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SEASONALITY IN NINETEENTH CENTURY LABOR MARKETS

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ABSTRACT

In nineteenth century America, most employment, particularly that in agriculture, was highly seasonal. Thus the movement of labor from outdoor to indoor must have increased labor hours and days per year, thereby resulting in higher national income and greater economic growth. We provide the means to understand two additional dimensions to the decrease in seasonal employment. The first is the reduction in seasonality within each of the sectors. The second is the possibility that employment in the two sectors dovetailed, and that peak-load demands in agriculture were met by the release of labor from manufacturing enterprises.

We find an increase to the 1880's and a subsequent decrease in the number of farm laborer per farm and in the harvest premium paid to farm laborers, suggesting that, within agriculture, peak-load employment was reduced. We also find distinct seasonal pattern to manufacturing employment in 1900, with decreases in both summer and winter, hinting that industrial workers may have found summer employment in nearby farming communities. But we conclude, for various reasons, that dovetailing of agricultural and industrial employment in the nineteenth century was slight. Seasonality was reduced during the nineteenth century largely because sectoral shifts transferred laborers from agriculture to manufacturing and because the influence of climate was reduced within each sector.

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> The nature of the problem of off-season slack time surely varied from region to region and time to time, reflecting differences in institutions, crop mixes, crop routines, degrees of mechanization, and the development of village and town life. The differing nature of the labor force interactions between agriculture and the other sectors in these settings is a subject clearly worthy of intensive study. While it has not been neglected, the lessons it has to teach about the process of American economic growth -- and economic growth generally -- have not yet been fully learned. The learning promises to be rewarding.
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> Robert E. Gallman, "The Agricultural Sector and the Pace of Economic Growth," in David C. Klingaman and Richard K. Vedder, eds., Essays in Nineteenth Century Economic History (Athens, 1975).

I

More than half the working population of mid-nineteenth century America was employed in one of three seasonally-sensitive sectors -- agriculture, construction, and fishing. The work of many others, on canals and lakes and in water-powered factories, was also hampered in winter months by the weather.[1] The many technological advances that enabled individuals to break through environmental restraints should have raised income per worker-year appreciably. Because more than half of the labor force (67.5 percent in 1850) was seasonally and involuntarily idle about four months each year, a technological change enabling year-round employment for all workers would have increased national income by 30 percent.[2] At the average annual rate experienced from 1840 to 1900, this would amount to 16.5 years of growth. Because the work of the rest of the labor force may also have been constrained by weather, the impact of surmounting seasonality may have been much larger.

One of the several concerns of Robert Gallman's work is the effect of ignoring seasonality on various economic magnitudes. The agricultural labor force, for example, will be overstated, and its productivity in agriculture understated, if seasonality is overlooked. Some labor attributed to the agricultural sector may produce output in another sector or may just be idle during part of the year. Thus the measured ratio of output per worker in agriculture to that in all other sectors may be understated.[3]

Many of the technological and organizational changes that eventually reduced seasonality

for the economy as a whole involved the expansion of the manufacturing sector and thus the rise of indoor work.[4] Some of these changes derived from the use of new sources of power replacing the undependable flow of water and wind.[5] But the impact of seasonality, as Robert Gallman notes in the quotation above, may have been diminished simply by an enhanced mobility of laborers across industries, sectors, and locations, permitting them to work at two or more employments in a year. Such mobility depends on transport costs and the flexibility of the alternative hiring sector, which, in turn, hinges on factors such as skill specificity, and storage and inventory costs of goods.

Many isolated examples have been found of the seasonal meshing of the agricultural and manufacturing sectors in the nineteenth and twentieth centuries.[6] One is provided by the pork-packing and hog-slaughtering houses that dotted the Ohio and Illinois country-side in the 1850s.[7] These provided winter employment for farm hands whose search for off-season employment would otherwise have taken them farther afield. Since the seasonal industries of packing and slaughtering operated, for reasons of climate, only during the off-season in agriculture, the example provides a clear case of the interaction between sectors to which Robert Gallman refers. An extensive literature also exists on by-employments among workers in the late-eighteenth and early nineteenth centuries.[8] Some have even attributed the drive for industrialization to the existence of seasonality in agriculture. Carville Earle and Ronald Hoffman, for example, have explored the hypothesis that industrialization was stimulated by the incentive to utilize seasonally unemployed or underemployed laborers.[9] The question, then, is how important was seasonality and how common was the meshing of the seasons in total employment patterns.

The proportion of the labor force seasonally unemployed or underemployed must have been more extensive in the nineteenth century than it was later, but there are no estimates of its magnitude.[10] And although seasonality may be less extensive the more advanced the economy, the seasonally-affected worker in the modern economy may be unemployed for longer stretches. A worker who engages in specific investments in a firm, industry, or geographic area,

is less likely to leave, even for a temporary position, and it is believed that such investments increased over time.

Seasonality is known to affect the wages, as well as the quantities, of labor. Lifetime or even annual wages, however, should be more similar among identically-skilled individuals, independent of occupation. Outdoor construction workers, for example, might be expected to earn a bundle of wages, working conditions, and leisure valued the same as the full-time earnings of their indoor counterparts. A premium may be paid to harvest and seasonal labor to transport them from the town to the field, and to entice those already working in agriculture to increase their hours of work per day. This premium, however, could decline over time with decreases in the seasonality of labor demand and increases in the supply of seasonal laborers. The extent of the premium to seasonal labor and its change over time may reveal much about interactions between the sectors and changes in seasonality.

II

Only limited evidence on seasonality and unemployment exists for the nineteenth century. We provide various estimates of seasonality and unemployment, and explore three possible means by which seasonality was surmounted in the nineteenth century. One is the expansion of sectors, such as manufacturing, that were less seasonal than agriculture and construction. The movement of workers from agriculture to industry would increase per capita output simply by the greater employment of workers over the year. A second means would be the reduction of seasonality within the agricultural sector, through the use of machinery and the substitution of livestock for grains, and in the manufacturing sector, through the use of power sources that were not dependent on water and air flow.

Finally, even if no labor moved permanently from farm to factory, a transiently mobile group of workers, migrating back and forth during the year, could have eliminated much of the seasonal component to employment.[11] A market for hired farm labor would enable farm owners and their older sons to utilize their own time better over the seasons and possibly even

to increase acreage worked per farmer. Thus a third means of reducing seasonality is through the mobility of workers across sectors and the meshing of seasonal employment demands across sectors.[12] As farming regions became more densely settled and transport costs declined, hired hands may have been better able to migrate from farm to factory and town.

Seasonality and Agriculture

The size of the seasonal labor force and its trend over time can be gauged by examining the number of hired hands in the labor force and its change across the nineteenth century. The data assembled in Table 1 show the number of male farm laborers per 1000 farmers, farms, and male persons for nine midwestern states. Although the most recent estimates of the farm labor force have been used, various data problems remain.[13] The earliest date for which farm laborers were identified in the census is 1860, but in the four census years, 1860 through 1890, sons of farmers were occasionally included in the farm laborer category. In many cases, their inclusion was justified because wages were paid to sons on the family farm or on neighboring ones.[14] According to census instructions, paid laborers, but not unpaid family-farm workers, were to be included in the farm laborer category. The suspicion that the rule was not consistently complied with led the census, in 1900, to enumerate farm laborers separately by family and nonfamily status. For that year only, therefore, nonfamily farm workers are listed in Table 1. Hence, the 1900 nonfamily figure understates the number of paid farm workers in comparison with the figures of the previous census years. Changing age groupings also complicate the presentation of the data, and two sets of columns are given for most of the dates: one for farm laborers older than 15 years and another for farm laborers older than 9 years of age. The levels for the two obviously differ, but the trends are virtually identical.

Each of the censuses was taken at about the same time in the agricultural cycle, and none was taken at the peak harvest period of the fall. The Census of 1870 began its count in June, that of 1880 was scheduled to be taken on or about June 1, and instructions for 1890 ask for the figures as of June 1. These censuses, therefore, probably capture the majority of annual

and seasonal farm laborers, but they omit those who worked on farms only during the late summer or fall, the harvest period.[15]

The market for farm laborers in the Midwest appears to have thickened considerably from sometime before the data begin in 1860 to the early 1870s. In each of eight midwestern states, farm laborers per farm increased between 1860 and 1870; the regional average rose from 0.42 laborers for each farm to 0.57 per farm.[16] Nebraska and Kansas, the least densely populated states, experienced the greatest increases; from 0.14 per farm to 0.44 in Nebraska, and from 0.35 per farm to 0.50 in Kansas. With but a few exceptions -- Indiana being the most important -- farm laborers per farm then declined, reaching a level in 1890 often below that experienced in 1860. The increasing use of farm machinery throughout the period must have enabled many farmers to reduce their labor requirements.[17] The absence of information on the number of workers at harvest time, however, makes it impossible to measure the complete effect.[18]

Farm laborers enumerated in the census may have been hired on annual or seasonal contracts or on a daily basis. There are, at present, only a handful of surveys that contain information revealing the proportion of workers hired on annual, seasonal, and daily bases. Such data are contained, for example, in a survey conducted by Missouri in 1880.[19] The 187 Missouri farmers enumerated in this 1880 survey reported that they hired twice as many hands in summer as in winter. Thus, if all winter hands were also hired for the summer months, the farmers let half their summer field hands go before the winter. The inference is that half the farm hands (189/369) employed in the summer were on annual contract. A related, but separate finding is that, on a farm-level basis, slightly over half of all farms (52 percent) hired more laborers in summer than in winter, 20 percent hired the same number, and 28 percent hired no farm laborers in any season.

But the Missouri data present a much different picture than those given in Table 1. There were 369 summer laborers on 187 farms or almost 2 laborers per farm. That is, there were more than four times as many summer farm laborers per farm than we have estimated for the nine midwestern states in 1880 and four times the number shown by the 1880 federal census data

for Missouri.[20] Part of the difference may be accounted for by the understatement in the census of all farm workers hired over the year. That is, the Missouri survey counted all hired hands regardless of month, while the census enumerated only those present at the time of the census.

National surveys for a later period, 1909, show that on a nation-wide basis, only 29 percent of all farm laborers hired by the month were employed throughout the year in agriculture.[21] The percentage varied somewhat by region. For the North Atlantic and South Atlantic the figure was 34 percent, for the North Central it was 24 percent, for the South Central it was 29 percent, and for the West it was 22 percent. In Missouri, for example, only 24 percent of all monthly farm laborers were employed throughout the year, about half the figure found in the 1880 Missouri survey. One possible explanation for the discrepancy -- and the one we are willing to accept -- is that half the farm laborers in the 1880 Missouri survey who were employed during the winter were not hired for all the winter months and, thus, not really hired for the entire year. Another possibility is that annual contracts as a proportion of all farm labor contracts declined from 1880 to 1909 as migratory labor became more plentiful.

Indirect evidence on seasonality can be gleaned from the premium paid to harvest and seasonal labor, as opposed to ordinary daily and off-seasonal labor, to attract laborers for a portion of the year. This bonus could reflect transport costs or a differential offered to compensate workers for the heightened probability of off-season unemployment.

Data on the premia for harvest labor in the late nineteenth century are contained in George Holmes's compendium of wages paid to farm labor.[22] Two types of seasonal data are given. The most complete are for daily wages paid to harvest and non-harvest labor with and without board. Observations from nineteen years across four regions are available for the period 1866 to 1909. The ratios for the figures without board are given in Table 2, part A.[23] Less complete are the data for monthly wages paid to seasonal and annual labor, for which only four years of observations are available. The Holmes data give the monthly wage for annual contracts and that for seasonal laborers. The harvest premium for daily wages is the ratio of daily wages

at harvest time to those not at harvest time. To construct a premium for seasonal laborers comparable with that for the harvest, we must compute an implicit off-season payment to farm laborers. The seasonal premium is then given by the ratio of the seasonal rate to the implicit off-season rate. We compute the implicit off-seasonal rate by assuming that the monthly payment for an annual contract is a weighted average of the seasonal monthly payment and the implicit monthly payment during the off-season. The weight is the proportion of the year that constituted the season. Holmes's compendium offers only scant evidence on the number of months that constituted a season in each of the regions (see Table 2, footnote b), so we have assumed a period of 6 months. A shorter season would increase the ratio and a longer one decrease it.

In both cases, the premium to seasonal or harvest labor was considerable by 1880 but declined substantially by the end of the century.[24] The annual data, given in Table 2 and graphed in the two portions of Figure 1, show the harvest premium rising in all regions from the end of the Civil War to the 1880s. During the period of increase it was typically lowest in the North Atlantic states and highest in the South Atlantic and North Central states. The premium then narrowed considerably during the 1880s. In the North Central states it fell by half, plummeting from just above 70 percent in 1880 to around 35 percent at the turn of this century. It decreased somewhat less in the North Atlantic region, which had the lowest premium at mid-century. Yet even in that region, it fell from about 50 percent in 1880 to 30 percent twenty years later.

Although the harvest and seasonal wage ratios display similar trends over time, the trends may result from different forces. The harvest premium is a ratio of daily wages, and daily laborers were themselves working only in the season for which data are recorded. Both wages, therefore, already include compensatory payments for the risk of unemployment. The harvest premium was presumably a further compensation for transportation costs needed to bring additional laborers into the fields, as well as an amount required to entice existing laborers to work more hours per day or more days per week. The decline in both premia, therefore, could be due to a combination of lowered transport costs, a decreased probability of unemployment

among migratory laborers, and a decreased demand for harvest labor.[25] The fact that, from the 1870s to 1890, the daily wage premium decreased more than did the (without board) seasonal wage premium suggests the degree to which either transportation costs declined or peak harvest demand was attenuated. The decrease in the seasonal wage premium alone indicates a decline in the probability of unemployment in the off season.[26]

Seasonal wage premia at the national level are not available for the first half of the nineteenth century, but they do exist for New England in the researches of Winifred Rothenberg and T. M. Adams.[27] We also report in Table 2 the ratio of daily wages paid in June, July, and August, which we take to be the most labor-intensive months, to those in the other nine months.[28] The increase in the harvest premium discernible in the Holmes data for the North Atlantic from 1866 to the early 1880s (38 percent to 51 percent) can now be extended further back in time. Harvest premia rose beginning in the 1820s, if not earlier, and they doubled in the twenty-year period between 1820/29 and 1840/49, rising from 16.5 percent to 34.1 percent.[29]

Monthly contracts were rare before the 1820s. Instead, laborers were hired by the day. In Rothenberg's data, which were culled from farmers' account books, most agricultural laborers during the late 1700s to 1820 were hired by the day. Beginning in the 1820s, however, laborers were more frequently given contracts and were paid by the month. But even during 1830 to 1835 the account books used by Rothenberg record 212 daily laborers and only 42 monthly laborers.[30] It is not possible to compute a seasonal premium for the monthly hires strictly comparable to that given by Holmes (Table 2, part B), because Holmes did not define the term "season." If the season is taken to be only the months of June, July, and August, the implied seasonal premia in the Rothenberg data for 1800 to 1856 is approximately equal to that in the Holmes data.[31] Because the season was probably longer, the seasonal premium for the monthly data appears also to have risen over time.

Why the harvest premium increased from early in the nineteenth century until the 1880s is not exactly clear, but the antebellum rise may be related to the transition from daily payments

to laborers to monthly contracts. Prior to the rise of monthly contracts, day laborer wages may have been part of other contractual obligations, and thus the daily wage may not have been subject to variability over the season. According to Paul Clemens and Lucy Simler, whose evidence pertains to the Delaware Valley not New England, the majority of hired agricultural laborers, prior to around 1820, lived on the grounds of their employers like the "cottagers" who were their counterparts in England.[32] The American cottagers were often families who were contractually obligated to work a certain number of days annually for their landlords. During the rest of the year, they were free to work their own plots or engage in cottage industry. The daily payments to these laborers, recorded in farmers' account books, did not, therefore, involve the movement of individuals for brief periods of time. Because these daily payments were contractually set along with the number of days per year, the payment recorded for a day in August may have been no higher than for one in January. But when farming became a more year-round activity, with the introduction of livestock, hay, and corn, there was less demand for cottagers. Further, as the factory system spread and many of the goods made by the cottagers became cheaper, and their alternative wage became higher, the cottagers reduced their supply. Monthly payments, and seasonal and annual contracts began to take the place of the cottager's annual contract and daily wage accounting.[33] Seasonality in the demand for labor, therefore, became reflected in the wages paid to labor over the year.

Although the evolution of markets in hired labor in the Delaware Valley accords with the data on the premium paid to harvest laborers, researchers have not found similar factors in New England. According to Rothenberg, day laborers, even in late-eighteenth century New England, were not cottagers, but instead traveled on a daily basis from town to farm.[34] Why, exactly, the harvest premium rose in New England from the early 1800s to the 1850s is, therefore, not yet clear.

One might expect harvest and seasonal premia to be reflected, as well, in the wages paid to nonfarm laborers, especially in areas close to farming communities. During the harvest period, when wages were considerably higher in agriculture, manufacturing enterprises and other

employers of unskilled labor may have been forced to increase wage payments. Alternatively, they could have scheduled vacations around the harvest period. City, town, and industrial wages need not have increased as much as those on farms, because part of the harvest premium is the cost of transporting labor to the farm. The evidence concerning seasonality in nonfarm wages is slender. To compete with the construction sector in the pre-1870 period, the McCormick Company increased wages in the spring and reduced them in the fall, and the iron furnaces around Philadelphia that hired wood cutters in the winter also displayed seasonality in their wages.[35] A large sample of wages paid by the military, however, yields mixed results concerning seasonality in the antebellum period. From 1821 to 1856, for example, the military paid a 5 percent premium in the spring and summer and a 15 percent premium in the fall for civilian labor in the Midwest.[36] But similar wages paid by the military in other regions display no seasonal pattern during this period.

Seasonality and Manufacturing

The 1900 census of manufactures was the first at the national level to request information on employment by month.[37] The data are given by state and industry, and within these by sex, but not by state and industry together. The graphs in Figures 2a and 2b show manufacturing employment indexes for males and females by the nine census regions.[38] The index is the ratio of monthly employment to that in the peak month, generally Spring or early Fall. We have not adjusted the data for increased employment across the year, and thus there is growth from January to December that imparts a tilt to the profiles but should not greatly affect the seasonal component.

In almost all cases, manufacturing employment for males dips by about 10 percent during the summer, although only in the East South Central and the South Atlantic regions does it reach its nadir during those months. In the West North Central, the West South Central, and the Pacific states the summer dip is only 5 percent of peak employment. In most regions the trough, not surprisingly, is lower in the winter than in the summer and drops by about 15 percent to 20

percent of its peak employment. A double-peaked distribution of employment over the year, therefore, characterizes seasonal employment patterns among all of the regions, with peaks occurring in April and October.

Seasonal employment was more pronounced for female manufacturing workers than for males. As Figure 2b indicates, in almost all regions -- the exception being the Pacific -- the employment trough during the summer is greater than that for men, and the double-peaked pattern is even more pronounced. Around 15 percent to 20 percent of peak labor was released over the May to July period. But an equal, or often lower, percentage was released in the December to February period. In the Pacific states, however, seasonality in manufacturing employment was due to fruit, vegetable, and fish canning, and its intensive demands in the late summer and fall give the monthly employment distribution its unique shape.

The regional patterns may disguise varying industrial seasonality. Figure 3, therefore, disaggregates by industry at the national level. Taken together these eleven industry groups account for almost 80 percent of all male operatives and craft workers in 1900 (the percentage of the total, by industry, is given in the graph). All industries except food, have a bimodal shape, with peaks in the spring and fall, and troughs in the summer and winter. Clay (clay, glass, and stone products) is the only industry having a bimodal shape with considerably lower employment in the winter than the summer. As in the regional graphs, the ratio of trough to peak employment over the year is about 80 percent to 90 percent. Thus the average percentage of workers laid off sometime during the year is around 15 percent. Some of the seasonality is due to the annual closings of certain firms during August, for example, many textile mills had an annual August "vacation."[39] But, again using the example of textiles, while there are two months of employment at 85 percent of peak, there are another four months with employment at or below 90 percent of peak.

The seasonal patterns displayed in both the regional and industrial graphs might reflect the movement of labor from industry to agriculture during the summer months, although we doubt the movement was substantial for females despite their more pronounced seasonal pattern

of employment. With the exception of food, the lowest months for employment are either in the winter months, or in July and August. Most industries had surprisingly higher employment levels in the winter than in the summer. Vehicles, the employment of which was dominated by the repair and construction of steam car railroads, had the most prolonged seasonal trough, extending from July to the beginning of winter. The industry operated at 90 percent of peak employment during the Fall harvest period, but was at almost peak employment during the Spring. Steam car railroad shops, furthermore, were located throughout the country, often near farming communities.

In many industries, particularly that of vehicles, the seasonal pattern of employment leaves open the possibility that labor migrated over the year between industry and agriculture. Further, the patterns displayed here for 1900 may be considerably more muted than earlier in the nineteenth century. Seasonality in manufacturing employment, then, suggests some dovetailing of employment in agriculture and industry. Industry, it would appear, responded to labor scarcity in the summer by reducing its employment. But there is reason to believe that the troughs in industrial employment were exogenously produced by, for example, a reduction in inputs during the summer months. Further, there is some reason to doubt that industrial laborers found substantial employment opportunities in agriculture during the trough periods in industry.

Peak employment in much of agriculture did not always occur during the summer months but, instead, often arose during the fall harvesting and spring planting periods.[40] There are important regional exceptions, however. Wheat farms in North Dakota and Minnesota doubled their labor usage in August, over that in April and May, although their April and May usage was, in turn, four times that in the winter months. In Washington state, peak labor usage among wheat farmers was in July, and in Wisconsin it was in August, with high levels prevailing over much of the year due to dairying. But in Iowa the peaks were July and September-October. In Texas cotton areas peak labor usage was in September, and in Georgia, on cotton, corn, and oat farms, it was May-June and September-November. In New York state, in diversified farming, the peak was October, with no discernible variation across the other months. Among all hired help

in agriculture, employment was highest from April to November, and peaks occurred in June-July and October.[41] The regional manufacturing employment graphs (Figure 2a) suggest that dovetailing may have occurred in the North Central portion of the country, but not in the South. Thus, evidence concerning seasonality of employment in manufacturing weakly supports the hypothesis that labor regularly migrated between the sectors and that industrial employment responded to labor scarcity during the peak periods in agriculture by relinquishing workers.

Unemployment in Agriculture and Manufacturing

Data on the number of farm laborers per farm and the premium paid to seasonal farm laborers suggest that the economic loss from the unemployment or underemployment of agricultural laborers may have been greatest in the period from 1870 to 1890. Further, the seasonal character of industrial employment in 1900 suggests that the decrease in the seasonal premium in agriculture may have come about by some increased meshing of the industrial and agricultural sectors.

The most comprehensive data on unemployment, in terms of geographical and occupational scope, are found in the U.S. population census manuscripts, and the 1900 Public Use Sample is the earliest currently available for the entire United States. The 1900 population census was the first to ask months of idleness in all forms of gainful employment during the year. While the 1880 census had requested months of unemployment from one's usual occupation, the results appeared too sparse to census officials and were never tabulated. The unemployment question for 1890 attempted to combine nonemployment in the current occupation and in all occupations, but the results seem to be a confusing mixture of the two. The 1900 data, therefore, provide the earliest reliable data at the national level. No available surveys of agricultural unemployment cover the 1870s and 1880s, and most others were taken in the 1890s during a major economic depression.

The census year 1900 (May 1899 to May 1900) is generally thought to have been a prosperous one.[42] Unemployment measures for that year, then, should reflect primarily

frictional and seasonal unemployment, rather than that due to a business cycle downturn. Another data set, for Michigan farm workers in 1894, will demonstrate what happened to unemployment during a severe economic downturn. Because the Michigan data distinguish between involuntary and voluntary forms of unemployment, they are also useful in adjusting the 1900 census data which do not.

Two unemployment statistics are given in Table 3 for male farm and nonfarm workers (16 to 70 years old) in four regions. The first measure is the percentage of workers who reported they were unemployed during the census year. The second gives months unemployed, conditional on experiencing any unemployment.

Almost 40 percent of all nonfamily farm laborers experienced some unemployment during the census year, although the figure varies by region from a low of 32 percent for the Northeast to a high of 40 percent for the West. The percentage of family farm laborers experiencing any unemployment is generally less than that for nonfamily farm laborers with the exception of the West. The percentage of farmers registering unemployment is a fraction of that for laborers, but is highest in the South.[43] Months unemployed conditional on some unemployment is within the 3 to 4 month range.[44] Of those who experienced any unemployment, 54 percent were unemployed between 3 and 4 months in the Midwest (not in table); a similar statistic for the South is 44 percent and is 52 percent for the Northeast.

In the nonfarm sector, laborers and those in the building trades experienced the greatest unemployment. Between 40 percent and 50 percent of each group, depending on region, reported experiencing some unemployment during the census year. The length of unemployment, conditional on being unemployed, was between 3 and 4 months, similar to that in the farm sector. Among nonfarm laborers, 42 percent were in the 3 to 4 month range, among building tradesmen the figure was 45 percent, and among manufacturing workers it was 38 percent. Manufacturing workers experienced a peak at 2 to 3 months (45 percent).

These data suggest that even as late as 1900, seasonality in the employment of farm laborers, laborers in general, and those in the building trades was substantial. From 40 percent

to 50 percent of male workers in these groups experienced some unemployment during the year and the mean length of unemployment over the year was about 4 months. Even when the sample is restricted to those experiencing fewer than 9 months of unemployment the conditional mean for nonfamily farm laborers is 3.4, and it is similarly invariant to the exclusion of the young or the old in the sample. For example, it is 3.8 months for the total sample, 3.75 months for those older than 19 years, and 3.7 months for those younger than 50 years. Taking out both tails of the age distribution lowers the conditional mean to 3.6 months or by less than a week.

The 1900 Public Use Sample indicates that in the Midwest, for example, 40 percent of all nonfamily farm workers experienced some unemployment over the year. Because at least 25 percent of all farm workers in the Midwest were hired on annual contract (from Holmes's data), more than one-half of all farm workers not on annual contract were probably unemployed for long stretches in 1900. Of course, this also means that half of those not on annual contract did find employment during the off-season or, alternatively, did not report unemployment to census enumerators.

One direct test of the notion that integrated labor markets reduced seasonality in agriculture by meshing the seasons of farm and nonfarm work is found in Table 4. The correlates of the probability of unemployment, estimated as a logit, are given for nonfamily farm laborers and nonfarm laborers, including those working in manufacturing and the building trades. In both estimations, individual characteristics are included as are variables to account for the urbanization of the laborer's county, in the case of farm laborers, and city size, in the case of nonfarm laborers.

Farm laborers employed in a county containing or adjacent to a large city (having more than 50,000 persons) and whose county of residence contained a city of at least 10,000 persons, experienced about a 11 percentage point decrease in the probability of experiencing unemployment. Because the mean unemployment rate was about 40 percent for rural nonfamily farm laborers, the move from a rural county to one near a large city (and containing medium-sized or large city) decreased the probability of unemployment by 28 percent. The move from a rural

county to one either adjacent to a large city or containing a medium-sized one decreased the probability of unemployment by 7 percentage points, or by 17 percent. Nonagricultural workers experienced a decreased probability of being unemployed of 19 percentage points when located in a large city as opposed to a rural area, reducing the probability of unemployment by 44 percent compared with that for rural workers. Rural areas heightened the probability of being unemployed by 15 percentage points over small cities and by 8 percentage points over towns.[45] But because only 27 percent of nonfarm laborers, and workers in manufacturing and the building trades resided in rural areas, the economy-wide effects were small.

Proximity to urban areas reduced unemployment for farm workers and nonfarm workers alike, and the impact was substantial. But 70 percent of farm laborers were not in counties containing or adjacent to cities, and 40 percent of these workers were unemployed for some portion of the year in 1900. While urban workers in the building and manufacturing sectors were at a considerably greater risk of unemployment in rural areas, only 27 percent of them resided outside cities and towns. Thus, the meshing of employment over the season was possible only for laborers living in counties that contained cities or in those adjacent to urbanized counties. Migration over the season was particularly difficult for laborers who lived in rural America, even as late as 1900.

If the unemployment measures for the farm sector in 1900 suggest a large seasonal element, those for 1894, in Table 5, suggest a large cyclical component. Michigan, the state for which the data apply, did not have an unusually high rate of unemployment in 1900.[46] In fact, Michigan probably had among the lowest rates of seasonal employment in the Midwest.[47] According to Schob, many agricultural laborers in Michigan typically found year-round supplementary employment in the timber and meatpacking industries.[48] Yet the data in Table 5, from an extraordinary study of farm laborers, indicate that almost three-quarters had experienced some lack of employment during 1894.

The Michigan unemployment data, unlike those in the census, give the cause of work absence. Of the 75 percent who reported days they did not work, 29 percent experienced some

form of voluntary unemployment (for example, vacation), 60 percent experienced only involuntary unemployment (for example, lack of work), and 11 percent listed a combination of the two. Voluntary and involuntary unemployment are inferred from the cause of lost days reported in the survey. Causes other than "lack of work" or "bad weather" are assumed to be voluntary and include vacation, recreation, moving, at school, at home, and sickness. Combinations of voluntary and involuntary are assigned to the involuntary category. Although sickness, and therefore the lack of work that results, are probably involuntary, there are several reasons for considering illness separate from other forms of involuntary unemployment. The most important reason is to isolate unemployment induced by economic circumstances. Further, unemployment today does not usually include time lost to illness because sickness benefits are often provided by employers. Various causes categorized under the voluntary heading might, however, be due to involuntary factors. A young man whose search for work proves fruitless might decide to attend school, for example. But, it is more likely that such an individual would have assigned at least some of his idle days to "lack of work" and be included in the involuntary category.

Using this categorization, 52 percent of all farm laborers experienced some form of involuntary unemployment. Even with the adjustment, the figure for involuntary unemployment in Michigan is still higher than that in the 1900 census, which was around 40 percent and which presumably also included lost time due to voluntary reasons. Government officials who compiled the Michigan survey understood that 1894 was a particularly depressed year and that the figure for lost time exceeded that in usual years. "The average time worked (about 9 ½ months) will compare most favorably with any other class of labor. The principal cause for loss of time being lack of work, caused by the farmers curtailing their expenses during the depression of farm industries."[49]

Distributions of months unemployed for the Michigan and 1900 census (Midwest) data are given in Table 5, part B. The census data are more tightly distributed around 3 to 4 months of unemployment than are those for Michigan farm workers, and this is true for the total column as well as for that due only to involuntary reasons. The depression in 1894, therefore, caused

a bulge in the short-term idleness of Michigan's agricultural workers. Note, as well, the left-skewness to the distribution of weeks not employed due to sickness, which causes the total distribution to be flatter.

Cause of unemployment was not given in the 1900 census, and although the marshals were instructed to ask months not employed, there is no direct evidence that voluntary causes (for example, sickness, leisure) were included. Yet it may be misleading to use the total figures on idleness in the 1900 census to indicate unemployment that was seasonally or cyclically induced. Intermingled with involuntary unemployment may be that which was voluntary, and the Michigan data can be used to infer residual unemployment that was not voluntary. Because some of the causes grouped in the voluntary category could have been induced by depressed economic conditions in 1894, we net out only unemployment due to illness. Just under 12 percent of Michigan's farm workers lost time to illness only. If the same proportion of farm workers would have been ill in the absence of an economic downturn, and this does seem reasonable, 26.4 percent would have been unemployed in the Midwest in 1900 for reasons other than illness.[50] The unadjusted figure from the 1900 census is 38 percent. Once again, if we use the data in Holmes on annual contracts, this implies that two-thirds of all farm laborers not on annual contract found work year-round, or alternatively did not report unemployment to the census enumerators.[51]

An additional manner of revising the 1900 census estimates based on the Michigan data is to adjust the distribution of months unemployed by subtracting months lost due to illness. The procedure accepts the estimate, made above, for the percentage of all farm laborers whose unemployment is involuntary (69.5 percent = 26.4/38). An additional set of assumptions must be made for this calculation because the census data are in integer numbers (not fractions) of months, while the Michigan data are in days and months. We assume that individuals responding to the census marshals rounded weeks lost into months and that individuals who experienced less than two weeks of unemployment gave a zero for months unemployed. We assume, therefore, that those who experienced 2 weeks to just under 6 weeks put down 1 month, those

who experienced 6 weeks to just under 10 weeks put down 2 months, and so on. These assumptions produce the months and weeks mapping given in Table 5, part B.

The procedure results in an even tighter distribution around 3 to 4 months of unemployment. Almost two-thirds (66 percent) of nonfamily farm workers in the Midwest experiencing any unemployment were unemployed for 3 to 4 months (as opposed to 54 percent in the total figures unadjusted for illness), and 90 percent were idle for 3 to 6 months (as opposed to 73 percent in the unadjusted total figures). We infer from the large percentage who were unemployed for 3 to 4 months, that the vast majority of the 25 percent involuntarily-unemployed farm workers were idle during the winter months.

Conclusions

Across the nineteenth century, seasonal restrictions on work time were reduced in three ways. Labor redistributed itself across sectors, moving from agriculture and other out-door work, to manufacturing, services, and other indoor work. Second, seasonality was decreased within each sector. Livestock and various grains served to smooth the agricultural work load over the year, and machinery reduced peak-load demands on the farm population. The use of steam power reduced industry's dependence on the flow of water and wind.

A third factor in reducing aggregate seasonality -- the subject of the headnote by Robert Gallman -- is that labor migrated between the two sectors, possibly reducing seasonal constraints in both. This meshing of the two sectors may have been exogenously determined. Pork packing in the nineteenth century, for example, could only be done in the winter and thus, coincidentally, dovetailed well with the agricultural season. Indeed, the peak labor demands of many manufacturing activities naturally mesh with those in agriculture. After the agricultural harvest, commodity-based manufacturing activities begin and proceed for as long as the crop lasts. Thus employment in sugar refining, cotton seed oil manufacturing, and canning and preserving should have meshed well with the labor demands for their respective agricultural commodities. But meshing could also have been a response to peak agricultural demands for labor and thus

endogenous in origin. That is, manufacturing activities that were not inherently seasonal could have released labor at times of greater labor scarcity, as reflected in the seasonal or harvest price of labor in agriculture.

The evidence on the first factor -- sectoral shifts -- is the clearest, and thus the least interesting. Further, its significance depends heavily on the second factor -- the extent of seasonality within each sector and its change over time. We presented evidence -- on agricultural laborers per farm and the premium paid to seasonal help -- indicating that seasonality in agriculture lessened in the 1880s. Although we have little direct evidence on the manufacturing sector, we showed that even as late as 1900, manufacturing employment displayed distinct seasonal patterns. Among the major industries, employment decreased in the summer and winter, and in most industries the trough was between 5% and 15% of peak labor usage.

The question arises, therefore, whether the summer trough fueled the labor needs of agriculture. In certain farming areas it may have, but most peak agricultural labor demands were in September and October, not July and August. The precise reasons for decreased manufacturing employment in the summer are not entirely clear. Some labor, to be sure, "went fishing," some may have migrated to work on the farm, and some was simply unemployed.

Evidence on unemployment indicates that laborers and workers in the building trades were subject to a 45 percent probability of unemployment across the year, and that much unemployment was seasonal in nature. About 22 percent of manufacturing workers experienced some unemployment over the year, although this figure, and that for laborers and building tradesmen, probably includes sickness, vacation, and other down-time not subject to the control of employers.

In agriculture, we find that after deducting for the "voluntary" component of nonemployment, about 25 percent of all nonfamily farm workers in 1900 were unemployed sometime during the year and that most of these workers experienced 3 to 4 months of unemployment. Whether or not many of the 75 percent who did not report unemployment during the year were involved in a meshing of the sectors through migration, depends on the proportion

of farm laborers who found yearly employment in agriculture. Reliable sources indicate that about 25 to 35 percent of all farm laborers were hired on annual contract, although some additional fraction may have found yearly employment in the agricultural sector on monthly, seasonal, and daily bases. Thus, there is considerable leeway for one to argue that labor did migrate and that the sectors dovetailed in a significant manner. Additional support for this view is found in the logit regressions indicating that agricultural laborers living in counties containing or near large cities experienced a far lower probability of unemployment that did those laborers far removed from urban areas. The significance of this finding must be tempered by the fact that 70 percent of agricultural laborers lived in rural areas.

Seasonality, once an important component of the nation's unemployment, faded slowly as America industrialized and as technology circumvented the vagaries of climate. After weighing all the evidence, we believe it was not substantially reduced by a movement of laborers across sectors having seasons that meshed. Rather, seasonality gradually disappeared with the mechanization of agriculture, the decline of farming, and the industrialization of America. The reduction of seasonal unemployment was a product of various features of economic development but provided, at the same time, an added fillip to economic growth.

Endnotes

1. We focus here only on the direct effect of climate in influencing seasonal patterns of production, primarily in agriculture, construction, and manufacturing. Seasonality was of obvious importance in transportation, as well. Thomas Senior Berry's study of the Mississippi River steamboat rates pointed to a "wide and erratic seasonality" that ended by the 1880s after the railroads captured much of the traffic. See Berry, Western Prices Before 1861: A Study of the Cincinnati Market (Cambridge, MA, 1943), pp. 47, 62-68. See also Louis C. Hunter, Studies in the Economic History of the Ohio Valley (Northampton, 1934), pp. 5-49, on transportation changes and for a more general discussion of "seasonal aspects of economic life of the Ohio Valley before the age of big business."

2. The figure of 67.5 percent uses the agricultural and total labor force estimates in Thomas Weiss, "Economic Growth before 1860: Revised Conjectures," National Bureau of Economic Research Working Paper, DAE-Series No. 7 (Oct. 1989), and those for construction and fishing are from U.S. Bureau of the Census, Historical Statistics of the United States (Washington, D.C., 1975), series D167-181. The assumption that these workers were unemployed for four months during the year is consistent with evidence for the late nineteenth century. The assumption that all other workers were not unemployed during the year imparts a downward bias to the impact of reducing seasonality. The assumed increase in the work year for those initially in seasonally-sensitive sectors could be due to changes in the seasonal pattern of producing specific products, a shift in the product-mix within a given sector (for example, the move from grains to livestock), or an intersectoral move to a sector with a less seasonal pattern of work.

3. The ratio of agricultural product per laborer to that in all other sectors has been used to infer growth in per capita output for the 1800 to 1840 period, to explain growth in later years, and to analyze the efficiency of factor markets in the nineteenth century. It is, therefore, an economic magnitude of some importance. A possible indication that the ratio is downwardly bias in the mid-nineteenth century is that it is considerably lower in the United States than in England. Paul W. Gates noted, in The Farmer's Age: Agriculture, 1815-1860 (New York, 1960), that "the English laborer was in most instances a year-round employee, whereas his American counterpart was more likely to be a migratory worker hired for the haying or the harvest season . . . The high cost of labor and the uncertainty of retaining it made the farmer adopt such laborsaving devices as were available and practicable" (pp. 278-79).

One estimate of the ratio, considered an upper-bound because it includes the value of home manufactures on the farm, is barely above 0.5. On the computation and magnitude of the ratio in the United States see Paul A. David, "The Growth of Real Product in the United States before 1840: New Evidence, Controlled Conjectures," Journal of Economic History 27 (June 1967), pp. 151-97. See Weiss, "Economic Growth before 1860," for a more recent application of the ratio. In the nineteenth century, however, the U.S. ratio was in the middle of the thirteen countries for which data are presented in Simon Kuznets, Economic Growth of Nations: Total Output and Production Structure (Cambridge, MA, 1971), pp. 290-92, 298. The extent to which these differentials in relative productivity reflect differences in seasonality remains to be determined.

4. Although, in early modern Europe, and, to some extent, America in the eighteenth and early part of the nineteenth century, household manufacture, with its biased labor-force mix by gender and by age, helped to mitigate the problems of labor seasonality. See, for example, Maxine Berg, The Age of Manufactures: Industry, Innovation and Work in Britain, 1700-1820 (New York, 1986), and the classic work of Rolla Milton Tryon, Household Manufactures in the United States, 1640-1860: A Study in Industrial History (Chicago, 1917).

5. See, for example, the discussions in Louis C. Hunter, A History of Industrial Power in the United States, 1780-1930. Vol. 1: Waterpower in the Century of the Steam Engine (Charlottesville, 1979).

6. For a discussion of urban-rural relocation for seasonal employment within the year, see David E. Schob, Hired Hands and Plowboys: Farm Labor in the Midwest, 1815-60 (Urbana, 1975), pp. 89, 150, 169; Allan G. Bogue, From Prairie to Corn Belt: Farming on the Illinois and Iowa Prairies in the Nineteenth Century (Chicago, 1963), pp. 182-87; J. Sanford Rikoon, Threshing in the Midwest, 1820-1940: A Study of Traditional Culture and Technological Change (Bloomington, 1988), p. 51; and, for this pattern of mobility within the meatpacking industry, see Rudolf Alexander Clemen, The American Livestock and Meat Industry (New York, 1923), pp. 111-13. In a discussion of the "harvest labor problems in the wheat belt" in the early twentieth century, D. D. Lescohier, Harvest Labor Problems in the Wheat Belt (Washington, D.C., 1922), notes that "residents of the towns of the small-grain States who hire out to farmers in their own localities constitute a large fraction of the total army of harvest hands" (p. 15). See also George K. Holmes, Supply of Farm Labor, U.S. Department of Agriculture, Bureau of Statistics, Bulletin 94 (Washington, D.C., 1912), pp. 75-78, on the interaction of farm and urban labor markets.

7. On packing and slaughtering houses see Schob, Hired Hands and Plowboys, p. 169, also Clemen, The American Livestock and Meat Industry, pp. 110-13. Margaret Walsh, The Rise of the Midwestern Meat Packing Industry (Lexington, 1982), pp. 15-37, points to the impact of seasonality on the extent of entrepreneurship in the industry.

8. On the nature and extent of by-employments in the late eighteenth and the nineteenth centuries see, in particular, Winifred B. Rothenberg, "The Emergence of a Capital Market in Rural Massachusetts, 1730-1838," Journal of Economic History 45 (Dec. 1985), pp. 781-808; Lucy Simler, "Those Who Live by Wages: Agricultural and Industrial Workers in Rural Pennsylvania, 1750-1820," (unpublished manuscript, 1988); Paul G.E. Clemens and Lucy Simler, "Rural Labor and the Farm Household in Chester County, Pennsylvania, 1750-1820," in Stephen Innes, ed., Work and Labor in Early America (Chapel Hill, 1988), pp. 106-43; and Alexander Keyssar, Out of Work: The First Century of Unemployment in Massachusetts (Cambridge, 1986), p. 12. The problem of occupational classification when there is by-employment was discussed in the census instructions in detail in both 1820 (distinguishing criteria for "principal" and "occasional, or incidental" occupations) and 1890 (distinguishing that upon "which he would ordinarily be engaged during the larger part of the year"). See Carroll D. Wright, The History and Growth of the United States Census (Washington, D.C., 1900), pp. 135, 189.

9. Carville Earle, and Ronald Hoffman, "The Foundation of the Modern Economy: Agriculture and the Costs of Labor in the United States and England, 1800-60," American Historical Review 85 (Dec. 1980), pp. 1055-94. See, in contrast, H. J. Habakkuk, American and British Technology in the Nineteenth Century: The Search for Labor Saving Inventions (Cambridge, 1962) for a framework of industrialization that emphasizes the scarcity, not overabundance, of unskilled labor. Earle, "A Staple Interpretation of Slavery and Free Labor," Geographical Review 68 (Jan. 1978), pp. 51-65, has also argued that the seasonal patterns imposed by different crops could provide some explanation of the choices made between slave labor and free labor in the antebellum United States. For a somewhat different argument relating slavery and seasonality, see Ralph V. Anderson and Robert E. Gallman, "Slavery as Fixed Capital: Slave Labor and Southern Economic Development," Journal of American History 64 (June 1977), who point to the importance of finding off-season work for the slave labor force (pp. 24-46).

10. Labor and product markets were less integrated, the cost of transportation was higher, and the agricultural sector, in which seasonality was most pronounced, was relatively larger earlier in the nineteenth century. It has been argued, however, that over the first half of the nineteenth

century increased commercialization of agriculture and manufacturing in New York State increased the severity of seasonal pauperism. See Joan Underhill Hannon, "Poverty in the Antebellum Northeast: The View from New York State's Poor Relief Rolls," Journal of Economic History 44 (Dec. 1984), pp. 1007-32. For discussions of the role seasonality played in late-eighteenth and early-nineteenth century urban social ills, see also David M. Schneider, The History of Public Welfare in New York State, 1609-1866, (Chicago, 1938), pp. 258-65, and John K. Alexander, Render Them Submissive: Responses to Poverty in Philadelphia, 1760-1800 (Amherst, 1980), pp. 13-16.

11. Alternatives would include adjusting to the varying longitudinal patterns of agriculture, as in the example of migrating harvest gangs for wheat in the late nineteenth century. See Fred A. Shannon, The Farmer's Last Frontier: Agriculture, 1860-1897 (New York, 1945), pp. 159-61.

12. For discussions of mobility in manufacturing employment in the early nineteenth-century northeast and the late-nineteenth century Midwest see, for example, Jonathan Prude, The Coming of Industrial Order: Town and Factory Life in Rural Massachusetts, 1810-1860 (Cambridge, 1983);
Alan Dawley, Class and Community: The Industrial Revolution in Lynn (Cambridge, MA, 1976), pp. 139-42; and Robert Ozanne, Wages in Practice and Theory: McCormick and International Harvester, 1860-1960 (Madison, 1968).

13. The revised data come from Thomas Weiss, personal communication.

14. Gates notes that "The first source of labor was the farm family with its many children. From early youth they were trained to do the milking, haying, plowing, planting, and hauling; they knew how to handle horses, cows, and oxen; and they were reliable and careful. As they grew to maturity and were not needed on their family homestead, they hired out to successful farmers" (The Farmer's Age, pp. 272-73).

15. Among the government reports for later periods that provide a breakdown of monthly employment in agriculture, by crop-type and region, are Eldon E. Shaw, and John A. Hopkins, Trends in Employment in Agriculture, 1909-36, WPA National Research Project, Report No. A-8 (Philadelphia, 1938), and United States Department of Agriculture, Bureau of Agricultural Economics, Farm Wage Rates, Farm Employment, and Related Data (Washington, D.C., 1943). For other useful breakdowns of seasonal labor requirements, see Lescohier, Harvest Labor Problems.

16. Note that there are no data for Minnesota in 1860.

17. For comments on the effect of agricultural technology in mitigating the excess harvest-labor demand, see, for example, John A. Hopkins, Changing Technology and Employment in Agriculture, U.S. Department of Agriculture, Bureau of Agricultural Economics, (Washington, D.C., 1941), pp. 14-15, 23, Shaw and Hopkins, Trends in Employment in Agriculture, p. 70, and Stanley Lebergott, Manpower in Economic Growth: The American Record since 1800 (New York, 1964), p. 246.

18. For a discussion of improvements in agricultural productivity between 1840 and 1910, suggesting the differential impact of mechanization in lowering labor requirements in harvesting and threshing in wheat and oat production, see William N. Parker, and Judith L.V. Klein, "Productivity Growth in Grain Production in the United States, 1840-60 and 1900-10," in Dorothy Brady, ed., Output, Employment, and Productivity in the United States after 1800, Studies in Income and Wealth, Vol. 30 (New York, 1966), pp. 523-80.

19. Missouri Bureau of Labor Statistics, Second Annual Report, for the Year Ending January 1, 1881 (Jefferson City, MO, 1881).

20. In 1880, for example, the number of farm laborers per farmer was 0.38 in Missouri and 0.38 in Michigan, 0.44 in Illinois, and so on.

21. Holmes, Supply of Farm Labor.

22. George K. Holmes, Wages of Farm Labor, U.S. Department of Agriculture, Bureau of Statistics, Bulletin 99, (Washington, D.C., 1912).

23. Data for the West include a changing group of states and contain too few observations for the early period.

24. The seasonal wage premium in Vermont agriculture declined at the same time. See T. M. Adams, Prices Paid by Vermont Farmers for Goods and Services and Received by Them for Farm Products, 1790-1940; Wages of Vermont Farm Labor, 1780-1940, Vermont Agricultural Experiment Station Bulletin #507 (Burlington, VT, 1944), p. 85. Within manufacturing, a decline has been recorded for the McCormick Works after 1870 by Ozanne, Wages in Practice and Theory, p. 125. Hunter, Studies in the Economic History of the Ohio Valley, pp. 21-23, points to the role of the railroad in solving the seasonality problem regarding transportation in the Ohio River Valley.

25. Note, as well, that the differences between the "with" and "without board" cases in Table 2, part B reflect the implicit payment for board in both the numerator and denominator. That is, if the value of earnings plus board were equal in the two contracts, the seasonal premium would have to be higher for the board-inclusive case. For example, let w^s be the seasonal monthly payment for a laborer who also receives board in-kind, w be the off-seasonal monthly payment for a laborer who receives board in-kind, $\hat{w}^s$ be the seasonal monthly payment without board, and $\hat{w}$ be the off-seasonal monthly payment without board. Also let b be the implicit dollar value of board per month. In equilibrium, $\hat{w}^s = w^s + b$ and $\hat{w} = w + b$, that is, the workers who receives board gets, in dollar terms, the same amount as the worker who receives only a wage. Therefore, $(\hat{w}^s/\hat{w}) < (w^s/w)$, or the without board ratio must be lower than the board inclusive ratio.

26. Timothy J. Hatton, and Jeffrey G. Williamson, "Unemployment, Implicit Contracts, and Compensating Wage Differentials: Michigan in the 1890s," Harvard Institute of Economic Research Working Paper No. 1481 (May 1990), find that there was complete compensatory payment in the agricultural sector to laborers who were subject to greater unemployment, primarily because of being hired on a daily basis rather than through annual contracts.

27. See Winifred B. Rothenberg, "The Emergence of Farm Labor Markets and the Transformation of the Rural Economy: Massachusetts, 1750-1855," Journal of Economic History 48 (Sept. 1988), pp. 537-66, and Adams, Prices Paid by Vermont Farmers.

28. We thank Winifred Rothenberg for making her daily and monthly wage data available to us.

29. Adams's data show an increase in the premium paid for July and August labor from 1790/99 to 1820/29 (Prices Paid by Vermont Farmers, p. 85).

30. We are not yet certain whether these data indicate a preponderance of daily laborers or merely a greater recording of daily hires in the account books. If each day of labor were recorded separately, there would be about 23 times as many daily recordings than monthly recordings.

31. The seasonal premium is computed as follows. Rothenberg's data are for individual contracts and give the monthly wage, the number of months, and the starting month. For each individual, therefore, the proportion of the contract that is "seasonal," α, can be computed. Assume that all contracts are implicitly given by $M_a = \alpha M_s + (1 - \alpha)M_{ns}$, as in the footnote to Table 2. That is, the average monthly wage (M_a) is equal to a weighted average of the seasonal monthly wage and the nonseasonal monthly wage, with the weight given by the proportion of months worked in season. We split the Rothenberg data into three year groups: 1800-19, 1820-39, and 1840-59. Within each we calculated the seasonal wage for individuals who worked only during the three highest-paying months, June, July, and August. We then solved for M_{ns} using the definition given above, and took the means by year group. The results are: 1800-56 1.343; 1800-19 1.268; 1820-39 1.454; and 1840-56 1.309. These numbers bracket those given by Holmes (Wages of Farm Labor) the North Atlantic region in the 1860s. It is likely, however, that the season was defined by Holmes as 5 to 6 months, and, therefore, that the seasonal premium in New England during 1800-56 was considerably less than later in the century.

32. Clemens and Simler, "Rural Labor and the Farm Household."

33. As part of this change, there was some shift in the overall composition of the agricultural labor force. Rather than involving the full family, those hiring out for agricultural employment were more generally male, young, and unmarried, the pattern more typical for the remainder of the century.

34. Provided by Winifred Rothenberg, private communication.

35. According to Ozanne: "The agricultural implement business was seasonal. If a good year was anticipated, production of reapers was stepped up in January, rising to a peak in June and July . . . Spring wage increases at McCormick's were selective . . . The purpose of this spring wage increase was no doubt to lessen the competition for labor of the building construction industry, which worked only in the summer months. Fall wage cuts came when cold weather stopped building construction" (Wages in Practice and Theory, p. 17). The seasonal pattern of wages was only a pre-1870 characteristic of the industry (p. 125). See also Earle and Hoffman, "The Foundation of the Modern Economy," and Joseph E. Walker, Hopewell Village: A Social and Economic History of an Iron-Making Community (Philadelphia, 1966), p. 230.

36. These data were generously provided by Robert Margo. See Robert A. Margo, and Georgia C. Villaflor, "The Growth of Wages in Antebellum America: New Evidence," Journal of Economic History 47 (Dec. 1987), pp. 873-95, for a description of the data set.

37. A discussion and analysis of seasonality in manufacturing in the early twentieth century is contained in Simon Kuznets, Seasonal Variations in Industry and Trade (New York, 1933). Parker J. Bursk, Seasonal Variation in Employment and Manufacturing Industries (Philadelphia, 1931), also examines industry data from the first-quarter of the twentieth century and reports that those industries with an average size of plant greater than forty employees had less seasonality than did smaller firms.

38. In regard to hours worked per day at different times of the year, based on the 1880 Census of Manufactures Jeremy Atack, and Fred Bateman, "How Long Did People Work in 1880?" National Bureau of Economic Research Working Paper, DAE-Series No. 15, (Aug. 1990), indicate that 68 percent of firms had the same numbers of hours worked per day in the summer as in the winter, 4 percent had more in the winter, and the remainder more in the summer. Presumably manufacturing seasonality was influenced both by weather factors influencing production, and the alternative opportunities for agricultural employment in the countryside.

39. This may have been due to the seasonal reduction in water power. See Hunter, A History of Industrial Power. Textile production was affected also by heat and humidity.

40. For a detailed description of the agricultural work year, see James R. Covert, Seedtime and Harvest: Cereals, Flax, Cotton and Tobacco: Dates of Planting and Harvesting East of Meridians 102-104 in the United States, U.S. Department of Agriculture, Bureau of Statistics Bulletin 85 (Washington, D.C., 1912).

41. See Benjamin J. Free, Seasonal Employment in Agriculture, Works Progress Administration, September 1938, pp. 11-58, and Covert, Seedtime and Harvest.

42. See, for example, Robert E. Gallman's annual GNP estimates, underlying his decade estimates in "Gross National Product in the United States, 1834-1909," in Output, Employment, and Productivity in the United States after 1800, pp. 37-76 and the recent industrial production index of Jeffrey A. Miron, and Christina D. Romer, "A New Monthly Index of Industrial Production, 1884-1940," Journal of Economic History 50 (June 1990), pp. 321-37.

43. One may reasonably wonder how a full-time farmer could be unemployed. Perhaps the farmers who reported unemployment had by-employments and were unemployed from these jobs. The somewhat anomalous results for family farm workers and farmers in the South are likely due to higher tenancy rates in that region.

44. The variation that exists in the conditional number of months of unemployment seems to reflect an apparent negative relationship between the percentage claiming any unemployment and the number of months unemployed. The conditional mean increases as fewer individuals experience any unemployment, suggesting the existence of some chronically unemployed persons, perhaps due to health reasons.

45. Duration of unemployment, conditional of experiencing some unemployment, varied somewhat differently with the urbanization variables. For the farm laborers, duration increased by about 0.6 of a month in counties containing large cities, above that in either rural counties or those containing or adjacent to small cities. In the nonfarm sample of workers, months of unemployment was, once again, higher in all cities, as opposed to rural areas, but was highest for those in small cities. Thus, unemployment for farm laborers living near large cities involved longer duration, but the probability of falling into unemployment was smaller. Those already in urban areas -- the nonfarm workers -- had unemployment spells that were less affected by the size of the city. In fact, larger cities appear to have given laborers more options to search for employment than smaller cities did.

46. See Timothy J. Hatton, and Jeffrey G. Williamson, "Wage Gaps between Farm and City: Michigan in the 1890s," Harvard Institute for Economic Research Discussion Paper No. 1449 (Cambridge, MA, 1989), for discussion and analysis of the Michigan farm data used here, as well as other related data sets for Michigan. See also Hatton and Williamson, "Unemployment, Implicit Contracts, and Compensating Wage Differentials."

47. The 1900 Public Use Sample is too small to explore this notion. There were 44 nonfamily farm workers in the sample and 14 experienced unemployment. The conditional mean for these 14 is 3.21 months.

48. Schob, Hired Hands and Plowboys.

49. Michigan Bureau of Labor and Industrial Statistics, Twelfth Annual Report, Year Ending February 1, 1895 (Lansing, MI, 1895), p. 233.

50. Assume that unemployment consists of a voluntary component, here taken to be only illness, and an involuntary component, everything else. Further, the voluntary and involuntary components, as defined here, are assumed to be uncorrelated. An economic downturn, for example, does not increase the incidence of sickness. Thus the same percentage of the population will be ill in the absence of an economic depression as will be ill when there is a downturn. We know from the Michigan data that 73 percent of farm laborers (with cause listed) were out of work in 1894 (see Table 5), and 11.6 percent of farm laborers were out of work due to illness. Therefore, 61.4 percent were, by assumption, involuntarily unemployed. In 1900, during far better times, 38 percent of all farm laborers were unemployed. Therefore 26.4 percent (38 - 11.6) of farm laborers in 1900 were involuntarily unemployed in 1900. It should be noted that Lebergott, Manpower in Economic Growth, makes similar adjustments in his use of the 1890 and 1900 census data on unemployment.

51. Holmes, Supply of Farm Labor.

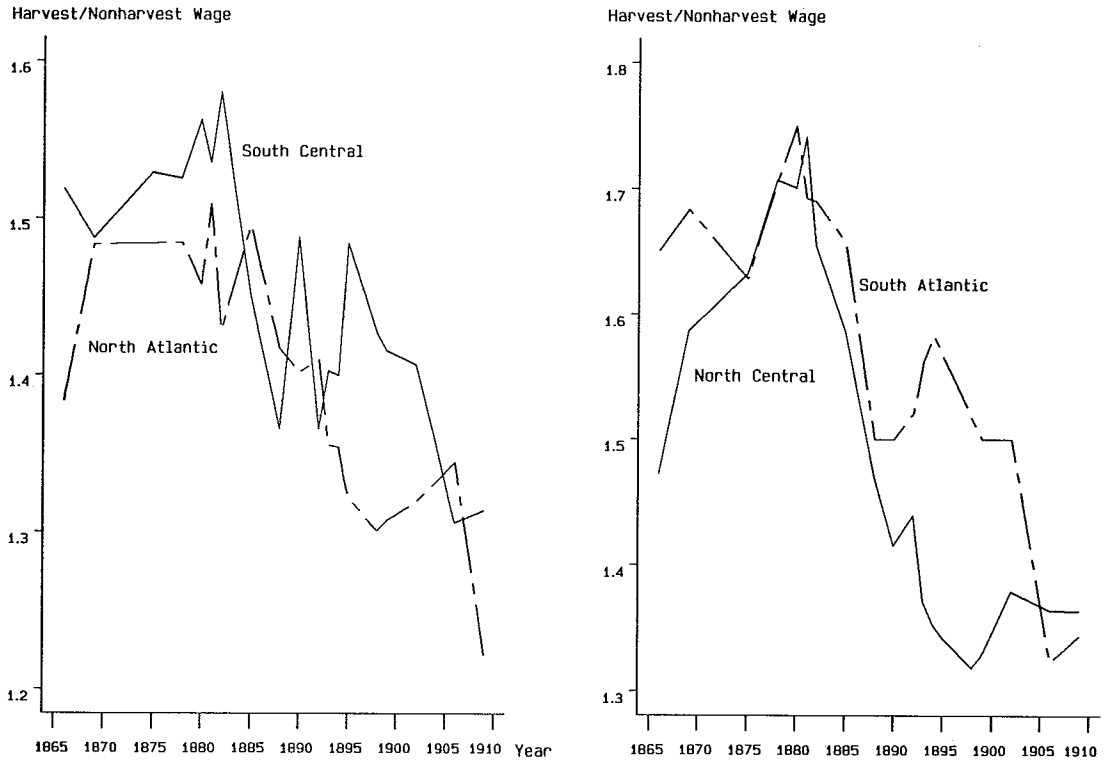

Figure 1: Harvest Premia for Daily Wages of Farm Workers

Source: Table 2.

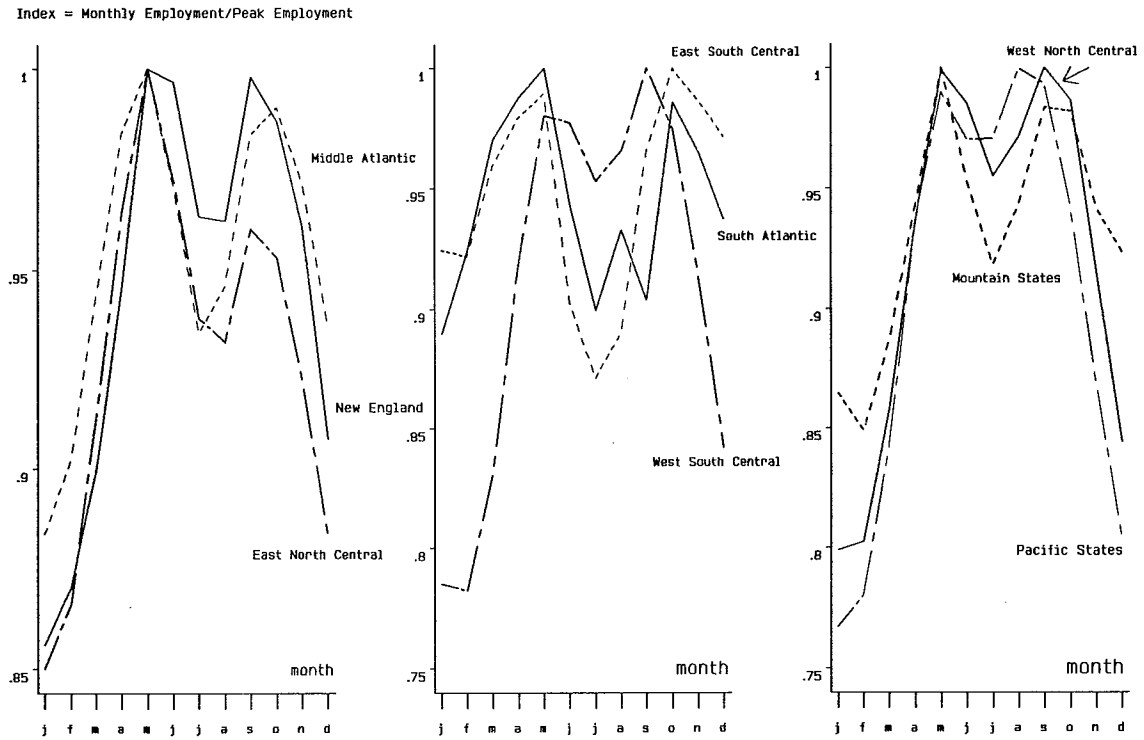

Figure 2a: Manufacturing Employment Index in 1900, Males

Source: U.S. Census Office, Twelfth Census of the United States, 1900. Manufactures, Part I: United States by Industries (Washington, D.C., 1902).

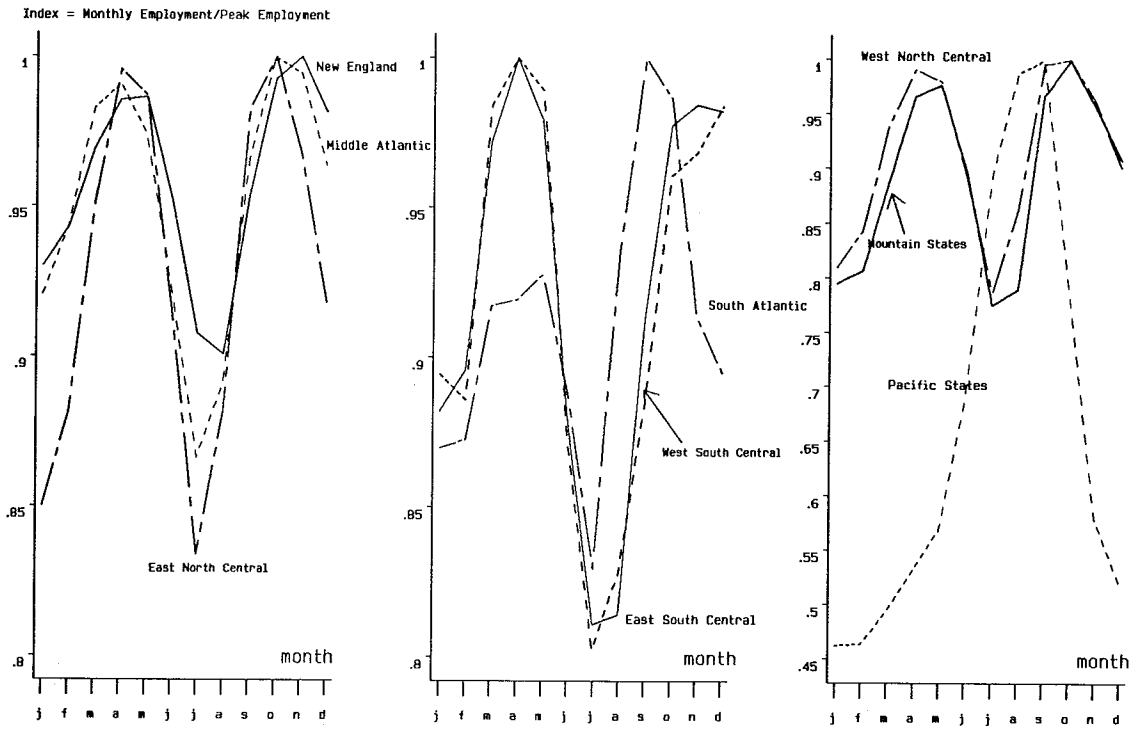

Figure 2b: Manufacturing Employment Index in 1900, Females

Source: U.S. Census Office, Twelfth Census of the United States, 1900. Manufactures, Part I: United States by Industries (Washington, D.C., 1902).

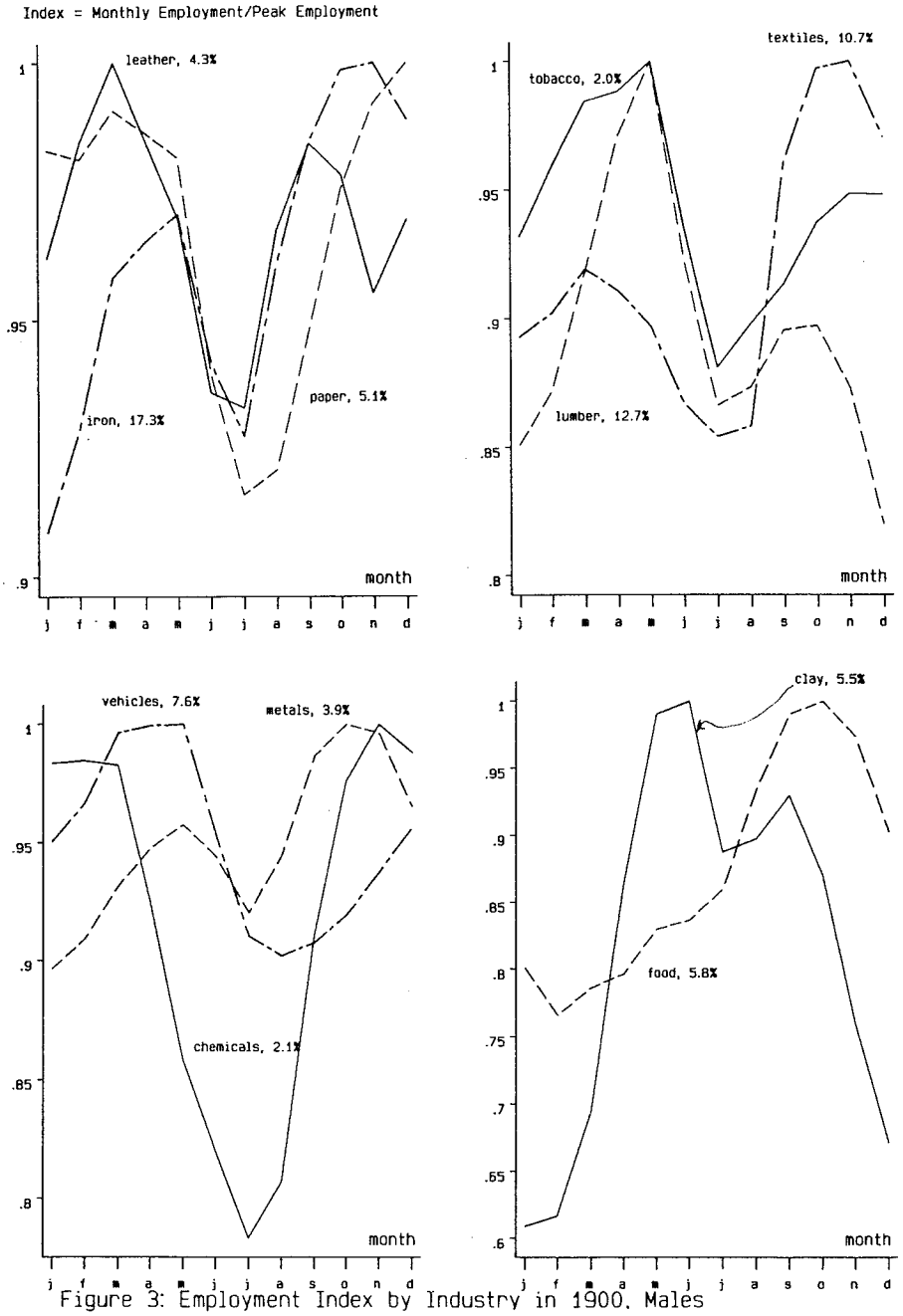

Figure 3: Employment Index by Industry in 1900, Males

Source: U.S. Census Office, Twelfth Census of the United States, 1900. Manufactures, Part I: United States by Industries (Washington, D.C., 1902).

Table 1
Male Farm Laborers (FL) per 1000 Farmers (F), Farms, and Male Population (P):
Midwestern States, 1860 to 1900

	1860[a]	1870	1880	1890	1870	1880	1890[a]	Nonfamily[b] 1900
	Farm Laborers (FL) ≥ 16 years				Farm Laborers (FL) ≥ 10 years			
Illinois								
FL/F	384.3	483.6	437.8	469.6	557.1	537.6	560.0	408.1
FL/farms	411.9	571.1	478.3	557.3	657.8	587.3	664.6	384.7
FL/P	110.6	148.0	123.0	102.8	170.5	151.0	122.6	60.7
Indiana								
FL/F	276.0	403.3	443.6	422.7	462.4	564.8	514.8	293.3
FL/farms	332.2	453.8	478.6	480.4	520.4	609.3	585.0	269.6
FL/P	110.1	146.7	147.6	130.0	168.2	188.0	158.3	68.5
Iowa								
FL/F	300.6	419.9	346.8	355.3	500.6	417.5	427.6	295.3
FL/farms	435.6	502.8	394.6	415.9	599.5	475.0	500.3	282.0
FL/P	99.5	160.0	139.6	130.4	190.7	168.1	133.8	83.5
Kansas								
FL/F	231.6	380.2	294.1	296.9	429.6	372.3	384.6	242.5
FL/farms	346.8	502.8	312.0	342.9	568.1	395.0	444.2	227.7
FL/P	99.5	151.7	132.8	120.1	171.4	168.2	131.4	77.5
Michigan								
FL/F	397.0	487.1	381.5	359.4	533.9	424.5	405.0	256.9
FL/farms	563.8	598.8	412.2	402.0	656.3	458.7	453.1	238.9
FL/P	143.6	152.2	111.8	93.7	166.8	124.3	91.7	56.9
Minnesota								
FL/F	n.a.	328.6	315.3	382.4	364.4	352.3	439.3	265.5
FL/farms	n.a.	385.4	327.9	427.5	427.4	366.4	491.0	252.1
FL/P	n.a.	125.6	115.2	110.2	139.3	128.7	109.6	64.0

	1860[a]	1870	1880	1890	1870	1880	1890[a]	Nonfamily[b] 1900
	Farm Laborers (FL) ≥ 16 years				Farm Laborers (FL) ≥ 10 years			
Nebraska								
FL/F	99.4	314.7	233.1	254.9	346.7	276.1	319.0	233.8
FL/farms	142.0	435.2	251.0	289.7	479.4	297.3	362.5	218.2
FL/P	35.6	117.0	102.6	89.7	128.8	121.6	96.5	72.1
Ohio								
FL/F	352.8	806.0[c]	435.4	409.3	944.6[c]	502.8	467.5	275.7
FL/farms	438.3	830.8[c]	458.9	462.8	973.7[c]	529.9	528.7	247.1
FL/P	119.3	201.6[c]	110.8	93.7	236.3[c]	128.0	92.2	47.0
Wisconsin								
FL/F	327.5	413.9	355.9	357.6	461.9	404.7	412.7	236.1
FL/farms	443.8	433.7	364.3	394.3	484.0	414.3	455.1	219.7
FL/P	130.0	139.3	115.0	102.5	155.4	130.7	101.3	53.7
TOTAL (9 States)								
FL/F	336.7	499.8	383.2	327.8	574.7	457.8	450.0	
FL/farms	420.9	570.9	412.0	374.7	656.3	492.3	514.4	
FL/P	119.9	160.0	123.0	92.4	184.0	146.9	126.8	

[a] The 1860 and 1890 data make use of Thomas Weiss's revised farm laborer estimates generously provided to us. The 1860 data subtract 15 year olds, and both 1860 and 1890 correct the estimates for agricultural workers included in the "laborers not elsewhere classified" category.
[b] The 1900 census was the first to enumerate farm workers as family members and as a group. The nonfamily figures for 1900 are sufficiently lower than are those for 1890 that some family farm members were likely to have been enumerated as agricultural laborers in the years preceding 1900. The farm laborer ratios for the total given in 1900 exceed those for any other years and are thus too high.
[c] Thomas Weiss has cautioned us that these numbers are vastly overstated but that he is unable to make revisions. They should be disregarded.

Sources: 1860 Population and Occupations: U.S. Census Office, Eighth Census of the United States, 1860. Population of the United States in 1860 (Washington, D.C., 1864); Farms: U.S. Census Office, Ninth Census of the United States, 1870. Vol. III: The Statistics of the Wealth and Industry of the United States (Washington, D.C., 1872). 1870 Population: U.S. Census Office, Ninth Census of the United States, 1870. Vol. II: The Vital Statistics of the United States, (Washington, D.C., 1872); Occupations: Ninth Census of the United States, 1870. Vol I: The Statistics of the Population of the United States (Washington, D.C., 1872); Farms: U.S. Census Office, Ninth Census of the United States, 1870. Vol. III: The Statistics of the Wealth and Industry of the United States (Washington, D.C., 1872). 1880 Population and Occupations: U.S. Census Office, Tenth Census of the United States, 1880. Statistics of the Population of the United States (Washington, D.C., 1883); Farms: U.S. Census Office, Tenth Census of the United States, 1880. Report on the Productions of Agriculture (Washington, D.C., 1883). 1890 Population and Occupations: U.S. Census Office, Eleventh Census of the United States, 1890, Report on the Population of the United States (Washington, D.C., 1897), Farms: U.S. Census Office, Eleventh Census of the United States, 1890, Report on the Statistics of Agriculture in the United States (Washington, D.C., 1895). 1900 Population and Occupations: U.S. Census Office, Twelfth Census of the United States, 1900. Vol. II: Population (Washington, D.C., 1902); Farms: U.S. Census Office, Twelfth Census of the United States, 1900. Census of Agriculture, 1900, Part I (Washington, D.C., 1902), and personal communication from Thomas Weiss.

Notes: In all years, except 1860, only male farm (agricultural) laborers (FL) are included. In 1860 female farm laborers are included by necessity. Age categories vary slightly across the census years. In 1890 it is $\geq$ 10 years, and for comparison figures for 1870 and 1880 are given for $\geq$ 10 years. In all years, except 1860, only male farmers (F) are included and in 1890 the category also includes planters and overseers. Population figures are for males only and in all years refer to those $\geq$ 15 years old.

Table 2
Seasonal and Harvest Wage Premia for Outdoor Labor by Region, 1866 to 1909

A. Harvest Wage Premia, Daily Wages without Board
(ratio of daily harvest wage to daily non-harvest wage)

	New England[a]
1820/29	1.165
1830/39	1.248
1840/49	1.341

	North Atlantic	South Atlantic	North Central	South Central
1866	1.38	1.65	1.47	1.52
1869	1.48	1.68	1.59	1.49
1874/75	1.48	1.63	1.63	1.53
1877/79	1.46	1.70	1.71	1.53
1879/80	1.46	1.75	1.70	1.56
1880/81	1.51	1.69	1.74	1.54
1881/82	1.43	1.69	1.66	1.58
1884/85	1.50	1.66	1.59	1.45
1887/88	1.42	1.50	1.47	1.37
1889/90	1.40	1.50	1.42	1.49
1891/92	1.41	1.52	1.44	1.37
1893	1.35	1.56	1.37	1.40
1894	1.35	1.58	1.35	1.40
1895	1.32	1.57	1.34	1.48
1898	1.30	1.52	1.32	1.43
1899	1.31	1.50	1.33	1.42
1902	1.32	1.50	1.38	1.41
1906	1.34	1.32	1.36	1.31
1909	1.22	1.34	1.36	1.31

B. Seasonal Wage Premia, Monthly Wages with and without Board
(ratio of monthly seasonal wage to implicit monthly non-seasonal wage)[b]

	With Board	Without Board	With Board	Without Board	With Board	Without Board	With Board	Without Board
1866	1.68	1.33	1.65	1.39	1.58	1.35	1.88	1.54
1869	1.65	1.38	1.87	1.45	1.69	1.42	1.86	1.39
1874/75	1.49	1.42	1.66	1.31	1.49	1.33	1.59	1.39
1909	1.45	1.32	1.37	1.25	1.34	1.23	1.39	1.24

[a] The harvest period is defined as June, July, and August.
[b] The implicit monthly non-seasonal wage assumes the season is 6 months long: $M_a = .5M_s + .5M_{ns}$, where M_a is the average monthly wage on an annual contract, M_s is the average monthly wage for seasonal labor, and M_{ns} is the implicit average monthly wage during the off season. If the season is longer than 6 months, as it probably was in the South, the premium will be somewhat exaggerated. George Holmes, Wages of Farm Labor, U.S.D.A., Bureau of Statistics, Bulletin 99 (Washington, D.C., 1912), cites evidence from a Kansas survey in 1893 that the average time during which farm laborers, hired by the month, were employed over the year was 6.76 months.
Sources: George K. Holmes, Wages of Farm Labor, U.S. Department of Agriculture, Bureau of Statistics Bulletin 99 (Washington, D.C., 1912). New England data in Part A were provided by W. Rothenberg. See, for example, Winifred B. Rothenberg, "The Emergence of Farm Labor Markets and the Transformation of the Rural Economy: Massachusetts, 1750-1855," Journal of Economic History 48 (Sept. 1988), pp. 537-66.

Table 3
Unemployment Measures by Region and Occupation
for Farm and Nonfarm Workers, 1900
(Males, 16 to 70 years old)

	Northeast	Midwest	South	West
	M = months unemployed during census year, 1900			
Farm Workers				
Farm Laborers (nonfamily)				
% with M > 0	32.2	38.0	38.4	40.4
M | M > 0	4.47	3.73	3.62	4.15
Number of observations	258	574	765	136
Family Farm Laborers				
% with M > 0	18.6	22.1	36.8	41.5
M | M > 0	3.35	4.05	3.35	3.18
Number of observations	113	461	650	53
Farmers				
% with M > 0	4.0	3.0	11.5	4.3
M | M > 0	4.29	4.48	3.62	3.00
Number of observations	527	1904	2331	184
Nonfarm Workers				
Laborers				
% with M > 0	43.6	52.4	47.1	40.1
M | M > 0	4.18	4.11	3.72	4.15
Number of observations	845	981	680	279
Manufacturing workers				
% with M > 0	22.4	21.7	22.5	24.2
M | M > 0	3.96	3.85	4.24	4.23
Number of observations	2226	1390	645	252
Building trades				
% with M > 0	41.4	54.7	45.5	37.5
M | M > 0	4.25	4.36	4.11	5.04
Number of observations	563	492	233	72
Professionals				
% with M > 0	13.2	19.8	21.3	11.3
M | M > 0	4.64	4.32	4.79	6.29
Number of observations	272	298	160	62

Source: 1900 Public Use Sample

Notes: The seven occupational groups do not exhaust the national labor force. Omitted are: trade and transportation, service, and mining. The occupational groups use the 1900 occupational codes; manufacturing includes operatives, craft workers, and supervisory personnel, but not laborers. The Northeast includes New England and the Middle Atlantic; the Midwest includes the East North Central and the West North Central; the South includes the South Atlantic, East South Central, and West South Central; and the West includes Mountain and Pacific.

Table 4
Correlates of the Unemployment Probability among Farm and Nonfarm Workers, 1900

Dependent variable = 1 if worker experienced unemployment during census year, 1899-1900.

	Farm Laborers (nonfamily)	$\frac{\partial P}{\partial x}$	Nonfarm Laborers and Workers[a]	$\frac{\partial P}{\partial x}$
Mean of dependent variable	0.375		0.341	
Constant	-0.807		1.02	
	(1.64)		(4.25)	
Age	0.0120		-0.0572	
	(0.53)		(5.23)	
Age squared $\times 10^{-2}$	-0.0105		0.0798	
	(0.37)		(6.09)	
Literate (writes)	-0.163		-0.584	
	(1.17)		(7.18)	
Never married	0.478		0.117	
	(3.78)		(1.88)	
White	0.0208		0.098	
	(0.14)		(1.05)	
County contains city ≥ 10,000 and near city ≥ 50,000	-0.453	-0.109		
	(2.44)			
County near city ≥ 50,000 does not contain city ≥ 10,000	-0.280	-0.067		
	(1.63)			
County contains city ≥ 10,000 not near city ≥ 50,000	-0.279	-0.067		
	(1.60)			
In large city (≥ 25,000)			-0.774	-0.190
			(9.88)	
In small city (10,000-25,000)			-0.627	-0.154
			(9.85)	
In town (1,000-10,000)			-0.316	-0.078
			(5.09)	
Number of observations	1733		8607	

[a] Nonagricultural workers includes those in manufacturing and the building trades. Laborers are all laborers except those in agriculture.

Source: 1900 Public Use Sample

Notes: Equations estimated by maximum likelihood logit. $\partial P/\partial x = \beta \cdot (1 - P) \cdot P$, where the mean unemployment rate in rural areas, P = 0.404 in the farm case and 0.434 in the nonfarm case. Absolute values of *t*-statistics in parentheses. Regional dummies were also included. The omitted variable for farm laborers is living in a county not containing a city and not nearby a city; more than 70% of farm laborers lived in such counties. The omitted variable for nonfarm laborers and workers is living in a rural area; 27% of the included workers lived in such areas. The dummy variables for location are exhaustive and nonoverlapping.

Table 5
Unemployment among Michigan and Midwestern Farm Laborers, 1894 and 1900

A. Michigan Farm Laborers, 1894

	Percentage with unemployment	Number of observations
Entire sample	74.7%	1000
If cause is listed	73.0	965
if married	73.8	447
If cause is lack of work or bad weather[a]	51.6	965
if married	54.4	330
If cause is sickness or indisposition	11.6	965
If paid by month	69.2	770
If paid by the month and no problem in winter	56.3	504
If paid by the month and housing is provided	55.4	195

B. Distribution of Months Unemployed for Those Experiencing Unemployment

Months (weeks) Unemployed[b]	Michigan Total[c]	Michigan Involuntary[d]	Michigan Sickness[e]	Midwest Total, 1900
< 1 (< 2 weeks)	2.7%	0.2%	8.0%	n.a.
1 [2-6)	15.7	10.8	25.0	4.1%
2 [6-10)	18.8	17.7	24.1	17.9
3 [10-14)	18.4	17.4	21.5	33.9
4 [14-18)	19.6	25.2	5.4	20.2
5 [18-22)	9.5	11.3	4.5	6.4
6 [22-26)	10.6	13.4	4.5	12.8
7 [26-30)	1.1	0.9	1.8	0.9
8 [34-38)	1.3	1.4	1.8	1.4
9 [38-42)	1.7	1.4	2.7	0.5
10 [42-46)	0.4	0.0	0.9	1.0
11 [46-50)	0.1	0.0	0.0	0.0
12 [50-52]	0.0	0.0	0.0	1.0
Mean months unemployed	3.36	3.66	2.66	3.73
Number of observations	747	425	112	574

[a] Also includes other causes together with lack of work or bad weather.
[b] Unemployment in the Michigan data is expressed precisely in months and days, converted here to weeks. In the census data, unemployment is in months.
[c] Includes all workers in the Michigan sample who reported months worked.
[d] Only includes workers who reported that the cause of unemployment was "lack of work" or "bad weather."
[e] Only includes workers who reported that the cause of unemployment was "sickness" or "indisposition."

Sources: Sample from Michigan Bureau of Labor and Industrial Statistics, Twelfth Annual Report, Year Ending February 1, 1895 (Lansing, 1895) and 1900 Public Use Sample.