeast; MW: Midwest; SA: South Atlantic; SC: South Central
Source: see text

Figure 1
David-Solar Price Index
(1860 = 100)

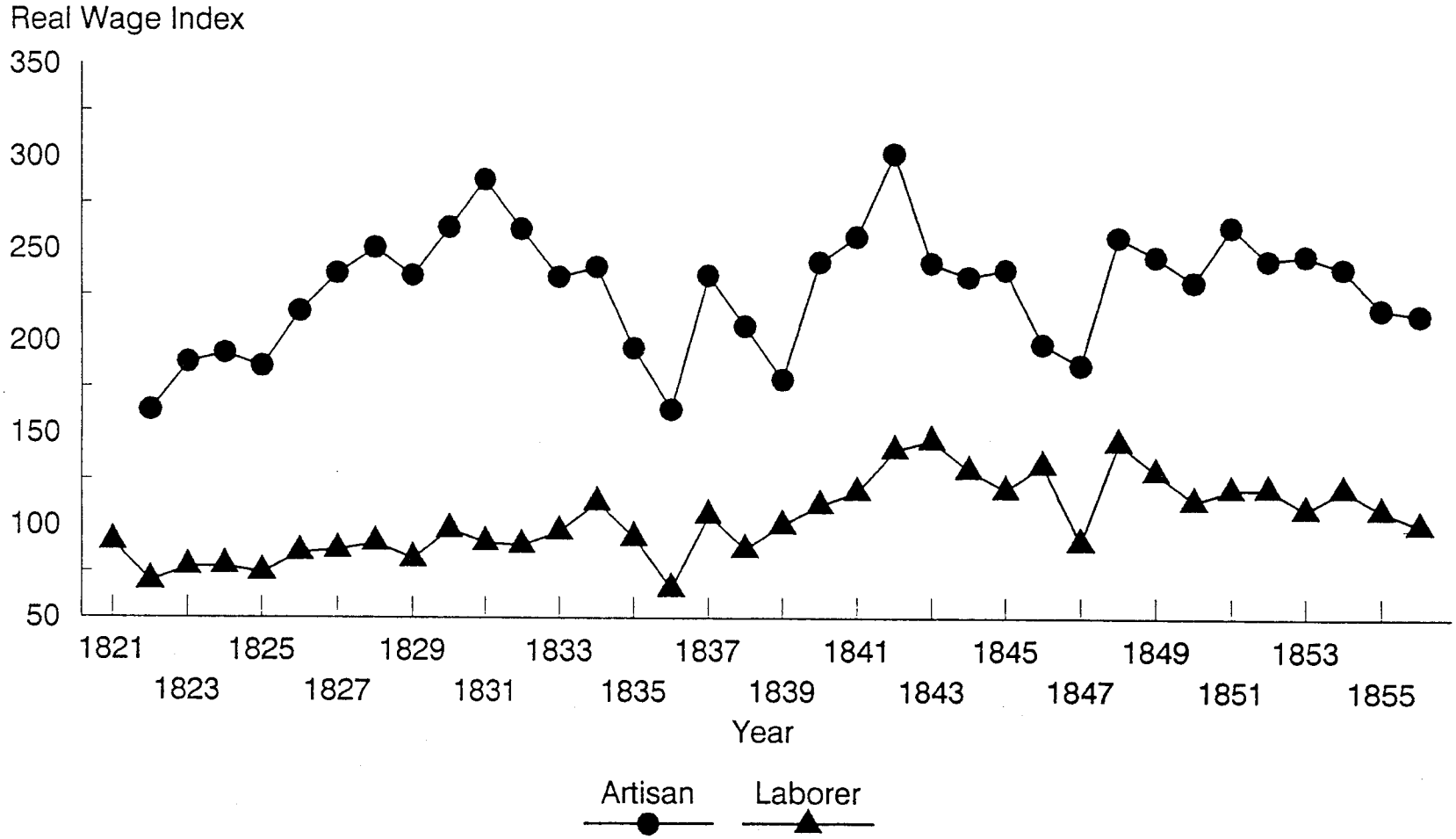


Source: David and Solar (1977)

Figure 2
Real Wages in the Northeast
(Common Labor/Teamster 1856 = 100)

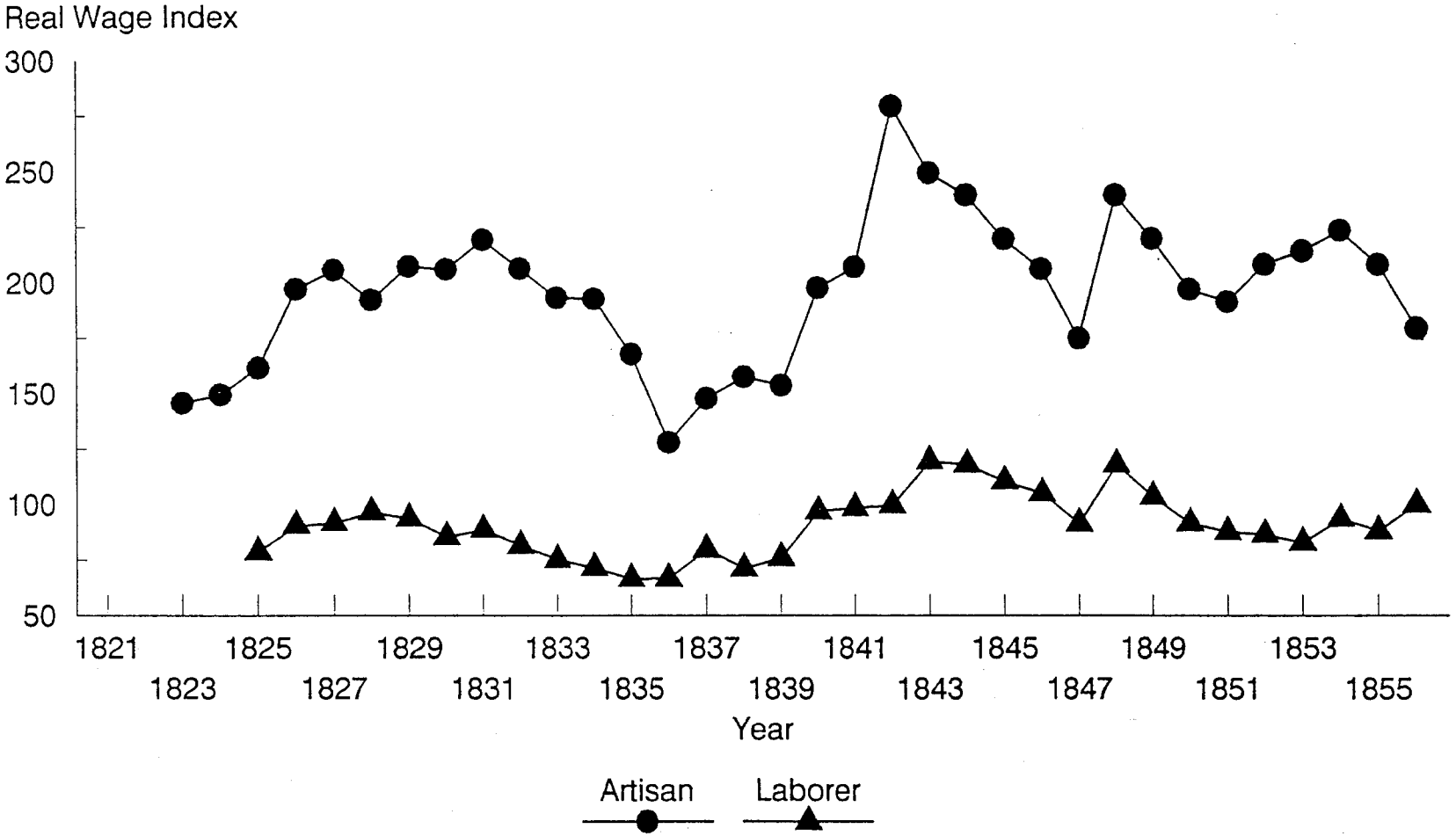
Source: see text

Figure 3
Real Wages in the Midwest
(Common Labor/Teamster 1856 = 100)



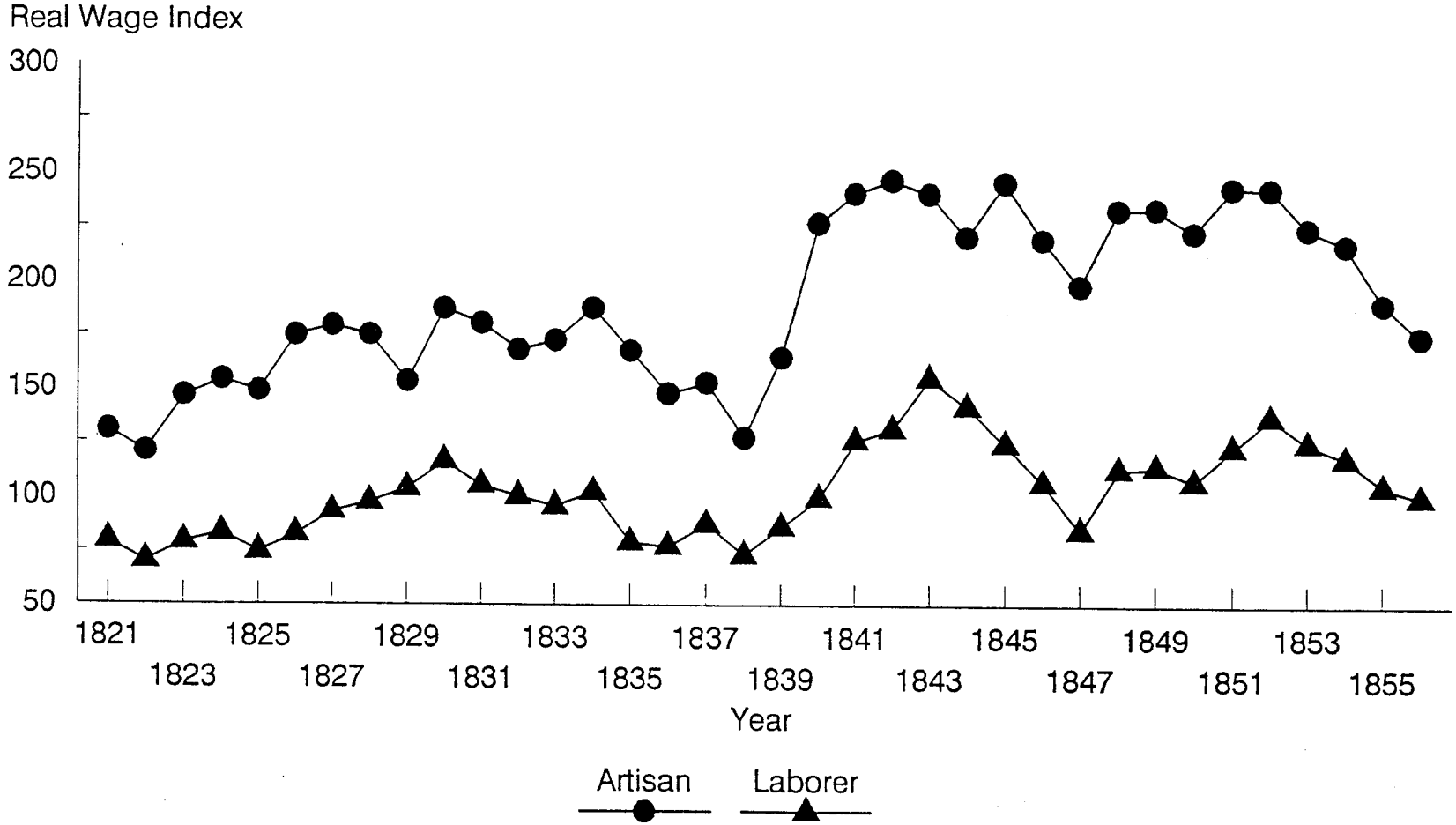
Source: see text

Figure 4
Real Wages in the South Atlantic States
(Common Labor/Teamster 1856 = 100)



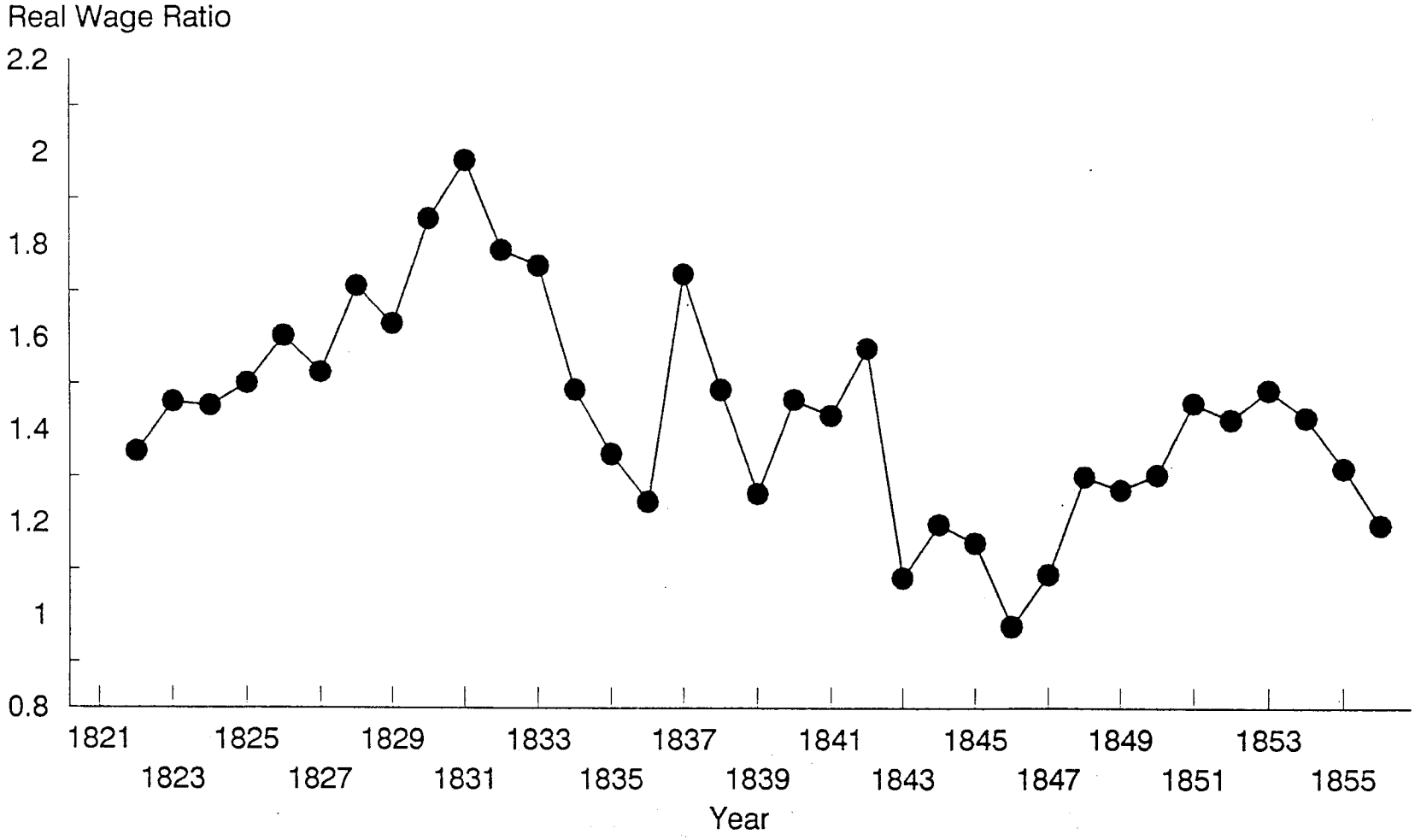
Source: see text

Figure 5
Real Wages in the South Central States
(Common Labor/Teamster 1856 = 100)



Source: see text

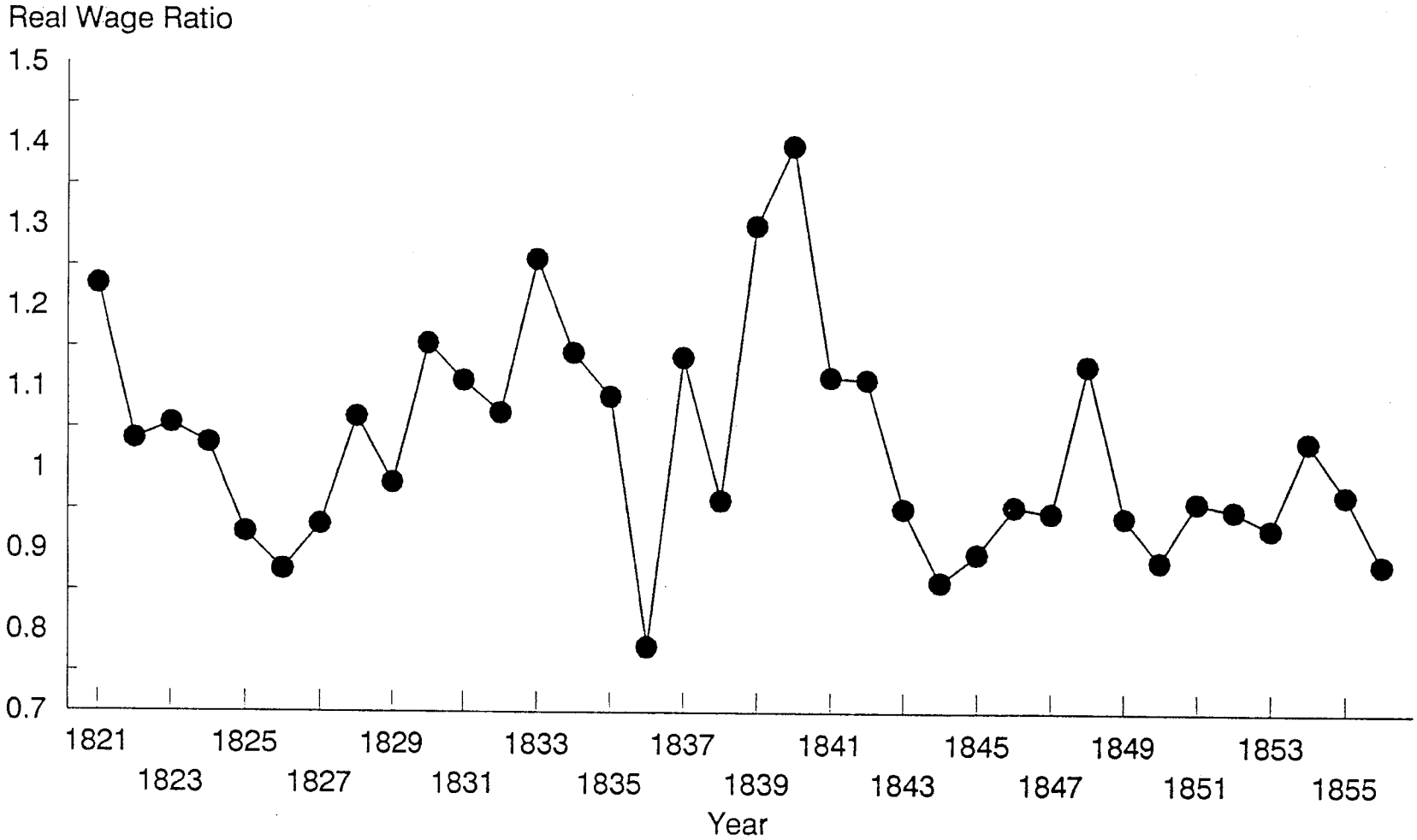
Figure 6
Real Wage Ratio, Artisans, Midwest/Northeast



ln(ratio)= 0.501 - 0.0079*Time R2=0.23

Source: see text

Figure 7
Real Wage Ratio, Laborers, Midwest/Northeast



ln(ratio) = 0.083 - 0.0034*Time R2=0.053

Source: see text