

NBER WORKING PAPER SERIES  
ON  
HISTORICAL FACTORS IN LONG RUN GROWTH

THE MARKET FOR MANUFACTURING WORKERS DURING EARLY  
INDUSTRIALIZATION: THE AMERICAN NORTHEAST, 1820 TO 1860

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Working Paper No. 28

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
July 1991

The authors benefited from excellent research assistance by James Lin, Zorina Khan, John Majewski, and Geng Xiao, as well as from comments by Robert Allen, Paul David, Lance Davis, Stanley Engerman, Robert Fogel, Claudia Goldin, Stephen Haber, Carol Heim, Peter Lindert, Robert Margo, Douglass North, William Parker, Hugh Rockoff, Jean-Laurent Rosenthal, Jonathan Skinner, Michael Waldman, David Weir, Jeffrey Williamson, Gavin Wright, and participants in seminars at UC Berkeley, Stanford, UCLA, Columbia, Harvard, Virginia, and the D.C. Area Workshop in Economic History. The research was supported by the Center for Advanced Study in the Behavioral Sciences, the California Institute of Technology, and the Institute of Industrial Relations and the Academic Senate at UCLA. This paper is part of NBER's research program in Development of the American Economy. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

This paper studies how well labor markets operated, and industrial workers fared, during early American industrialization. The principal bodies of evidence examined are four cross-sections of manufacturing firm data from 1820 to 1860, and newly-constructed price indexes for classes of products in different locales. The central findings are that real wages rose substantially over time for all segments of the manufacturing labor force. Workers responded flexibly to changing circumstances, and benefited almost immediately from the rapid expansion of the 1820s. Impressive growth in compensation was maintained until the late 1840s or early 1850s, when progress was slowed by heavy immigration and the mechanization of a number of previously labor intensive industries. Of course, these gains were not continuous, but the evidence bears against the view that the difficult years were due to poorly-functioning markets, rapid changes in technology, or other aspects of industrialization. On the contrary, the chief deviations from the upward trend in real wages seem to be attributable to supply-side shocks originating in the agricultural sector or in unusually large immigration flows, rather than to the path of industrial development.

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Concern with economic dislocation and associated hardships has long been a familiar theme in histories of the early industrialization of various countries.<sup>1</sup> With the major changes in relative prices, resource allocation, and technology characteristic of this phase of growth, many scholars doubt that workers and institutions could be so flexible in responding to the new conditions that there would be no significant class of losers. Even with competitive markets, those with investments or other interests specific to old ways, or those who bear high costs of adjustment, are likely to be hurt by aspects of progress which would depreciate their assets or compel alterations in behavior. Moreover, these shifts in individuals circumstance, behavior, and culture might be especially disturbing because of the lack of previous experience with such an accelerated pace of social change.

Although not devoid of these considerations, the literature on the United States has been something of an exception, with the beginning of economic growth seeming nearly frictionless in some accounts. This traditional assessment undoubtedly stems from the relatively high standard of living and more equal distribution of income enjoyed by the American population during the colonial and early national periods as compared to their European counterparts.<sup>2</sup> Declining industries, technologies, and districts have certainly been noted, but most studies emphasize the clambering to exploit opportunities and put the extensive geographic and social mobility of the period in a positive light. Indeed, accounts of the classic formative experiences of the Early Republic, such as young women joining the Lowell mills or farmers streaming into midwestern river valleys, often read like textbook descriptions of workers flowing to higher-value activities in pursuit of material gain.

This faith in a broad sharing of the benefits appears to be consistent with wage series compiled for the American Northeast in recent years by Donald Adams, Robert Margo and Georgia Villaflor, and Winifred Rothenberg.<sup>3</sup> Their data, which pertain primarily to

agriculture, construction, and transportation, concur in suggesting that real wage levels rose markedly during the antebellum period. Relying on different types of evidence, however, other researchers have revived doubts about how the working classes fared. Most prominent among them are the "new labor historians" who have argued that the changes in technology, in the use of alternative pools of labor, and in the degree of commercialization eroded the autonomy and status of many skilled artisans without even providing meaningful improvements in material consumption. These scholars seem to conceive of early labor markets as plagued by persistent problems of oversupply, where competition operated to depress wage rates and prevent workers from capturing much if any of the returns to increases in productivity.<sup>4</sup> Although not obviously linked to any particular sources, a nationwide decline in heights beginning with the birth cohorts of the 1830s and a parallel decrease in life expectancy, uncovered by Robert Fogel and others, have further stimulated interest in the impact of early American industrialization on welfare.<sup>5</sup>

This paper aims to deepen our understanding of these issues by exploring the variation in manufacturing wages across relevant firm characteristics and over time. Wage rates cannot, by themselves, offer a comprehensive index of material welfare. At best, they contain only indirect and incomplete information on fundamental conditions of life such as the nature of work performed, health, and environmental quality. Yet they deserve serious examination because they do provide a useful gauge of purchasing power -- a crucial component of the standard of living in early industrial societies -- as well as insight into the range of economic possibilities individuals face, and the choices they make.

Our focus is on the Northeast, where industrial development was concentrated during the initial stages of the process. The principal bodies of evidence examined are four cross-

sections of firm data from 1820 to 1860.<sup>6</sup> The central findings are that all discernable segments of the manufacturing labor force realized substantial increases in real wages over the period as a whole, and that those differentials apparent at the beginning narrowed over time, as one would expect with the extension of markets. Workers appear to have benefited almost immediately from the rapid industrial expansion of the 1820s, and maintained impressive rates of growth in compensation until the late 1840s or early 1850s, when progress was slowed by heavy immigration and the spread of mechanization to a number of previously labor-intensive industries. Of course, these gains were not continuous, and manufacturing workers suffered through some painful spells. But the evidence bears against notions that the difficult years were due to poorly-functioning markets, rapid changes in technology, or other aspects of industrialization. On the contrary, the chief deviations from the upward trend in real wages seem to be attributable to supply-side shocks originating in the agricultural sector or in unusually large immigration flows, rather than to the path of industrial development.

## II. AN ECONOMY AT GROWTH

The forty years spanned by the manufacturing censuses used here encompass the early stages of industrialization in the United States, and were a period of economic transformation in the Northeast. A formidable modern manufacturing sector began to emerge in that region during the first two decades of the century, spawned by the expansion of domestic commerce associated with state and private efforts to extend the transportation grid, as well as the interruption of foreign trade during the Embargo and the War of 1812.<sup>7</sup> Although battered during the postwar contraction, northeastern manufacturing resumed growth at an accelerated pace in the 1820s, and maintained it over the next several decades. By 1860, this region was far ahead of others in per capita income, and had realized an enormous shift of its resources

out of agriculture and into manufacturing and services. Although other regions were moving along similar paths, the Northeast held the lead in manufacturing output, technology, urbanization, the evolution of markets, and other dimensions of industrial development.<sup>8</sup>

The burgeoning manufacturing sector of the Northeast was in constant flux over these years, and the changes concerned composition and technology as well as size. With rising incomes and enhanced opportunities to produce for and consume through the market, more of the population were inclined to indulge tastes for fashionable store-bought merchandise and for material pleasures which had just a generation before been reserved for the genteel if available at all.<sup>9</sup> Mass-oriented industries like cotton textiles and boots and shoes quickly grew to become the largest employers in the sector, and in so doing greatly augmented the relative demand for women and children.<sup>10</sup> But these were not the only industries or classes of labor to benefit from economic growth. Ever-increasing levels of consumption bolstered demand for previously exotic items like musical instruments, fine furniture, window glass, and an array of new products whose manufacture often involved highly skilled workers. The quality and diversity of goods exploded during the antebellum era, with important implications for our understanding of both living standards as well as the mobility of factors of production.<sup>11</sup>

Changes in the composition of manufacturing were accompanied by equally impressive advances in organization and methods. Between 1820 and 1860, manufacturing productivity in the Northeast grew at rates approaching those of the late-nineteenth and twentieth centuries. A broad range of industries were able to realize substantial gains in productivity through relatively modest alterations in production processes -- that is, without radically new types of equipment or increases in capital intensity.<sup>12</sup> What these alterations consisted of is not entirely clear, but they likely involved many incremental improvements in the design of

products and capital, as well as in the coordination of labor and other inputs. For example, even without significant changes in the kinds of tools used, firms raised measured productivity by increasing the division and intensity of labor within their establishments. Small shops with a few skilled artisans were increasingly displaced by so-called non-mechanized factories or manufactories which employed higher proportions of workers lacking in general skills and now responsible for narrowly-defined tasks. Those that survived tended to be located in outlying areas, or to be specialized in products less suitable for standardized production. It was not until the late 1840s and 1850s that machinery driven by inanimate sources of power came to be widely adopted in many manufacturing industries other than textiles.

Expanding markets played a major role in promoting the diffusion of such improvements in technology. Whereas most establishments operated in relatively local markets early in the century, these protected circumstances broke down swiftly in the Northeast. Not only did the growing demand for manufactures attract the entrance of additional producers, and falling transportation costs increase competition between geographic districts, but the rates of invention and innovation were stimulated as well.<sup>13</sup> Although the speed of this process varied across industry and place, the integration of product markets between urban centers, northern New York, and southern New England was far along by the mid-1820s, with hundreds of roads constructed, navigable rivers extended, and canals like the Erie in operation. By the late 1840s, there were few pockets in the Northeast beyond the reach of a regional market held together by a network of low-cost transportation.

It is apparent that the impact of industrialization on the market for manufacturing workers involved a variety of mechanisms. On one hand, the rapid growth in industrial output, underway by the 1820s, should have strained the sources of skilled employees whose supply

must have been somewhat inelastic in the short run. Tending in the other direction, however, were changes in technology that facilitated the substitution of less-skilled classes of workers, including women and children.<sup>14</sup> The net results of these counteracting influences on the demand for manufacturing workers with a traditional artisanal training, and on the wage rates for the different classes of labor, are unclear, but certain to have varied across industries based upon elasticities of substitution and of supply. What can be said, though, is that if workers and firms were responsive to market conditions, as the shift in industrial composition suggest, then increases in productivity and falling transport costs would have led to growth in the return to labor generally and a narrowing of geographic differentials in wages as well as in prices. Trade in products alone could have accomplished this, even without much geographic mobility by workers.<sup>15</sup>

### III. THE DATA ON NOMINAL WAGES

With this as background, we turn to the estimates of mean nominal annual wages computed from the samples of manufacturing firm data for adult males in the Northeast, and presented in Table 1. Although such nominal figures are of limited value in gauging the improvement over time in living standards, they help to highlight the patterns of cross-sectional variation and the internal consistency of the data. They were constructed from firm-level reports of their mean wage rates on an annual (1820), daily (1932), or monthly (1850 and 1860) basis, and make no allowance for interruptions in employment, other than an effort to exclude part-time establishments from the 1820 sample. The daily and monthly rates were converted to annual figures by assuming 310 days or 12 months of work per year, so as to



TABLE 1: Nominal Mean Annual Wage Rates for Adult Males in Northeastern  
Manufacturing: By Geographic Area, Urbanization, and Size of Firm:  
1820 to 1860

	<u>1820</u>	<u>1832</u>	<u>1850</u>	<u>1860</u>
<b>Unweighted</b>				
Middle Atlantic	\$225.4 (430)	\$247.6 (300)	\$289.1 (485)	\$328.3 (419)
Rural	200.8 (297)	241.3 (280)	267.8 (196)	297.7 (148)
Urban	280.2 (133)	336.1 (20)	303.4 (289)	347.8 (271)
Major Urban	303.9 (87)	-	327.9 (88)	373.0 (92)
New England	256.4 (196)	291.5 (600)	334.2 (497)	384.1 (440)
Rural	250.1 (145)	292.7 (372)	324.3 (271)	368.8 (170)
Urban	274.2 (51)	289.5 (228)	341.2 (226)	389.4 (270)
Major Urban	348.4 (10)	410.4 (14)	376.4 (27)	421.6 (74)
TOTAL	235.1 (626)	276.9 (900)	302.1 (982)	342.2 (859)
<b>Weighted</b>				
Middle Atlantic	265.9 (2264)	278.0 (4970)	350.5 (2713)	354.3 (4346)
Rural	238.3 (1171)	270.1 (4424)	287.2 (466)	374.7 (984)
Urban	295.5 (1093)	342.0 (546)	362.1 (2247)	348.8 (3362)
Major Urban	305.8 (896)	-	376.4 (1428)	340.1 (1724)
Small	215.7 (689)	213.4 (318)	283.5 (542)	316.8 (441)
Medium	281.7 (698)	293.3 (593)	312.8 (520)	367.8 (517)
Large	292.7 (877)	280.8 (4059)	375.6 (1651)	358.4 (3388)
New England	269.7 (1489)	299.9 (8623)	326.9 (3709)	371.1 (4587)
Rural	252.2 (875)	303.4 (4094)	313.5 (1110)	351.9 (673)
Urban	293.6 (632)	296.8 (4529)	329.9 (2599)	372.7 (3914)
Major Urban	325.3 (243)	387.8 (144)	338.0 (772)	411.8 (1670)
Small	239.5 (359)	285.6 (811)	349.1 (517)	388.0 (440)
Medium	263.0 (506)	290.6 (1717)	334.4 (814)	368.4 (668)
Large	292.6 (624)	304.4 (6095)	321.7 (2378)	370.1 (3479)
TOTAL	267.4 (3753)	291.9 (13593)	341.3 (6422)	360.1 (8933)

Table 1 (cont.)

Notes and Sources: The estimates were computed from the samples of northeastern manufacturing firm data drawn from the schedules of the 1820, 1850, and 1860 Federal Census of Manufactures and from the 1832 McLane Report. The unweighted averages were computed as means of the averages reported by each firm in the category in question. The weighted averages were calculated as means by weighting the firm averages by the number of employees of the relevant type (i.e., number of adult males). In addition, the observations from the 1850 and 1860 samples were weighted, for both sets of estimates, by state-specific weights that were intended to control for the disproportionate representation of manufacturing firms from the smaller states in those samples. The numbers of observations, whether firms or employees, over which the averages were computed are presented within parentheses.

The figures reported for 1832, 1850, and 1860 are based on information that probably pertains to the operations of firms in 1831, 1849, and 1859 respectively. The 1832 estimates were calculated from straightforward reports of average daily, weekly or monthly wages for adult males, with the annualizations based on assumptions of 12 months, 310 days, or 52 weeks of employment per year. In 1850 and 1860, firms generally did not separately enumerate adult males and boys. Accordingly, the reported numbers of male employees in these years were decomposed into adults and boys by assuming that boys accounted for the same proportions, by industry, of male employees as they had in 1820. In those industries in which boys had accounted for more than 33 percent of male employees in 1820, it was further assumed that the shares had fallen to 33 percent by 1850 and 1860. The average wage for adult males was then estimated from the average male wage, by assuming that the boy wage was 50 percent of the adult male compensation. The establishments enumerated in the 1820 Census typically recorded their annual wage bill and the numbers of employees in various classes. Several methods of estimating an adult male wage from this information have been utilized, but the figures presented were computed by assuming that females and children earned 0.35 of the adult male wage. These procedures were selected to bias the 1820 estimates upward relative to the 1850 and 1860 figures. See Goldin and Sokoloff (1982) for a discussion of relative female and child wages.

Table 1 (cont.)

Notes and Sources. The estimates have been computed over the firms from eighteen manufacturing industries appearing in the samples: chemicals, cotton textiles, fine work (clocks, jewelry, etc.), furniture, glass, harnesses and wagons, hats, iron and steel, iron products, liquors, flour milling, paper, shoes and boots, tanning, tobacco products, tools and machinery, and wool textiles. All of the observations from these industries in the 1832, 1850, and 1860 samples, with the exception of a small number of outliers, were included in the analysis. As for the 1820 sample, the bottom thirty percent of the establishments in these industries with the relevant information were truncated from the sub-sample over which the estimates were prepared, in order to control for the likelihood that a number of firms in 1820 were operating only part of the year and would thus lead to understatements of the annual wage rates prevailing at the time.

Urban firms are those located in a county with a population of 10,000 or more, or in a county that borders on such a county. Firms in major urban counties are a subset of urban firms and are those located in counties with cities of 25,000 or more. The estimates are based on a "rolling" classification of urban counties, with the designated group expanding over time. Rural firms are the residual. Small firms are those with five or fewer employees, and large are those with more than 15.

approximate average annual earnings for full-time employees, not actual average earnings across all manufacturing workers. Little is known about changes over time in the spells of unemployment per worker, or in the prevalence of part-time work. But given the evidence of a decrease over time in the length of the average manufacturing workday, and that earnings grew more rapidly than daily wage rates, it seems likely that our figures understate the advance in the earnings of year-round manufacturing employees -- at least between 1832 and 1860.<sup>16</sup>

Geographic variation in nominal wages appears, by these estimates, to have been quite limited. Wages were somewhat higher in New England than in the Middle Atlantic, and in urban areas relative to rural, but these gaps seem generally modest and to have declined over time. In both parts of the Northeast, wage rates grew most rapidly in rural counties, followed by those in urban areas, and at the slowest pace in major urban centers such as Boston, New York, and Philadelphia. The only large and persistent deviation from rough equality was that small firms in rural counties of the Middle Atlantic, especially in western Pennsylvania, paid their employees significantly lower wages (20 to 30 percent less than the regional average).<sup>17</sup>

The most straightforward explanation for the convergence of nominal wages is that improvements in transportation served to narrow the range of geographic variation in the returns to workers, both through enhanced labor mobility and adjustments by employers to changes in their product markets. Wage rates in different areas were driven toward convergence by competition between producers as the radiation of navigable waterways, railroads, and other modes of transport between the cities and hinterlands promoted the extension of markets throughout the Northeast. These developments would be expected to have disproportionately large effects on the opportunities for specialization in outlying districts, and the evidence suggests that these areas did indeed experience a rise in relative wages.

Although the minor geographic disparities in nominal wages prevailing in 1860 may not precisely mirror those in real compensation, they are at least consistent with the view that a well-integrated northeastern labor market for manufacturing workers was largely in place by that date.

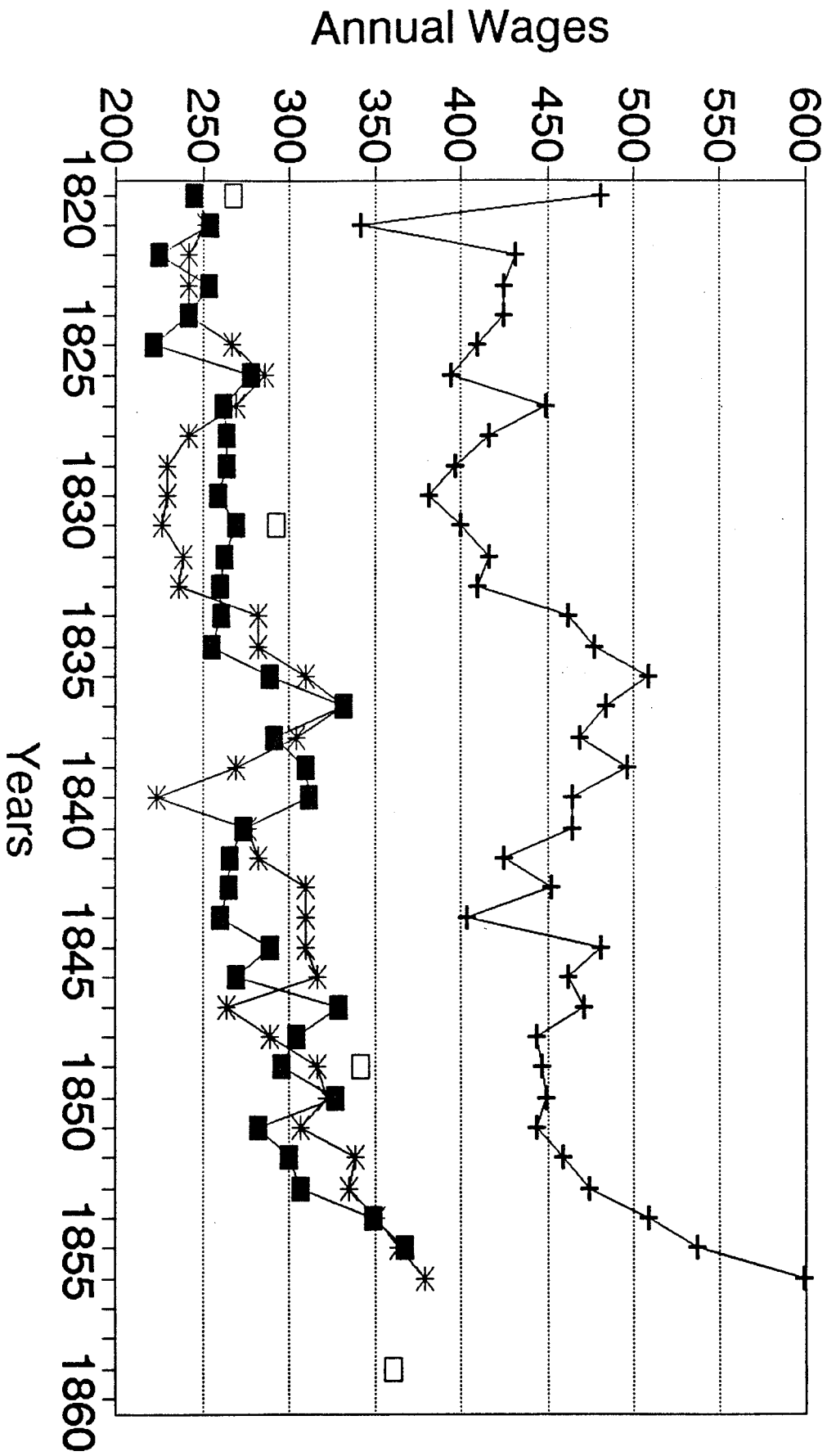
Another feature of these estimates is that employees of small firms (1 to 5 workers) gained ground on their counterparts in both medium- (6 to 15 workers) and large-sized (16 or more workers) enterprises over the period. In both New England and the Middle Atlantic, workers at small firms received much lower wages in 1820, but closed the gap steadily to pull ahead in the former sub-region by 1850, and within 15 percent in the latter by 1860.<sup>18</sup> Exhibiting a similar qualitative pattern, employees of medium-sized establishments overtook their peers in larger firms. This pattern is intriguing, because the shops with only a few workers tended to rely on artisans with traditional skills, whereas larger establishments used methods involving an extensive division of labor and accordingly hired workers who were on average lacking in general skills.<sup>19</sup>

At first, the likelihood that workers with a comprehensive knowledge of their production processes might be less well remunerated than were those with fewer skills appears remote. However, on reflection, the phenomenon seems feasible in a pre- or early-industrial economy, where many of the skilled workers in small establishments were initially geographically insulated from regional markets. Although not possessing the human capital of an accomplished artisan, adult males who were specialized by task could have achieved greater productivity through fuller integration into a broad market or adapted more easily to advances in production methods. By this logic, larger firms paid higher wages in the short run, because they operated more efficiently by focusing on the manufacture of a standardized product for

a mass market instead of customized or diverse outputs at an irregular or below full-capacity rate. But as product and labor markets expanded over time, the small shops that survived had to raise their productivity and wage rates to competitive levels. This interpretation appears borne out by the data. Not only did the relative performance of small firms improve in productivity as well as wages between 1820 and 1860, but the small firms with low productivity and low wages that managed to survive were located in ever more outlying counties.<sup>20</sup>

Despite the reasonableness of their patterns of cross-sectional variation, one might still question the levels of our nominal wage estimates. Two of the manufacturing censuses sampled suffer from problems of representativeness, and all may be vulnerable to biases from the inclusion of firms operating less than full-time.<sup>21</sup> Though these are serious concerns, confidence in our figures is strengthened by checks of consistency with alternative wage series. In Figure 1, our weighted-average estimates are compared with the series of daily wage rates constructed by Rothenberg for agricultural labor in Massachusetts, and by Margo and Villaflor for civilian workers (artisans and laborers separately) hired by the U.S. Army, expressed on an annual basis. The assumption of 310 days of employment at the specified rates may yield overstatements of yearly compensation, but the basic agreement about the amount of nominal wage growth over the period should be unaffected. There is a particularly close correspondence between our estimates and the Rothenberg series, with the former about 10 to 15 percent higher throughout. Both suggest greater wage increase during the 1820s, and slower advance during the 1830s and 1840s, than do those of Margo and Villaflor.<sup>22</sup> Also of significance is the finding that the 1820 estimate is not unreasonably low, as would be the case if it were biased downward by the inclusion of many part-time establishments in the

Figure 1  
Annual Wage Series in Current Dollars



Notes and Sources: Included are the Margo and Villaflor series for northeastern laborers (MVLAB) and artisans (MVART); the Rothenberg weighted series (RW) series for agricultural labor in Massachusetts; and our weighted averages from Table 1 for adult males in northeastern manufacturing (SV). The Margo-Villaflor and Rothenberg daily wage rates were converted to annual estimates by assuming 310 days of work. The Rothenberg series estimates for higher-paid and lower-paid tasks were averaged at 1820, and extended over time by applying the trend from the weighted (RW) series. Margo and Villaflor, "Growth of Wages;" and Rothenberg, "Emergence of Farm Labor Markets."



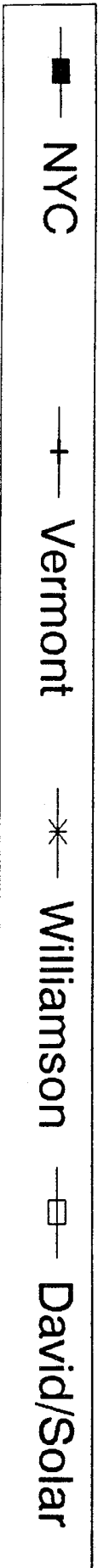
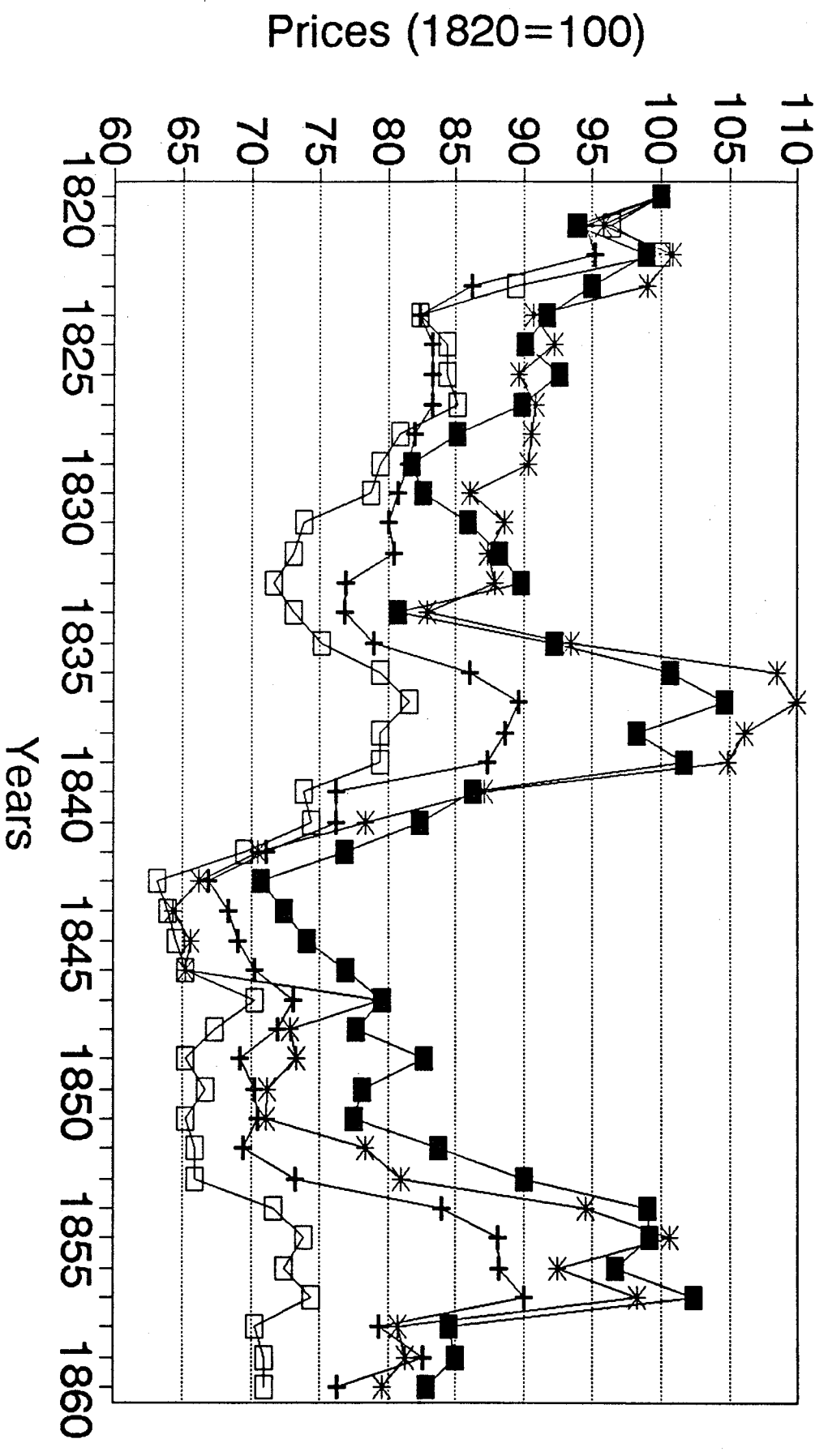
data.<sup>23</sup>

#### IV. PRICE INDEXES AND REAL WAGES

Although nominal figures are useful, real wage estimates provide a richer picture of change over time in living standards. Reliable price indexes are required for their construction. The preparation of such indexes, however, is a formidable problem given the limited numbers of commodities and places covered by existing price series, our imperfect knowledge of how the composition of expenditures varied over household characteristics, and the incidence of sharp changes in relative prices between commodities and places over the period. Thus, although one in principle would like a set of indexes which would encompass all groups in all places, this goal is not yet attainable.<sup>24</sup> Accordingly, our analysis is based on examination of the sensitivity of results to the choice between an array of indexes assembled from different sources and with disparate methods. Included are several which appear prominently in the literature as well as some we constructed from retail and wholesale price series for Boston, New York City, Philadelphia, and rural Vermont.

There are salient discrepancies between the alternative consumer price indexes for the years from 1820 to 1860, but they should not be allowed to obscure the impressive similarities. Indeed, many findings concerning the record of real wages are robust to the selection between them. To illustrate this point, four consumer price indexes pertaining to the Northeast are presented in Figure 2: the Williamson index for the urban poor, the David-Solar index for the nation as a whole but based on northeastern data, and two others which we have constructed for manufacturing workers in New York City and rural Vermont, respectively. Although they diverge by up to nearly 40 percent for brief intervals, the series move broadly together and within a relatively narrow band. They all show a significant decline in the cost of living over

Figure 2  
Selected Consumer Price Indexes



**Notes and Sources: See Appendix A.**

the entire period, with the trend interrupted by two severe cycles of approximately five-years duration. To be specific, all register a marked decline in consumer prices between 1820 and the early 1830s, before spiking to a peak in 1837 and then plunging to nearly the lowest point of the antebellum era at the cyclical trough of 1843. From this point, each rises slowly through the beginning of the 1850s, when living costs again surge upward by 15 to 40 percent for the next five years before falling back sharply. It is only during these extreme episodes of the late 1830s and mid-1850s that major gaps between the indexes are evident.

Since each of the four indexes indicates a significant decline in the cost of living over the period as a whole, our nominal wage figures are consistent with substantial improvement in real wages between 1820 and 1860 in the American Northeast. Estimated real wage growth for the average manufacturing worker ranges from the nearly 60 percent implied by the New York CPI to the roughly 90 percent yielded by the David-Solar index (see Table 2).<sup>25</sup> All classes of employees gained over the period, with rural workers advancing relative to urban, New Englanders doing marginally better than their peers in the Middle Atlantic, and those at small establishments realizing more rapid wage growth than those in medium-sized plants, who in turn gain on their counterparts at larger enterprises. One can speculate about how the wage levels would compare or patterns of relative wage movements change if group-specific price indexes were available. For example, given that improvements in transportation led the prices of manufactures and imported (domestic) food products to fall (rise) over time in rural areas relative to urban levels, it seems likely that there were also differences between cities and the countryside in the record of the cost of living.<sup>26</sup> However, without more detail on commodity prices or on how the budget shares of manufacturing workers varied across place, any claims on the issue would be heroic at best. Accordingly, our analysis will apply one index at a time,

TABLE 2: Indexes of Real Wages for Adult Males in Northeastern  
 Manufacturing: By Geographic Area, Urbanization, and Size of  
 Firm: 1820 to 1860

	<u>1820</u>	<u>1832</u>	<u>1850</u>	<u>1860</u>	<u>Per Annum Growth Rate 1820-1860</u>
<b>Unweighted</b>					
Middle Atlantic	100	128-150	155-197	171-205	1.4-1.9%
Rural	89	125-147	144-182	156-186	1.5-1.9%
Urban	124	174-204	163-206	182-218	1.0-1.5%
Major Urban	135	-	167-223	195-233	1.0-1.4%
New England	114	150-177	179-227	201-240	1.5-1.9%
Rural	111	151-178	174-221	193-231	1.4-1.9%
Urban	122	149-176	183-232	203-244	1.3-1.8%
Major Urban	155	212-249	202-256	220-264	0.9-1.4%
TOTAL	104	143-168	162-206	179-214	1.4-1.9%
<b>Weighted</b>					
Middle Atlantic	100	122-143	159-202	157-188	1.2-1.6%
Rural	90	118-139	131-166	166-199	1.6-2.1%
Urban	111	150-176	165-209	154-185	0.8-1.3%
Major Urban	115	-	171-217	151-180	0.7-1.2%
Small	81	93-108	129-163	140-168	1.4-1.9%
Medium	106	128-151	142-180	163-195	1.1-1.6%
Large	110	123-144	171-216	159-190	0.9-1.2%
New England	101	131-154	149-188	164-197	1.3-1.7%
Rural	95	133-156	143-181	156-187	1.3-1.8%
Urban	110	130-153	150-190	165-198	1.2-1.5%
Major Urban	122	170-200	154-195	182-218	1.0-1.5%
Small	90	125-147	159-201	172-206	1.7-2.2%
Medium	99	127-149	152-193	163-195	1.3-1.8%
Large	110	133-157	146-185	164-196	1.0-1.5%
TOTAL	101	128-150	155-197	159-191	1.2-1.6%

(Table 2 (cont.))

Notes and Sources: See the notes to Table 1 and Appendix A. The consumer price indexes applied to convert the current dollar figures to constant dollars were the New York City CPI prepared by the authors and the David and Solar index. The range presented is bounded by the two deflated figures. In each set of estimates, the Middle Atlantic average in 1820 was normalized to 100, and all other estimates expressed relative to that standard.

but is tempered with an appreciation of the crude approximations involved in the implicit assumption of the cost of living in the Northeast being everywhere the same.<sup>27</sup>

Since all of the indexes manifest a decline on the order of 15 to 25 percent in consumer prices from 1820 through the early 1830s, the conclusion that real wages in manufacturing rose substantially during the intervening decade seems robust. Again using the New York and David-Solar CPIs for bounds, the estimates indicate growth between the 1820 Census and the 1832 McLane survey of 2.2 to 3.7 percent per annum. This fact pace may reflect the effects of beginning the eleven-year period of rather steady prosperity near a cyclical trough, as well as the strength of the industrial expansion of the 1820s. The rate of advance moderated to a more suitable 1.1 to 1.5 percent between 1831 and 1849 (the 1832, 1850, and 1860 figures pertain to 1831, 1849, and 1859, respectively), despite the wild price fluctuation of the late 1830s and the prolonged downturn following the Panic of 1837. Finally, all of the price indexes imply little if any real wage growth in manufacturing over the 1850s. Average compensation was essentially flat over the decade as a whole, but workers must have suffered greatly during the middle years when consumer prices soared.

The strong underlying positive trend in real wages between 1820 and 1850, followed by a slowdown in the 1850s, extends to most segments of the manufacturing labor force distinguishable in our data. There are some deviations from the central tendency, but overall the experiences of the different groups included in Tables 2 and 3 are quite similar. Especially striking is the uniformity of dramatic progress between 1820 and 1832, a decade of major increases in patenting and manufacturing productivity, geographic extensions of transportation infrastructure and markets, as well as uninterrupted industrial expansion.<sup>28</sup> The record seems to indicate that virtually all categories of workers in the Northeast shared in an important

TABLE 3: Indexes of Real Wages For Adult Males in Selected Manufacturing Industries: 1820 to 1860

	Per Annum Growth Rate				
	<u>1820</u>	<u>1832</u>	<u>1832</u>	<u>1820-1860</u>	
<b>Unweighted</b>					
Coaches/Harnesses	95 (30)	130-153 (60)	154-196 (111)	180-215 (128)	1.7-2.1%
Cotton Textiles	100 (71)	147-173 (145)	145-184 (24)	132-158 (22)	0.7-1.2%
Furniture/Woodwork	75 (28)	124-145 (30)	158-200 (52)	194-232 (49)	2.5-2.9%
Grist Mills	79 (42)	105-123 (17)	124-158 (135)	134-160 (117)	1.4-1.8%
Iron/Steel	100 (59)	124-145 (106)	153-194 (38)	164-196 (28)	1.3-1.7%
Paper	103 (28)	127-149 (42)	149-189 (22)	171-205 (22)	1.3-1.8%
Shoes	100 (19)	99-116 (108)	128-163 (265)	141-168 (178)	0.9-1.3%
Tanning	71 (59)	101-118 (130)	139-177 (106)	153-183 (83)	2.0-2.5%
Tools/Machinery	107 (14)	152-178 (68)	165-209 (71)	155-185 (84)	1.0-1.4%
Wool Textiles	91 (59)	113-133 (140)	146-185 (46)	149-178 (23)	1.3-1.7%
<b>Weighted</b>					
Coaches/Harnesses	91(168)	126-148 (415)	151-192 (438)	168-201 (701)	1.6-2.1%
Cotton Textiles	100(487)	136-160(2460)	125-159 (504)	125-150 (438)	0.6-1.0%
Furniture/Woodwork	76 (79)	111-130 (199)	124-157 (279)	202-242 (263)	2.5-3.0%
Grist Mills	85(100)	111-130 (111)	113-143 (116)	122-146 (93)	0.9-1.4%
Iron/Steel	90(678)	107-126(3225)	135-172 (562)	162-194(1050)	1.5-2.0%
Paper	96(182)	117-137 (302)	139-176 (105)	145-173 (112)	1.1-1.6%
Shoes	101(236)	94-110(2325)	115-146(1397)	141-169(1992)	0.9-1.3%
Tanning	81(231)	104-122 (489)	140-178 (266)	156-186 (421)	1.7-2.2%
Tools/Machinery	105 (45)	150-176 (892)	151-192(1730)	138-165(2136)	0.7-1.2%
Wool Textiles	88(395)	116-136(2409)	135-171 (301)	126-151 (406)	0.9-1.4%



Table 3 (cont.)

Notes and Sources: See the notes to Tables 1 and 2. The industries were selected so as to ensure that there were an adequate number of observations in each year. The number of observations on which each estimate is based is reported within parentheses. The estimates for shoes in 1832 include many firms that relied on putting-out workers. Since they appear to have worked only part-time at manufacturing shoes, their estimated annual wage significantly understates what a full-time worker would have earned.

bidding up of labor compensation during the first three decades of industrialization.

Both the deceleration of real wage growth for the average manufacturing employee and the actual drop in compensation offered by large and urban Middle Atlantic establishments highlight the 1850s as different from the previous thirty years, and a genuinely protracted period of hard times for wage labor. Whereas fundamental changes in manufacturing organization, technology, and output have been accompanied by substantial increases in real wages between 1820 and 1850, real wages stagnated during this last decade of the antebellum era despite continued, if not accelerated, productivity growth. The surge in immigration of the late 1840s and early 1850s seems to be the most likely explanation of this marked change in pattern. In particular, the coincidence of impressive advance in productivity with roughly constant real wages can readily be accounted for by the highly elastic supply of labor provided by the immigration flows.<sup>29</sup> Moreover, since the new immigrants were on average less skilled than the native-born, and concentrated in Middle Atlantic urban centers, the argument also seems consistent with the observation that large and urban Middle Atlantic establishments had the worst record of wage growth during the 1850s.<sup>30</sup>

Alternative explanations that rely on a technologically-driven deskilling of the workforce are not easily reconciled with the evidence. The principal problem is the strong records of real wage growth between 1820 and 1850, the period of most extensive diffusion of the new organizations of manufacturing production which involved greater division of labor and use of less-skilled workers. Accounts that turn on a failure of labor markets, due to reduced bargaining power of artisans in the context of increasingly competitive product markets, falter on similar grounds.<sup>31</sup>

Moreover, the observation that the wage rates paid by small firms rose over time relative

to those of larger establishments seems inconsistent with the view that the demand for artisanal labor was undercut by technological development. If skilled artisans were indeed disproportionately concentrated in small shops, then this change in the structure of wages would imply that such workers realized an increase in their relative wage. Technological change may indeed have facilitated the substitution of less-skilled workers for artisans in many industries, and in so doing, bolstered the relative demand for the former.<sup>32</sup> What the evidence suggests, however, is that this effect was dominated by countervailing developments which supported the wage for skilled artisans in manufacturing: rapid growth of the industrial sector, with a relative inelastic short-run supply of artisans; expanding markets which led to more intensive and effective use of skilled labor; and the change in the relative supplies of different classes of workers produced by immigration.

The idea that artisans in traditional labor-intensive industries may have adjusted flexibly to the changes in labor market conditions, and done well, receives further support from the estimates presented in Table 3. The largest gains in real wages between 1820 and 1860 were registered in manufacturing industries which had long relied on artisans who worked with simple tools and equipment. For example, of the four industries with the most improvement, three of them, coaches and harnesses, furniture and woodwork, and tanning, are cases where firm sizes had grown significantly to accommodate a larger number of workers lacking in general skills and division of labor within the firm. By 1860, furniture and woodwork and coaches and harnesses offered the highest wages among the ten industries examined. In contrast, four of the five industries that lagged the manufacturing average in wage growth were highly capital-intensive and are seldom cited as cases of deskilling: cotton textiles, grist mills, tools and machinery, and wool textiles.

## V. CYCLICAL FLUCTUATIONS

It seems clear that the early stages of industrialization in the Northeast were characterized by a positive secular trend in real wages across a broad range of manufacturing workers. There were, however, severe cycles about that growth path during the late 1830s and mid-1850s, when sharp increases in the cost of living coincided with steep, if transitory, declines in real wages. These events are evident in Figure 3, which depicts the annual wage series of Rothenberg, and Margo and Villaflor, as well as our weighted estimates for the years of the four cross-sections, deflated by the New York City CPI. Although the reversals stand out more with this deflator, the secular advance with cycles in the late 1830s and 1850s are robust to other price series -- as are the drops in non-agricultural wages during the episodes of spikes in the cost of living.

Those who emphasize the detrimental effects of industrialization on the material conditions of workers would probably not be surprised by these intervals of pronounced volatility in real wages. Indeed, some have argued that the growing use of unskilled labor and machinery by manufacturers led to an economy which was more prone to cyclical booms and busts as well as a work force that was less able to resist reductions or obtain increases in wages. Detailed investigation of these bad spells, however, raises questions about the nature of their connections to industrial development.

Perhaps the most striking basis for skepticism about the contribution of industrialization to the difficulties of manufacturing workers during the late 1830s and mid-1850s is the evidence that the sharp increases in consumer prices during the two episodes were primarily driven by movements in food prices. As depicted in Figures 4 and 5 for New York and Vermont, the food component of the CPI is the principal source of the major jump in the cost

Figure 3  
Real Wage Indexes Deflated by NYC CPI

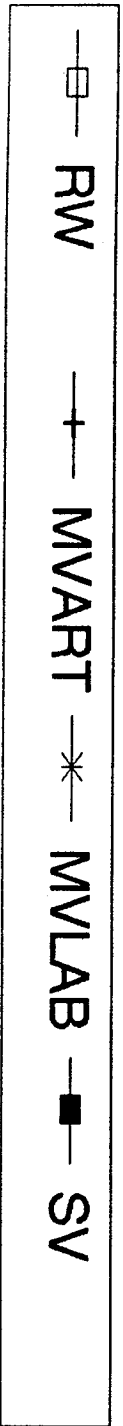
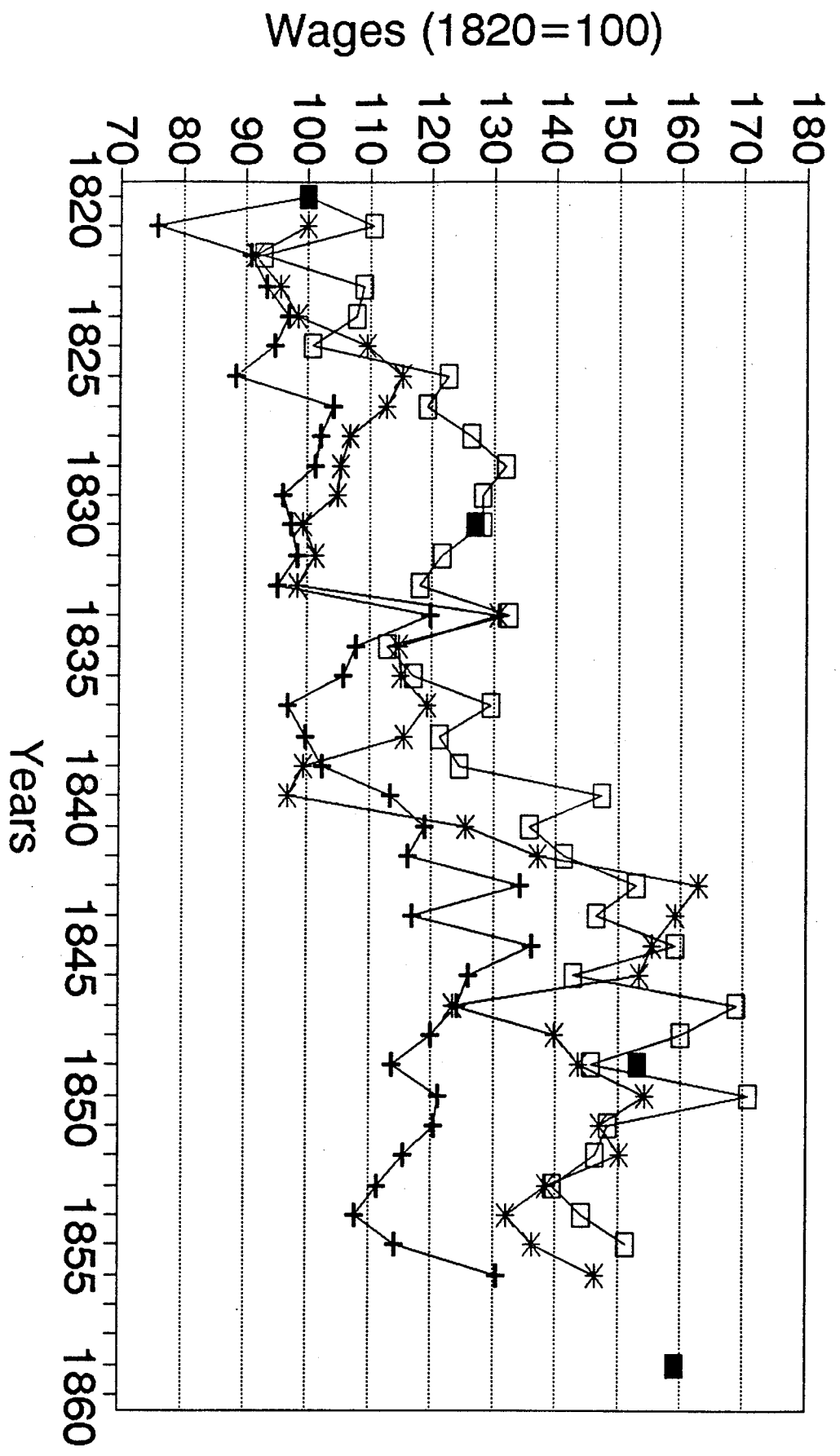


Figure 4  
Components of NY City Price Index

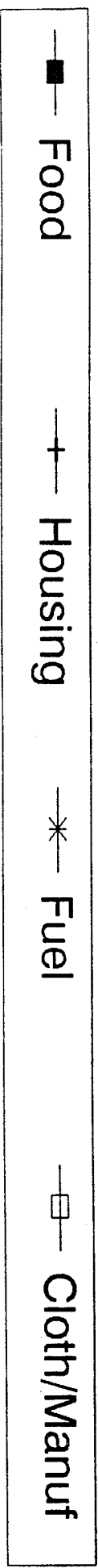
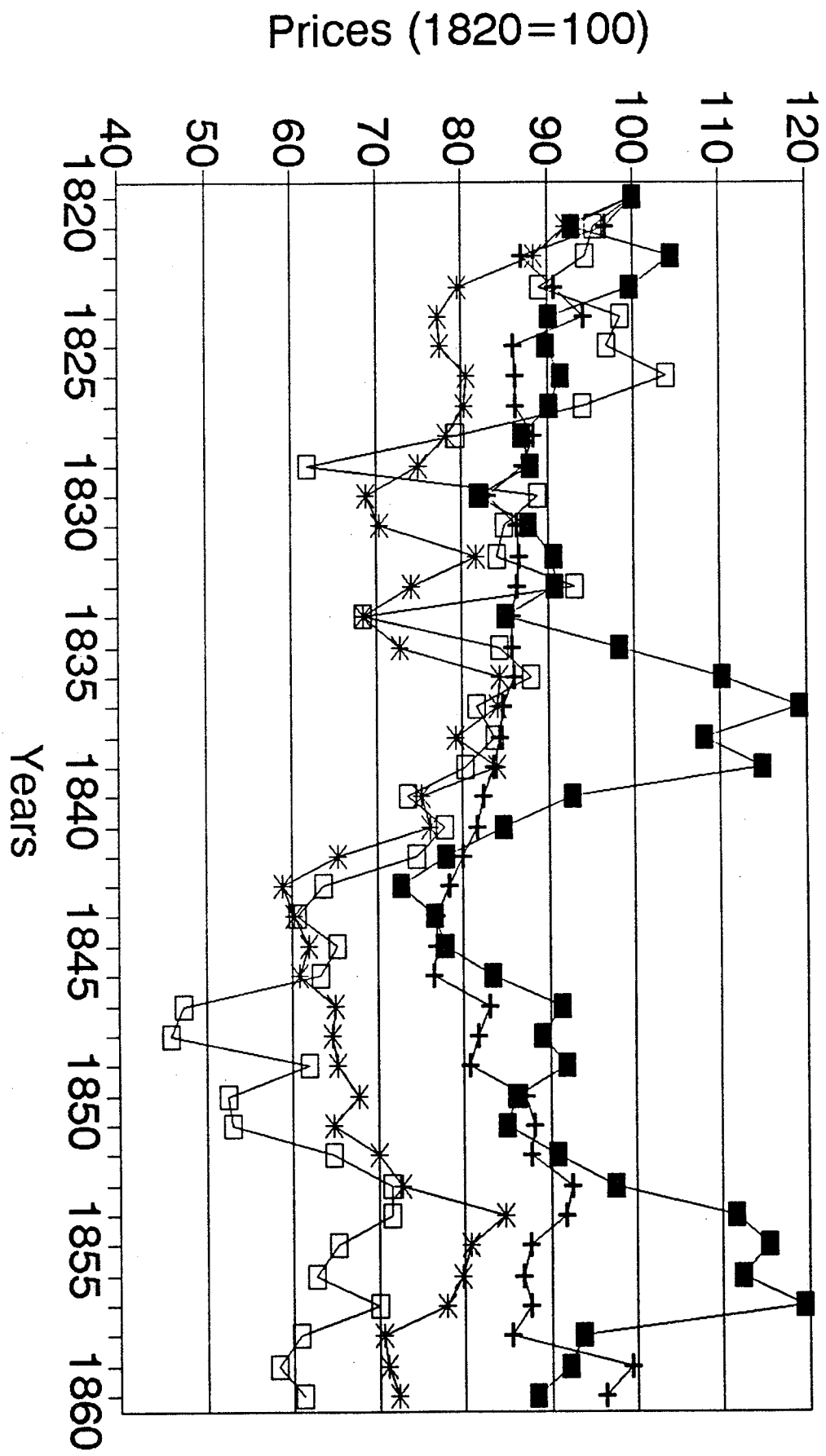
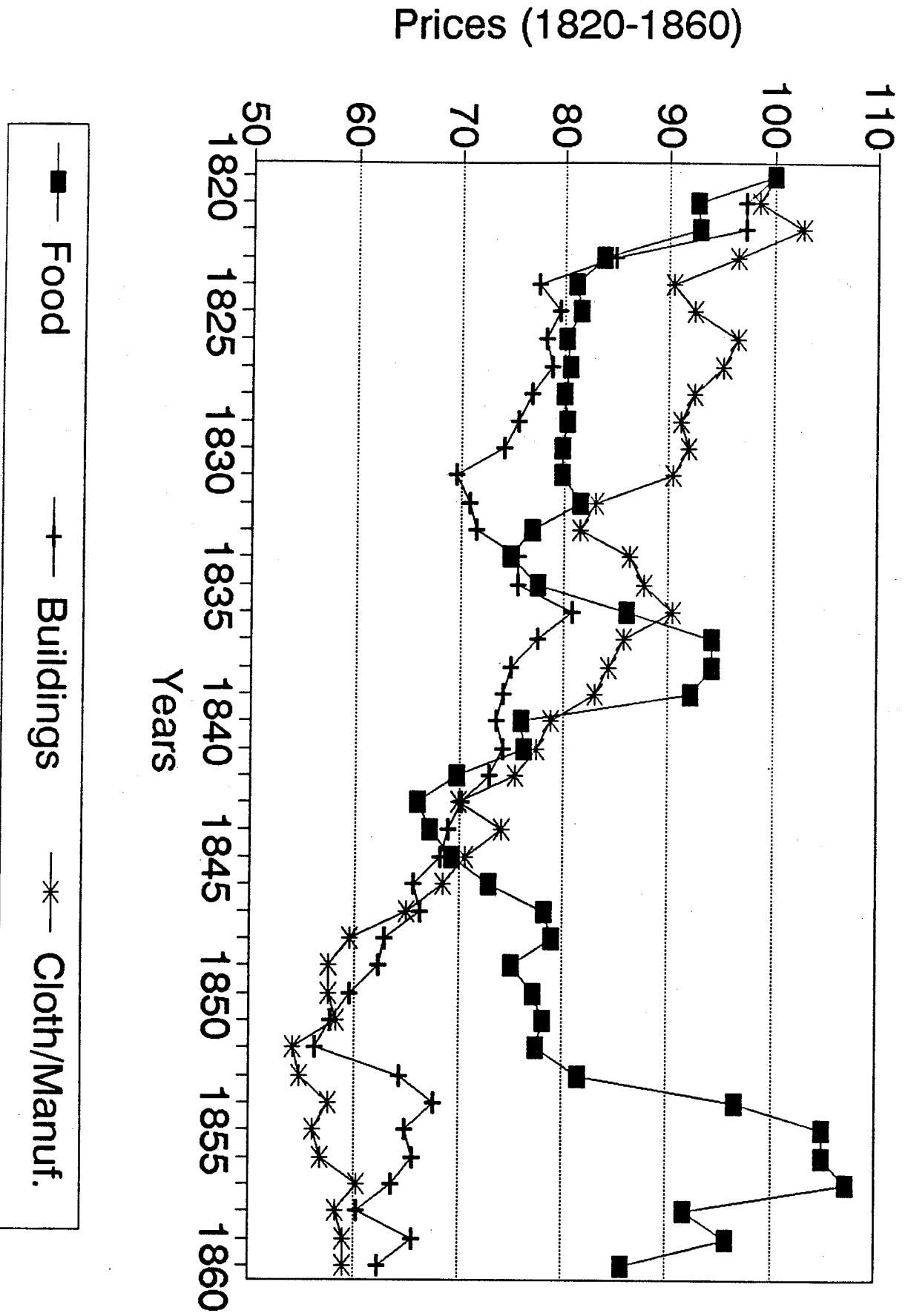


Figure 5  
Components of Vermont Price Index



Notes and Sources: See Appendix A and the notes to Table 1 and Figure 1.



of living between 1834 and 1837. Although the other components also advanced during the middle 1850s, food prices registered the most dramatic gains and were dominant in an accounting sense. This radically unbalanced pattern suggests that it may have been shocks to the economy originating in the agricultural sector that were responsible for the fluctuations in real wages, rather than any structural impediments to wage adjustment or business cycles induced by the process of industrialization.<sup>33</sup>

By decomposing food prices into sub-components, one can document that spikes of several years duration in the prices of grains, dairy, meat, and to a lesser degree, fruit and vegetables explain much of the declines in real wages during the two episodes. Figures 6, 7, 8, and 9 present indexes for these components of food prices at New York, Philadelphia, Boston, and rural Vermont. The plots reveal a strong correspondence across locations in price movements and indicate that the disturbances in food prices during the late 1830s and mid-1850s were extraordinary in magnitude and at least regional in scope. Although such events in food prices might in some contexts be related to features of industrial development, these seem instead to be more readily attributable to shocks exogenous to that process.

The major upturn in food prices beginning in 1835 seems rooted in exceptionally severe and widespread outbreaks of the wheat midge, the Hessian fly and wheat rust in New York, Pennsylvania, and New England. These pests were common throughout the 1830s, but wheat output was especially hard hit in 1835 and 1836, when the crops were devastated in many areas and riots over food prices ultimately broke out in New York City.<sup>34</sup> The agricultural periodicals of the era are replete with accounts of the situation and support the hypothesis that an extreme shortfall in grains led to dramatic increases in price with corresponding and persistent effects on dairy and meat prices because of rising feed costs and smaller

Figure 6  
Bread/Grain Prices in Selected Areas

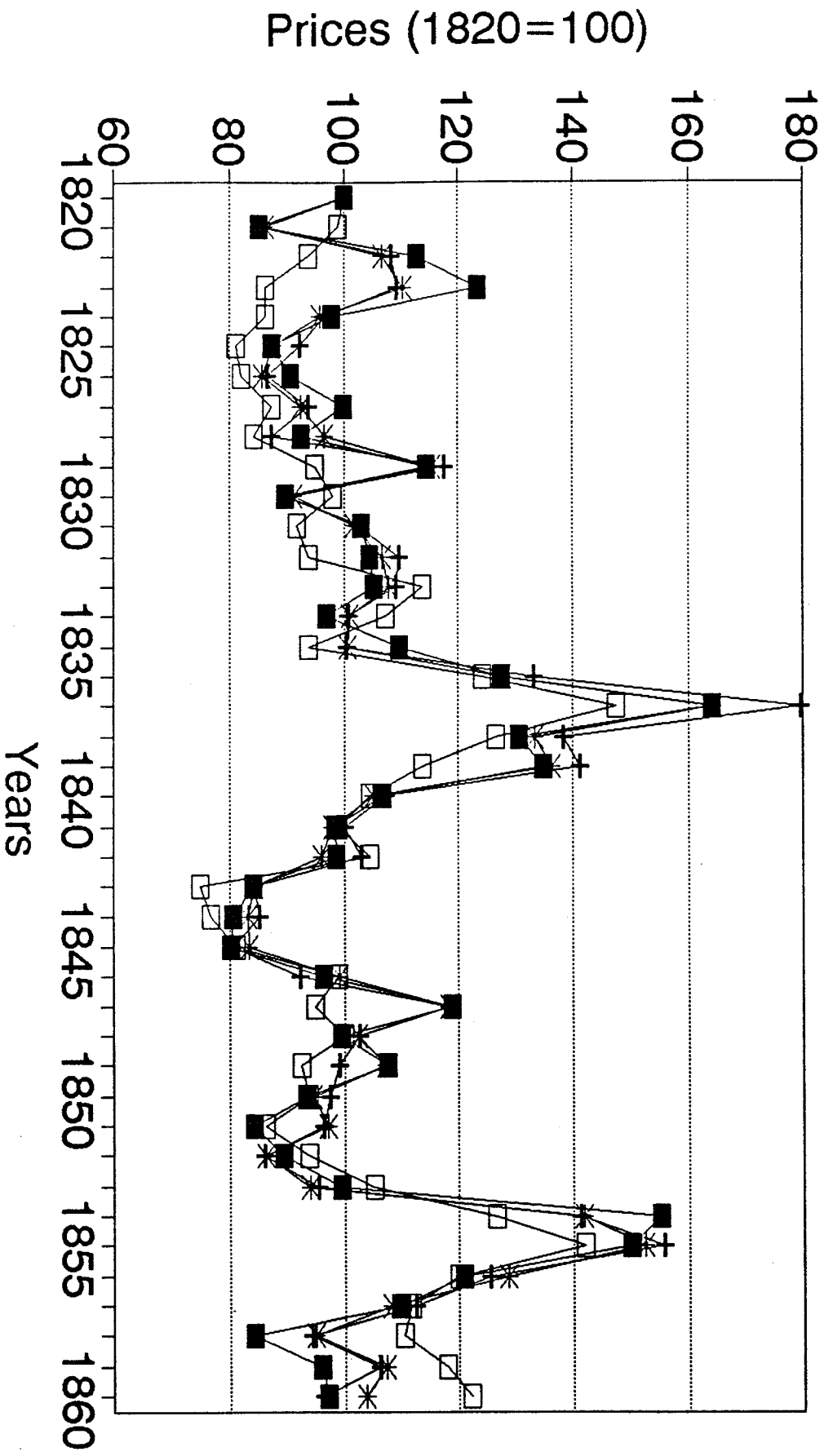


Figure 7  
Meat Prices in Selected Locations

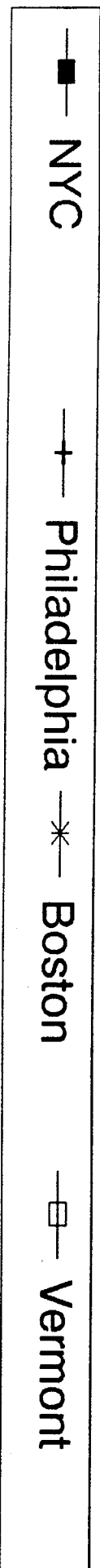
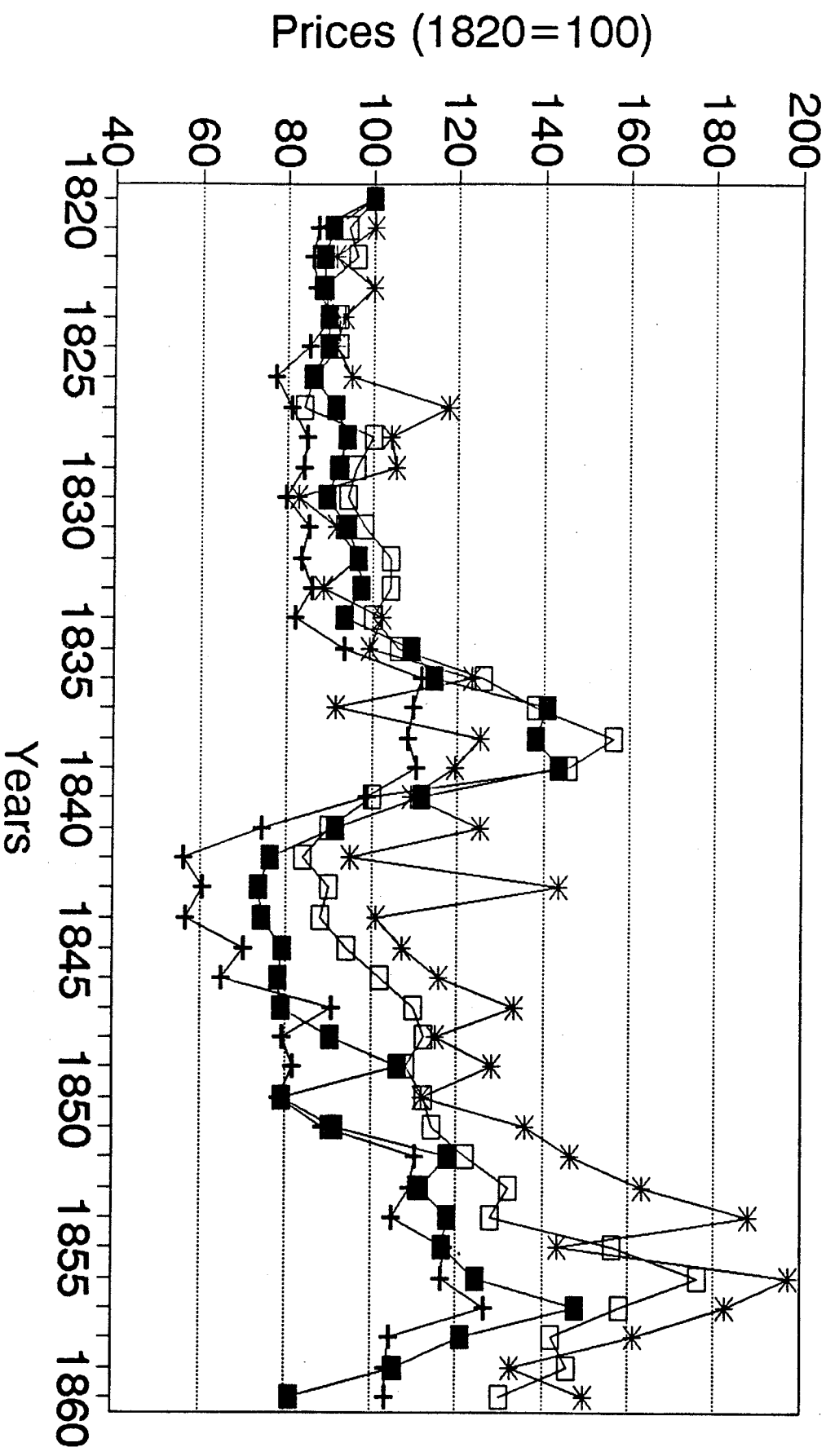


Figure 8  
Dairy Prices in NYC and Vermont

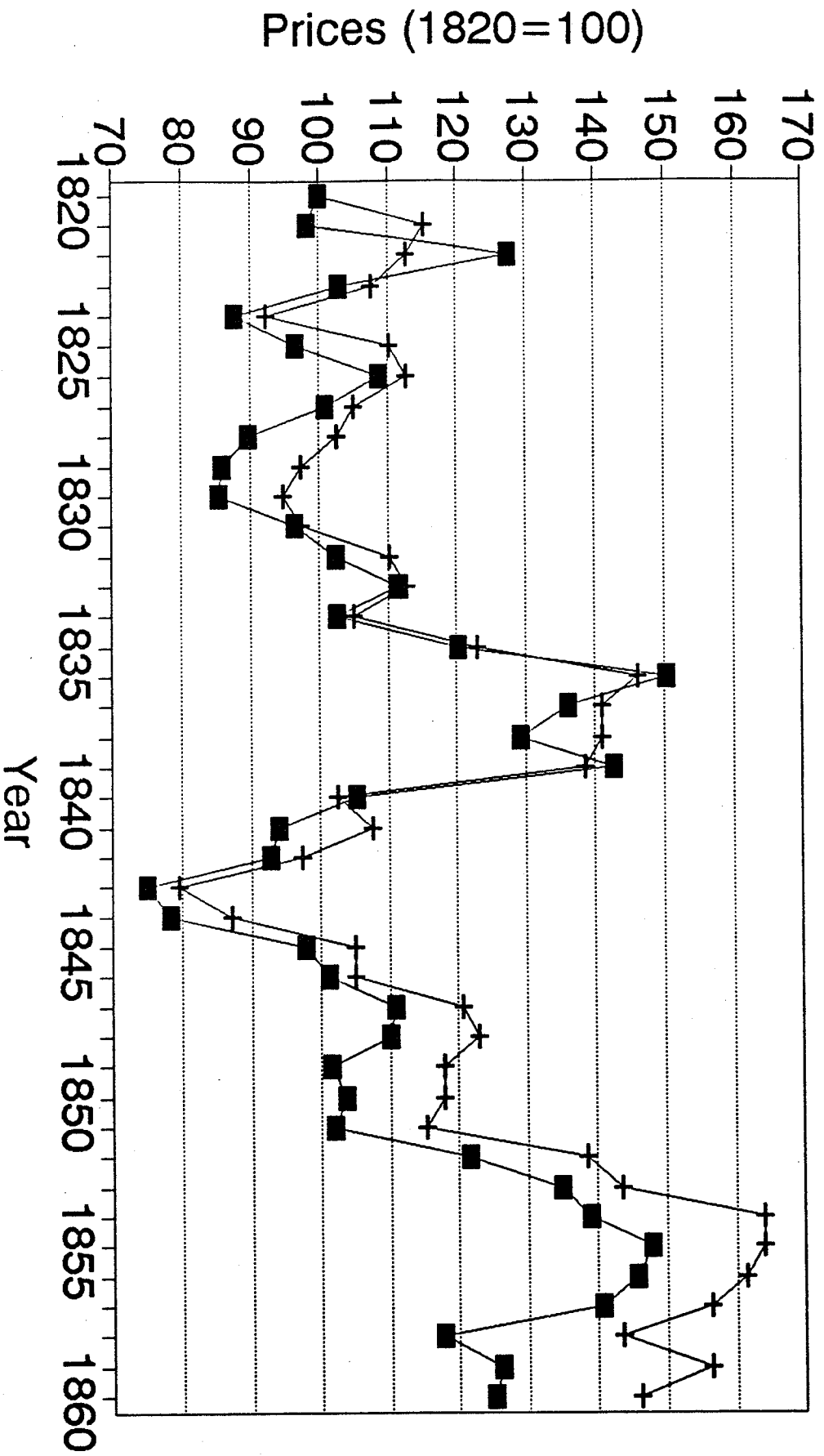
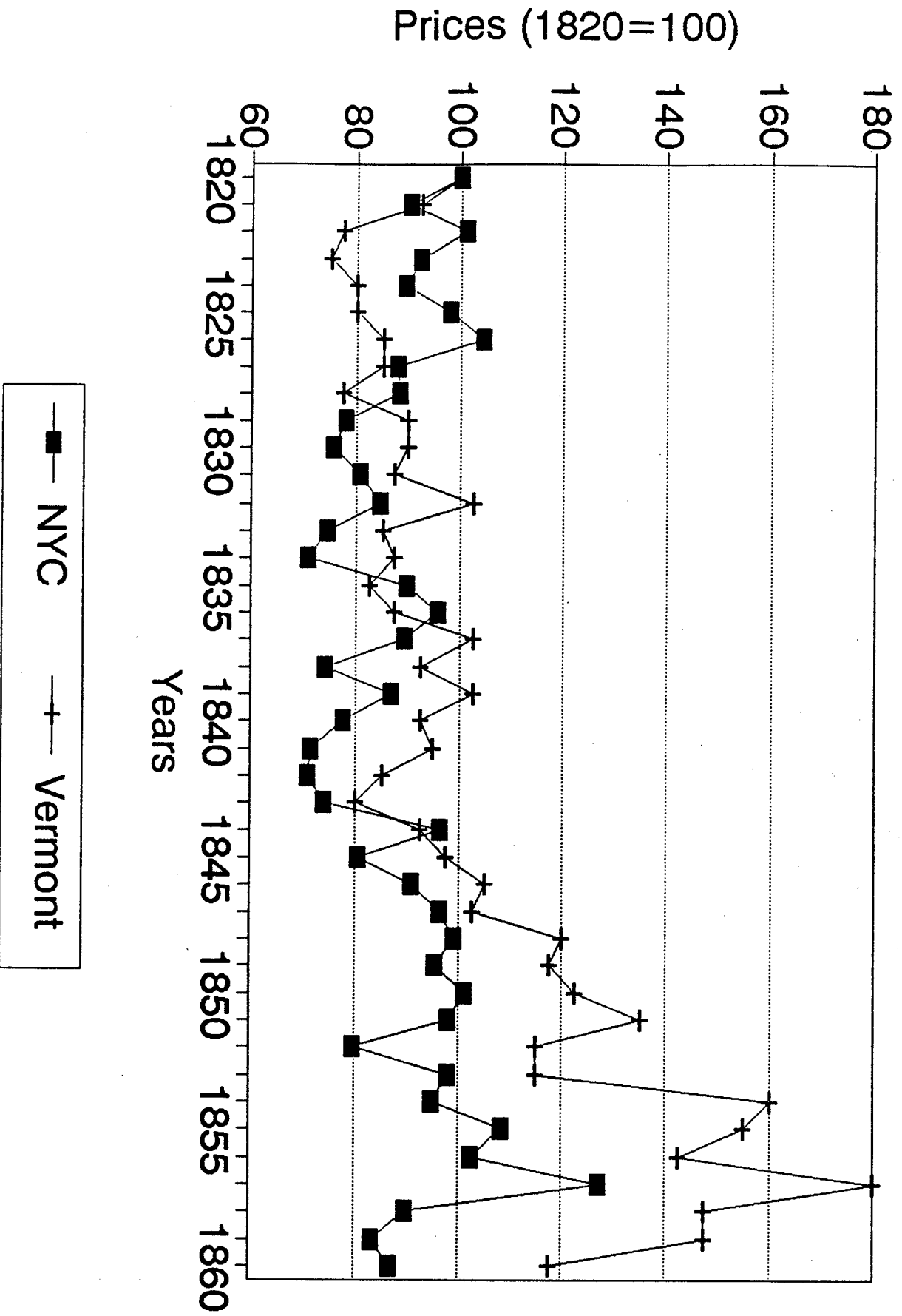


Figure 9  
Vegetable Prices for NYC and Vermont



Notes and Sources: See Appendix A.

herds:

The harvest prospect, so far as regards winter grain, is gloomy, as much so, we fear, as it was twelve months ago. Our accounts from Virginia, from the middle states, and from the wheat districts of our own state [New York], are all but favorable ... we shall have little cause to expect a better wheat crop than we had in 1836. To show that the crop of 1836, fell far short of our consumption, it is only necessary to state, that there was imported into New-York alone, from Europe, in 1836, half a million-bushels, and in the current year, up to the 19th of April, eight hundred and fifty-seven thousand bushels ... of wheat, besides rye and other grain - thus drawing from the country some millions of dollars for bread stuffs, our great staples, which we have been in the habit of exporting to a large amount ... The price of meats have been so high, and the scarcity of forage so great, that our live stock has been greatly diminished, and prudence and good management are necessary to replenish our herds and flocks.<sup>35</sup>

Indeed, grain prices began to fall precipitously in 1838, ahead of those for dairy and livestock products.

This evidence raises the possibility that the compensation of non-agricultural workers may simply have fallen with the short-term decrease in the value of their marginal product. Given the income-elastic demand for non-agricultural goods, the effect of the drop in national income would have reinforced the immediate impact of the supply shock on the relative price of food. In this view, agricultural labor should not have experienced much of a decline in real wages, and indeed Rothenberg's series is roughly stable during these years. Although the Margo-Villaflor series for laborers suggests that the recovery of real wages lagged the restoration of normal conditions in agriculture, the delay may be due to the contraction following the Panic of 1837 -- which could well have been related to the effects of the agricultural supply shock. Further study of this episode is certainly necessary, but the record seems to highlight a continued vulnerability of early industrial economies, and specifically real wages in the non-agricultural sector, to sharp fluctuations in agricultural output or other sources of short-run variability in food prices.<sup>36</sup>

As for the equally dramatic rise in food costs during the mid-1850s, the major source

appears to have been circumstances in Europe. Historians have usually credited the poor harvests throughout the continent in 1853, followed by the effects of the Crimean War on the Baltic trade, for the extremely high world grain prices (and volume of U.S. exports) prevailing through 1856. The idea that the increased cost of living in the American Northeast had an international source is supported by parallel movements in consumer price indices for Belgium, France, Germany, and Sweden during these years.<sup>37</sup> The linkage to dairy and livestock prices seems to have operated as it did earlier; grain prices began to fall in 1856 with the end of the war, but unambiguous decreases in the former (as well as in vegetable prices) did not materialize until a year or two later. The situation may have been further exacerbated by the drought in New York, which was the primary dairy and an important gardening state, in 1854 and 1855. In the 1855 New York Census, for example, only 11 percent of the reporting dairies had attained their "normal yield" of butter and cheese in 1854, with 38 percent falling at least one-third short of this standard.<sup>38</sup>

In summary, neither of the two episodes of extreme short-term fluctuations in the cost of living between 1820 and 1860 appears attributable in any meaningful way to the process of industrialization. Exogenous shocks to the agricultural sector seem, instead, to bear chief responsibility. Although there may be questions about whether the cyclical effects of the supply-side disturbances may have persisted longer because industrial sectors adjust slowly to macroeconomic shocks, or about whether the influx of immigrants retarded the adjustment of labor markets in the 1850s case, steep but temporary drops in real wages for non-agricultural workers would have occurred regardless. Given this modes and indirect role of industrialization in accounting for the volatility, there is little reason to reject the implication of the real wage trends that these early stages of growth yielded substantial improvements in the material



compensation of manufacturing workers.

## VI. MULTIVARIATE ANALYSIS OF VARIATION IN WAGES

The simple patterns of variation in wages seem to support the interpretation that workers and firms in the Northeast were quite flexible in responding to the structural and technological changes of early industrialization, and that the market for manufacturing labor generally operated well. At the same time that major shifts in the allocation of labor were taking place, virtually all segments of the workforce appear to have shared in the improved compensation arising from increases in productivity. At our level of aggregation, there is no evidence that significant groups of manufacturing employees failed to make progress because of depreciated human capital or lack of mobility between industries or geographic districts. On the contrary, the greatest gains were realized by workers in once outlying rural areas who were increasingly drawn into the growth process by the expansion of product markets. Instead of wider wage differentials, which one would expect if labor market participants adjusted slowly to altered circumstances, the gaps apparent in 1820 narrowed considerably.<sup>39</sup>

Even artisans appear to have adjusted well overall to the changing circumstances. Those who remained in small shops, for example, won wage increases equivalent in proportional terms to those of the typically less-skilled employees of medium- and large-sized establishments. Some might question whether this group was representative of artisans in general. If their employers were seeking to economize on labor costs, however, their wage rates should have reflected the opportunity cost for artisans working in other enterprises. Part of the improvement over time may have been compensation for the less amenable conditions of the work, including intensification and regimentation, implemented by manufacturers in the

increasingly competitive environment. But given that such work practices are most commonly associated with the larger manufacturing establishments, this factor does not seem able to fully explain the pattern.

These findings could be sensitive to the limited controls for independent variables in the bivariate analysis. Accordingly, we have examined a variety of multivariate approaches, including the cross-sectional weighted regressions presented in Table 4 for each of the four years. They provide more comprehensive estimates of the patterns of variation by regressing the wage rate for adult males on dummy and interaction variables for firm characteristics. The qualitative results remain unchanged, however. Even after adjusting for industry, sub-region, urbanization, and firm size, there is a marked convergence over time in wage rates between classes of workers. Employees in counties with major urban centers, for example, began in 1820 and 1832 with a statistically significant edge of approximately 15 to 20 percent (summing the coefficients on the urban and major urban dummies) over their rural counterparts, but the discrepancy fell to barely 10 percent in 1850 and was insignificant in 1860. Similarly, according to regressions (1), (3), (5), and (7), wage rates in small establishments rose from roughly 16 percent less than those in medium-sized firms (with an even greater deficit compared with large establishments) in 1820, to 9 percent less in 1832, to parity in 1850 and 1860. This pattern is robust to alternative specifications and suggests that labor markets were becoming so well integrated over time that influences on wages in one district would soon be reflected in other areas.

The one anomalous feature is that the gap between small and larger enterprises in the rural parts of the Middle Atlantic declined only modestly over the period from about 30 percent in 1820 and 1832 to roughly 15 to 25 percent in the later years. This understates the extent

TABLE 4: Cross-Sectional Wage Regressions for Adult Males in Northeastern Manufacturing:  
1820, 1832, 1850, and 1860.

Dep. Var. Log (Adult Male Wage)	Constant	SUB-REGIONS				URBANIZATION			FIRM SIZE			INTERACTIONS			N	R <sup>2</sup>
		New Eng.	N. New Eng.	S. New Eng.	New York	Urban	Major Urban	Small	Large	Small *	Small Urban	Small Urban	Mid. Atl.			
(1)	5.519 (117.62)	-0.111 (-1.97)	-0.072 (-1.89)	-0.097 (-2.80)	0.048 (1.18)	0.154 (3.40)	-0.162 (-3.82)	0.062 (1.88)							623	0.26
(2)	5.544 (118.23)	-0.175 (-3.05)	-0.125 (-3.15)	-0.086 (-2.52)	0.027 (0.64)	0.129 (2.85)	-0.298 (-5.76)	0.069 (2.11)	0.343 (4.331)						623	0.28
<u>1832</u>																
(3)	5.654 (148.35)	0.036 (1.81)			0.109 (5.52)	0.110 (1.54)	-0.085 (-1.93)	0.068 (2.33)							708	0.37
(4)	5.676 (149.21)	0.016 (0.82)			0.104 (5.27)	0.101 (1.43)	-0.324 (-4.50)	0.064 (2.22)	0.301 (3.78)	0.077 (0.83)					708	0.38
<u>1850</u>																
(5)	5.570 (130.15)	0.082 (2.35)	0.066 (3.16)	0.015 (0.77)	0.043 (1.96)	0.074 (3.41)	-0.024 (-0.82)	0.012 (0.48)							981	0.45
(6)	5.618 (127.82)	0.017 (0.43)	0.043 (1.98)	0.009 (0.45)	-0.002 (-0.09)	0.065 (2.95)	-0.160 (-3.72)	0.025 (0.99)	0.225 (3.43)	0.019 (0.24)	0.156 (3.30)				981	0.46
<u>1860</u>																
(7)	5.595 (99.22)	0.040 (0.88)	0.087 (3.13)	-0.045 (-1.68)	0.013 (0.44)	0.017 (0.71)	-0.053 (-1.33)	0.057 (1.84)							858	0.20
(8)	5.657 (97.73)	-0.020 (-0.40)	0.079 (2.80)	-0.046 (-1.74)	-0.049 (-1.42)	0.020 (0.84)	-0.253 (-4.17)	0.060 (1.94)	0.312 (2.69)	0.010 (0.07)	0.248 (3.88)				858	0.22

Notes and Sources: See the notes to Tables 1 and 2. These regressions use the log of the nominal annualized wage as the dependent variable, and were estimated with industry dummy variables which are excluded from the table. Each observation was weighted by the number of adult male employees. The selection of independent dummy variables was somewhat different for 1820 and 1832, because the sample from the former year included few small establishments in urban New England counties, and the sample from the latter consisted primarily of observations from Massachusetts and Pennsylvania. Coefficients are reported with t-statistics below within parentheses. The constant represents a cotton textile firm operating in a rural county of Delaware, New Jersey, or Pennsylvania.

of convergence, however. First, wage levels were virtually uniform across small and medium-sized firms in New England and the urban counties of the Middle Atlantic throughout the period (evident in regressions (2), (4), (6), and (8)). Moreover, rural averages alone do not adequately convey the process of wage adjustment occurring as markets expanded into what had been remote districts. As falling transport costs brought them increasingly into competition with distant producers, rural firms were induced to raise their productivity and wage rates to competitive levels. These adjustments contributed to the relative advance of both wages and firm size in rural counties, and with the declining fraction of shops which were so insulated, the overall wage gap between small and medium enterprises fell to statistical insignificance by 1850 (see (5) and (7)). Small firms with lower wages did persist in isolated parts of the Middle Atlantic, as is apparent from (6) and (8), but their relative numbers dwindled over time.

The regressions confirm a relative increase over time in the wage rates offered by small establishments overall, but indicate that the pattern did not quite hold everywhere. An examination of the change over the cross-sections in the coefficients on the dummy variables for firm size and on their interactions with region and urbanization reveals that these gains by workers in small shops were realized throughout New England, but only in the rural counties of the Middle Atlantic.<sup>40</sup> Even in the divergent Middle Atlantic cities, however, workers in small firms maintained their relative wages. In none of these areas, therefore, do artisans appear to have suffered in either absolute or relative terms.

The regressions in Table 5 differ in that they examine both the cross-sectional and temporal variation over a pooled sample, and accordingly subject the hypotheses about trends over time to more direct tests. The coefficients on the year dummies reflect substantial real wage growth over the period from 1820 to 1860, even after controlling for changes in industry,

TABLE 5: Pooled Cross-Sectional Real Wage Regressions:  
1820, 1832, 1850 and 1860

	Dependent Variable: Log (Adult Male Wage)			
	(1)	(2)	(3)	(4)
Constant	6.053 (218.00)	6.041 (215.84)	6.055 (215.63)	6.081 (180.97)
Sub-Regions:				
Northern New England	-9.020 (-0.62)	-0.027 (-0.87)	-0.034 (-1.09)	-0.024 (-0.78)
Southern New England	0.007 (0.25)	0.006 (0.21)	0.005 (0.17)	0.018 (0.67)
New York	-0.067 (-4.76)	-0.068 (-4.82)	-0.070 (-4.97)	-0.064 (-4.54)
Urbanization:				
Urban	0.041 (3.24)	0.039 (3.04)	0.021 (1.56)	-0.048 (-1.81)
Major Urban	0.059 (4.09)	0.063 (4.37)	0.062 (4.31)	0.070 (4.71)
Year:				
1820	-0.494 (-27.82)	-0.474 (-24.81)	-0.479 (-25.09)	-0.517 (-16.27)
1832	-0.209 (-15.02)	-0.194 (-13.47)	-0.201 (-13.95)	-0.250 (-9.88)
1850	-0.055 (-4.34)	-0.055 (-4.00)	-0.055 (-4.02)	-0.083 (-2.52)
Firm Size:				
Mid-Atlantic Small	-0.132 (-5.20)	-0.080 (-2.41)	-0.175 (-4.48)	-0.198 (-4.94)
Mid-Atlantic Large	0.020 (0.95)	0.022 (1.07)	0.024 (1.18)	0.030 (1.46)
New England Small	0.018 (0.56)	0.124 (2.94)	0.095 (2.23)	0.070 (1.63)
New England Large	0.017 (0.83)	0.021 (0.99)	0.024 (1.17)	0.028 (1.33)

Table 5 (cont.)

	Dependent Variable: Log (Adult Male Wage)			
	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>
<u>Other Interactions:</u>				
Mid-Atlantic Small Urban			0.165 (4.56)	0.191 (5.03)
Small 1820		-0.126 (-2.77)	-0.076 (-1.64)	-0.042 (-0.87)
Small 1832		-0.199 (-4.25)	-0.157 (-3.31)	-0.118 (-2.44)
Small 1850		-0.021 (-0.59)	-0.019 (-0.53)	-0.004 (-0.10)
Urban 1820				0.126 (3.37)
Urban 1832				0.084 (2.87)
Urban 1850				0.037 (1.09)
Artisanal 1820				-0.256 (-5.56)
Artisanal 1832				-0.109 (-2.86)
Artisanal 1850				-0.049 (-1.32)
N	3281	3281	3281	3281
R <sup>2</sup>	0.38	0.39	0.39	0.40

Notes and Sources: See the notes to Tables 1, 2, and 4. The industries classified as artisanal in the interactions are coaches/harnesses, clocks/jewelry, glass, and furniture/woodwork. Industry dummy variables were included in the regressions, but are not reported here. The constant represents a medium-sized cotton textile firm operating in 1860 in a rural county of Pennsylvania, Delaware, or New Jersey in the year 1860. The wages were deflated by the New York CPI.

location, and firm size. Again, the pace of advance was most rapid during the 1820s, and slowed to a virtual standstill during the 1850s. The results also provide further evidence of improved market integration. In particular, regression (2) indicates again that wages in small firms began in 1820 at a lower level, but rose at a faster pace to overtake, or surpass in New England, those of larger enterprises as early as 1850. Although its statistical significance is reduced, the pattern continues to hold (regression (3)) when one allows for different relationships with firm size between New England and the Middle Atlantic.

Especially telling is regression (4), where the coefficients on the interaction variables between years and firm characteristics suggest that wages grew more rapidly in rural counties, and in artisanal industries like coaches and harnesses, clocks and jewelry, glass, and furniture and woodwork. This latter finding, which is robust to reasonable changes in classification, bolsters the case for our interpretation of the relative wage growth of artisans. All of the industries included in this artisanal group tended to rely on traditionally-trained artisans, but shifted somewhat over time toward the use of greater numbers of less-skilled employees for the carrying out of the simpler tasks in the production process. That their workers on average realized more substantial increases in wages, after controlling for firm size, is important corroborating evidence.

In general, the results support the view that early industrialization boosted real wages for virtually all groups in manufacturing, but was of greatest benefit to employees in areas previously insulated from the broad markets. Decreases in transportation costs, as well as improvements in productivity stimulated by the extension of markets, led wages in such districts to rise to general competitive levels. In those parts of the Northeast which were just beginning to engage in extensive commerce and develop substantial manufacturing activity, it is perhaps



not surprising that skilled or artisanal labor became increasingly scarce and had its relative return bid up.

## VII. LABOR MOBILITY

Much of our discussion of the market for manufacturing workers during early industrialization presumes that there was extensive trade and labor mobility within the Northeast. Even if manufacturing firms realized productivity growth, the fruits of this progress would not necessarily be shared with employees unless there were effective competing demands for the labor.<sup>41</sup> Similarly, the wages of artisans employed in small shops would not reflect those in other enterprises unless there was effective competition for jobs. One method of gauging the intensity of such competition would be to examine the frequency with which workers changed jobs and the associated changes in wages rates. Although the substantial sectoral shift of labor out of agriculture suggests that there must have been considerable occupational mobility, the current lack of job histories for individuals makes direct study of the question problematic. Another way of approaching the issue, however, is to examine the extent of geographic mobility.<sup>42</sup>

The samples of U.S. Army recruits drawn by Fogel and his colleagues contain information on places of birth and enlistment for each soldier and permit the estimation of migratory flows between locations as well as persistence rates.<sup>43</sup> Table 6 presents such a cross-tabulation for the geographic mobility of northeastern-born recruits during the Civil War between cities or villages classified by size. The results indicate high rates of geographic mobility among the young men included in this randomly-drawn and quite representative sample. Even with the use of such general categories for destination, the rates of persistence seem quite low. For example, only 54 percent of the recruits born in rural areas (cities or

TABLE 6: Geographic Mobility Of Civil War Recruits Born In The Northeast

		<u>Place of Birth</u>				<u>TOTAL</u>
		<u>Rural Areas</u>	<u>Small Cities</u>	<u>Large Cities</u>	<u>[4 Largest Cities]</u>	
<u>Place of Enlistment</u>	Rural Areas	696	151	129	91	976
	(a)	0.71	0.15	0.13	0.09	1.00
	(b)	0.54	0.16	0.11	0.10	0.28
<hr/>						
Small Cities	(a)	351	613	112	93	1076
	(b)	0.33	0.57	0.10	0.09	1.00
	(b)	0.27	0.63	0.09	0.10	0.31
<hr/>						
Large Cities	(a)	243	206	938	711	1387
	(b)	0.18	0.15	0.68	0.51	1.00
	(b)	0.19	0.21	0.80	0.79	0.40
<hr/>						
[4 Largest Cities]	(a)	43	71	635	579	749
	(b)	0.06	0.09	0.85	0.77	1.00
	(b)	0.03	0.07	0.54	0.65	0.22
<hr/>						
TOTAL	(a)	1290	970	1179	895	3439
	(b)	0.38	0.28	0.34	0.26	1.00
	(b)		1.00	1.00	1.00	1.00

Notes and Sources: The table provides a cross-tabulation of places of birth and enlistment for all of the individuals contained in the random sample of Civil War recruits for which they were reported. Proportions of row totals appear on lines (a), while proportions of column totals appear on (b). Rural areas consist of cities or villages with populations less than 2500 in 1860; small cities include those with populations from 2500 to 9999; and large cities had populations of 10,000 or more. The next to last row and column of the table pertain to recruits born or enlisted in the cities of Boston, Brooklyn, New York and Philadelphia. The figures for these "4 Largest Cities" are also counted in the "Large Cities" category. For further information about the sample, see Fogel, "Nutrition and the Decline in Mortality."

villages with populations less than 2500 in 1860) enlisted in such districts, while the figures for recruits born in small and large cities were 63 percent and 80 percent, respectively. The actual persistence rates for enlisting in the same city as birth occurred in were of course considerably lower (about 40 percent overall), but the rank ordering in which rural areas have the highest (and large cities the lowest) rates of outflow is preserved. Perhaps not surprisingly, there was net out-migration of native born from rural areas and net in-migration to small and large cities. The data for the four largest cities in 1860 (Boston, Brooklyn, New York, and Philadelphia) are also reported separately. Although they experienced a slight net outflow of native born, they also had higher persistence rates than either rural areas or small cities.

These estimates are consistent with our view that the Northeast was characterized by extensive geographic mobility during the early stages of industrialization, and that employers of labor would have had to match wages for workers in other parts of the region. Indeed, with an extremely mobile population, a demonstrated ability on the part of workers to shift between industries, and expanding output markets, the basic requirements for a well-integrated labor market and wage convergence appear satisfied.

The estimates in Table 6 also provide information about the relative attractiveness of circumstances in cities as opposed to rural areas. It is especially interesting that the net movement of natives born in the Northeast is toward cities, even though the tendency of the immigrants to cluster there might be expected to have adversely affected housing costs, labor market conditions, and the disease environment.<sup>44</sup> The preference of these young men for cities also overrode the apparent increase between 1820 and 1860 in rural wages relative to urban. This flow of migrants undoubtedly contributed to the process of wage convergence and may have reflected an advantage for cities in the cost of living, in real incomes for natives, or

in illiquid capital gains reaped by urban households during the years of exceptional city growth.

As David Galenson and Clayne Pope have argued, longstanding residents of an area might benefit disproportionately from rapid population growth through an increase in the relative value of the location-specific assets (human as well as physical) acquired earlier. Given that the tendency for native-born recruits to be disproportionately represented in the middle- and upper-class occupations was more pronounced in urban areas than rural, these data provide some support for the hypothesis.<sup>45</sup> If the theory is correct, our mean wages for various categories of manufacturing workers in 1860 would underestimate the average wage for the respective classes of only native-born employees, and the extent of the bias would vary with the proportion of foreign born in the labor force. The immigrants would have led to a bidding up of the returns to native labor in those districts where they concentrated, but at the same time obscured this effect in the gross wage data by occupying a larger fraction of the jobs and working at lower wage rates.

## **VIII. CONCLUSIONS**

The early stages of industrialization no doubt posed a challenge to many workers. Through the same process that created new opportunities, old patterns of behavior were rendered less rewarding, if not totally lacking in viability. Not all people thrive under such conditions. It might seem remarkable, therefore, that the material benefits from the onset of growth in the American Northeast were widely shared, and that all of the groups distinguishable in our data realized substantial increases in real wages over the period from 1820 to 1860. Indeed, those workers who were tested by having their insulation from the broad regional market eroded by improvements in transportation, registered the greatest

advances in compensation. This record of achievement under pressure tells us much about the people and the process of industrialization in the early Republic, and indicates that Americans were on the whole eager to pursue economic opportunities -- whether this meant jobs with higher wages, goods at lower prices, or investments with better returns.

Many scholars have questioned how well traditional artisans coped with the challenges associated with early industrialization. This group had large investments in knowledge of general production skills, whose value might have been depreciated by the direction and accelerated pace of technical change. Yet our estimates, though indirect, suggest that on average their wages grew more rapidly than those of other manufacturing workers. There were obviously individual artisans who did less well than this average, especially among the older workers who typically had more difficulty adjusting to new jobs or regimes. But one should not ignore the many opportunities that remained for the class as a whole and were evidently exploited. Their skills and knowledge continued to be valued in many industries because of the slow progress in standardizing the production of high-quality or customized goods, and their usefulness to factories in the performance of specific tasks requiring general expertise.

Despite the substantial progress over time, the record of real wages in manufacturing between 1820 and 1860 was not one of continual improvement. Bad things do happen, and early industrial America was no exception to this law of nature. How much misfortune was due to industrialization is a question not easily answered. As for individual experiences, life can be punishing and there are always some who take losses. As for classes of manufacturing workers, however, none of the painful intervals that stand out in the record seem likely to be directly or primarily attributable to the path of industrial development. If the sharp fluctuations in real wages during the 1830s and 1850s were indeed driven by movements in food prices,

the contributions of industrial organization, industrial labor markets, or technology to these bad spells seem reduced to issues of persistence. Similarly, the slowdown in real wage growth between 1850 and 1860, associated with a corresponding increase in the capital share of manufacturing income, is hard to link directly to industrialization. The most likely explanation is the immigration of the late 1840s and 1850s, but the unusually heavy flows of these years do not appear to have been endogenous with respect to domestic economic circumstances. On the contrary, they, like the other major shocks to the progress of manufacturing workers during early American industrialization, seem largely to have been imposed exogenously, rather than being naturally generated by the process. Whether the beginning of industrialization made the American Northeast more or less prone and sensitive to volatility in agricultural prices, labor supply, or other socioeconomic variables is an important question yet to be resolved. But the implication of the evidence examined here is that despite its material advantages and rapid secular advance, this small early industrial economy remained quite vulnerable to extreme fluctuations in agricultural conditions and other such disturbances.

## APPENDIX A

The Williamson and David-Solar price indices are drawn respectively from Jeffrey G. Williamson, "American Prices and Urban Inequality," Journal of Economic History, 36 (June 1976), pp. 303-333; and Paul A. David and Peter Solar, "A Bicentenary Contribution to the History of the Cost of Living in America," Research in Economic History, 2 (1977), pp. 1-80. The former was meant to pertain to the urban poor in northeastern cities, and the latter to the Northeast in general. The New York and Vermont consumer price indices, as well as those for Boston and Philadelphia reported below, were constructed by adopting the rather conservative budget shares (Brady, "Price Deflators for Final Product Estimates" and "Consumption and the Style of Life") estimated for low-income urban households: 0.599 for food, 0.133 for housing, 0.061 for fuel and lighting, and 0.205 for clothing and other manufactured goods. This division of expenditures might be considered conservative, because it is at the high end of the estimates with respect to the share devoted to food, and food prices rose over the period relative to the prices of most other commodities. The budget shares for middle and upper income groups imply a somewhat greater decline in the cost of living over time. Since information on the prices of individual food products is relatively plentiful, separate indices of food prices were prepared for each location by using budget shares for individual commodities derived from Hoover ("Retail Prices After 1850"). This food component of consumer prices was divided between meat and fish (0.233), bread and baking goods (0.193), dairy products (0.163), fruits and vegetables (0.164), and other food products (0.247). Hoover's budget shares were estimated from late-nineteenth century data, and might also be considered conservative with respect to the extent of price decline before 1860, because she gave much less weight to expenditures on once scarce commodities like tea and sugar, which loomed large

in worker budgets of the early-nineteenth century and yet fell substantially in price over the antebellum period (Larkin 1988, p. 175).

Where possible, the sub-components of the food price indexes for Boston, New York, and Philadelphia were estimated separately from city-specific wholesale (or retail in the case of Boston) commodity series contained in Anne Bezanson, Robert D. Gray, and Miriam Hussey, Wholesale Prices in Philadelphia, 1784-1861 (Philadelphia, 1937); Arthur H. Cole, Wholesale Commodity Prices in the United States, 1700-1861, 2 vols., (Cambridge, 1938); George G. Warren and Frank A. Pearson, Prices (New York, 1933); and Carroll Wright, Sixteenth Annual Report of the Massachusetts Bureau of Statistics of Labor (Boston, 1885). Among the individual commodities whose price series were employed are bread, flour, cornmeal, indian meal, rye meal, and rice (bread and baking goods); bacon, beef, pork, fish, and halibut (meat and fish); and coffee, eggs tea, molasses, sugar, gin, rum, and whiskey (other food products). For the dairy products and fruits and vegetables components, however, there were not sufficient data available to estimate separate indices; hence, materials from all of these cities were pooled, with the price index for dairy products estimated from series for butter, cheese, and lard, as well as from the Bezanson average for dairy products. The price index for fruits and vegetables was estimated from series for potatoes, lemons, raisins, apples, as well as from the Bezanson averages for beans, fruits, and condiments. The three cities also share the same price indices for fuel and lighting, housing, and clothing and manufactured goods. The component for fuel and lighting was computed as an average of the Warren and Pearson and Bezanson indices; the Adams series for construction costs (Donald R. Adams, Jr., "Residential Construction in the Early Nineteenth Century," Journal of Economic History, 35 (December 1975), pp. 794-816.) in Philadelphia is used as the housing component; and the clothing and manufactured goods component is a weighted average of commodity series for shoes, gloves, handkerchiefs, hose,



calico, cambric, muslin, cotton yarn, and linen, as well as of interpolated series for the product prices in the coaches/harnesses, furniture, glass, and paper industries (Sokoloff 1986). Further details on the construction of the indices are available from the authors.

The Vermont index has been constructed anew from the information in T.M. Adams, Prices Paid By Vermont Farmers for Goods and Services and Received By Them for Farm Products 1790-1940, Bulletin 507 (Burlington, VT, 1944), on the retail prices paid by Vermont farmers and on the prices they received for their produce. Although Adams estimated an index of food prices directly from his data, we have modified his series because the expenditure pattern on food of Vermont farmers seems unlikely to be representative of that of manufacturing workers. Specifically, we have used the Adams series for the prices farmers received for their livestock and vegetables as the components for meat and fish and fruits and vegetables, respectively. His series for the prices received for grains and dairy products are employed in Figures 7 and 9 below. Adams's food price series, which includes both local produce and agricultural goods obtained from afar, is used for the remaining parts of our overall Vermont food index. In addition, the Adams series on the cost of building materials and on the cost of clothing serve as the components for housing and clothing and other manufactured goods, respectively. The only set of non-Vermont prices employed is for the fuel and lighting component, where the average of the Warren and Pearson and Bezanson indices is again used.

Many of the choices about the weights for individual commodities, or between alternative price series, are to some degree arbitrary. In order to limit the significance of this potential problem, as well as to learn more about the patterns of price variation, extensive sensitivity analysis was carried out on many issues before settling on the particular specifications reported. In general, we were impressed with the robustness of the basic results.

What stands out are the major declines in the prices of manufactures and imported food products, the modest declines in fuel and lighting costs, and the roughly stable or rising prices of meats, grains, and dairy products. This sharp change in relative prices, which was of course to the benefit of farmers, appears to have been especially pronounced in rural areas like Vermont, where improvements in transportation induced a convergence of local prices toward the levels prevailing in urban districts. As a consequence, the Vermont price index was the most sensitive to the weights used on the different components, and one should be cautious about accepting the implication of our estimates that the overall cost of living there for manufacturing workers fell relative to that in urban centers.

There are two potentially severe problems with the construction of our indexes, but they work in opposite directions. The first is the wholly inadequate series for housing costs, which likely understates the substantial runup in large cities resulting from heavy immigration and domestic migration in the 1840s and 1850s. However, due to the limited share of housing in total consumption expenditures (13.3%), as well as caveats about the higher rentals reflecting the improved services arising from residence in a particular location, one should be careful before concluding that the qualitative results are an artifact of this deficiency. Moreover, the effects of the poor coverage of housing are to some degree offset by the failure to account for improvements in the quality of all kinds of products which are not reflected in price. Many scholars (Brady, "Relative Prices;" and Gordon, Measurement of Durable Goods Prices) have noted or demonstrated that the quantitative significance of this defect of conventional price indices can be enormous, and one would expect this factor to have been important with the introduction of many new products and the competition over the ornament and design of even simple consumer items which has characterized early and late American industrialization. Such improvements in quality were likely realized in agricultural products such as butter, cheese, and

meat, as well as in housing and manufactures (Gates, A Farmer's Age; Brady, "Relative Prices;" and Larkin, Reshaping). A related problem is that the price indexes fail to entirely capture the gains to consumers over the period arising from greater regularity in supply of products as well as easier access to retailers.

## ENDNOTES

<sup>1</sup>Among economic historians, the so-called "standard of living debate" has focused on the British experience. For example, see Eric J. Hobsbawm, The Age of Revolution, 1789-1848 (Cleveland, 1962); R.M. Hartwell, "The Rising Standard of Living in England, 1800-1850," Economic History Review, 13 (April 1961), pp. 397-416; and Stephen A. Marglin, "What Do Bosses Do?: The Origins and Function of Hierarchy in Capitalist Production," Review of Radical Political Economics, 6 (Summer 1974), pp. 33-60.

<sup>2</sup>Daniel J. Boorstin, The Americans: the National Experience (New York, 1965); Alice Hanson Jones, Wealth of a Nation to Be (New York, 1980); Robert W. Fogel, "Nutrition and the Decline in Mortality Since 1700: Some Preliminary Findings," in Stanley L. Engerman and Robert E. Gallman, eds., Long-Term Factor in American Economic Growth (Chicago, 1986); and Kenneth L. Sokoloff and Georgia C. Villaflor, "The Early Achievement of Modern Stature in America," Social Science History, 6 (Fall 1982), pp. 453-481.

<sup>3</sup>Donald R. Adams, Jr., "Wage Rates in the Early National Period: Philadelphia, 1785-1830," Journal of Economic History, 28 (September 1968), pp. 404-26; "Some Evidence on English and American Wage Rates, 1790-1830," Journal of Economic History, 30 (September 1970), pp. 499-520; "The Standard of Living During American Industrialization: Evidence from the Brandywine Region, 1800-1860," Journal of Economic History 42 (December 1982), pp. 903-17; and "Prices and Wages in Maryland, 1750-1860," Journal of Economic History 46 (September 1986), pp. 625-45. Robert A. Margo and Georgia C. Villaflor, "The Growth of Wages in Antebellum America: New Evidence," Journal of Economic History 47 (December

1987), pp. 873-95; and Winifred B. Rothenberg, "The Emergence of Farm Labor Markets and the Transformation of the Rural Economy: Massachusetts, 1750-1855," Journal of Economic History 48 (September 1988), pp. 537-66.

<sup>4</sup>This school has carried on, and yet broadened, the rich traditions in labor history exemplified by the work of John R. Commons and Associates, History of Labor in the United States, 4 vols. (1918-1935). Although the "new labor historians" are generally critical of the effect of industrialization on manufacturing workers, there is quite a diversity of views about specifics. Some are accepting of significant increases in productivity as well as in compensation, but the great majority are quite skeptical. For example, Susan E. Hirsch, Roots of the American Working Class: The Industrialization of Crafts in Newark, 1800-1860 (Philadelphia, 1978). Also see Paul G. Faler, Mechanics and Manufacturers in the Early Industrial Revolution: Lynn, Massachusetts, 1780-1860 (Albany, 1981); Jonathan Prude, The Coming of Industrial Order: Town and Factory Life in Rural Massachusetts, 1810-1860 (New York, 1983); Howard B. Rock, Artisans of the New Republic: The Tradesmen of New York City in the Age of Jefferson (New York, 1979); Stephen J. Ross, Workers on the Edge: Work, Leisure and Politics in Industrializing Cincinnati, 1788-1890 (New York, 1985); and Sean Wilentz, Chants Democratic: New York City and the Rise of the American Working Class (New York, 1984).

<sup>5</sup>These samples of manufacturing firm data have been described and employed in a number of recent studies. They were drawn from the manuscripts of the 1820, 1850 and 1860 Censuses of Manufactures, and the 1832 Treasury Department survey of manufactures commonly known as the McLane Report (U.S. House of Representatives, Documents Relative to the Statistics of Manufactures in the U.S., 2 vols. Washington, D.C., 1833). For details about

the samples, see Jeremy Atack, "Economies of Scale and Efficiency Gains in the Rise of the Factory in America, 1820-1900," in Peter Kilby, ed., Quantity and Quiddity: Essays in U.S. Economic History (Middletown, 1987); as well as Kenneth L. Sokoloff, "Industrialization and the Growth of the Manufacturing Sector in the Northeast, 1820-1850," unpublished doctoral dissertation (Harvard University, 1982); and Productivity Growth in Manufacturing During Early Industrialization, 1820-1860," in Stanley L. Engerman and Robert E. Gallman, eds., Long-Term Factors in American Economic Growth (Chicago, 1986).

<sup>6</sup>Robert W. Fogel, "Nutrition and the Decline in Mortality Since 1700: Some Preliminary Findings," in Stanley L. Engerman and Robert E. Gallman, eds., Long-Term Factors in American Economic Growth (Chicago, 1986); and Clayne Pope, "Adult Mortality Before the Twentieth Century: Current Evidence and New Sources," in this volume.

<sup>7</sup>Thomas C. Cochran and William Miller, The Age of Enterprise: A Social History of Industrial America (New York, 1961); George Rogers Taylor, The Transportation Revolution, 1815-1860 (New York, 1962); Diane Lindstrom, Economic Development in the Philadelphia Region, 1800-1850 (New York, 1978); and Carter Goodrich, Government Promotion of American Canals and Railroads, 1800-1890 (New York, 1960).

<sup>8</sup>Richard A. Easterlin, "Interregional Differences in Per Capita Income, Population, and Total Income, 1840-1950," in Studies in Income and Wealth, 24, Trends in the American Economy in the Nineteenth Century (Princeton, 1960); and Viken Tchakerian, "Structure and Performance of Southern and Midwestern Manufacturing, 1850-1860: Evidence from the Manuscript Censuses," unpublished doctoral dissertation (U.C.L.A., 1990).

<sup>9</sup>Dorothy S. Brady, "Consumption and the Style of Life," in Lance E. Davis et al., American Economic Growth (New York, 1972); and Rolla Milton Tryon, Household Manufactures in the United States, 1640-1860 (New York, 1966).

<sup>10</sup>Claudia Goldin and Kenneth Sokoloff, "Women, Children, and Industrialization in the Early Republic: Evidence from the Manufacturing Censuses," Journal of Economic History, 42 (December 1982), pp. 741-774.

<sup>11</sup>For discussions of the increases in the quality and range of goods consumed, see Chauncey M. Depew, One Hundred Years of American Commerce (New York, 1895); and Jack Larkin, The Reshaping of Everyday Life, 1790-1840 (New York, 1988). For analysis of how conventional prices indices do a poor job in contexts where there are new products or significant improvements in quality, see Robert J. Gordon, The Measurement of Durable Goods Prices (Chicago, 1990). The bias is in the direction of understating progress. For the relevance of this problem to the early nineteenth century, see Dorothy S. Brady, "Relative Prices in the Nineteenth Century," Journal of Economic History, 24 (June 1964), pp. 145-203. The other point to make about the rise of new industries and the change in the composition of northeastern output is that they indicate that labor must have been quite mobile.

<sup>12</sup>Goldin and Sokoloff, "Women, Children, and Industrialization;" and Kenneth L. Sokoloff, "Investment in Fixed and Working Capital During Early Industrialization: Evidence from U.S. Manufacturing Firms," Journal of Economic History, 44 (March 1984), pp. 545-556; "Was the Transition from the Artisanal Shop to the Non-Mechanized Factory Associated With Gains in Efficiency?: Evidence from U.S. Manufacturing Censuses of 1820 and 1850," Explorations in

Economic History, 21 (October 1984), pp. 351-382; and "Productivity Growth in Manufacturing." See Hirsch, Roots, for an industry-by-industry treatment of the record in Newark.

<sup>13</sup>For the geographic extension of low-cost transportation and its impact, see Balthasar Meyer, Caroline E. MacGill, et al., History of Transportation in the United States Before 1860 (Washington, D.C., 1917); Tryon, Household Manufactures; Taylor, Transportation Revolution; Albert Fishlow, American Railroads and the Transformation of the Ante-Bellum Economy (Cambridge, 1965); and Kenneth L. Sokoloff, "Inventive Activity in Early Industrial America: Evidence from Patent Records, 1790-1846," Journal of Economic History, 48 (December 1988), pp. 813-850.

<sup>14</sup>The substitutability of women for unskilled men in the growing manufacturing sector might be cited as another reason why the elasticity of supply for less-skilled workers would have been greater than for artisans. See Goldin and Sokoloff, "Women, Children, and Industrialization;" and Jeffrey G. Williamson and Peter Lindert, American Inequality: A Macroeconomic Perspective (New York, 1980).

<sup>15</sup>For a discussion of the conditions necessary for factor-price equalization, see Paul A. Samuelson, "International Factor-Price Equalization Once Again," Economic Journal, 59 (June 1949), pp. 181-197.

<sup>16</sup>For the respective findings, see Jeremy Atack and Fred Bateman, "How Long was the Workday in 1880?," NBER Working Paper Series on Historical Factors in Long Run Growth,



15 (Cambridge, 1990); and Adams, "Standard of Living." Information collected in the McLane Report indicates that small firms had longer reported workdays than their larger counterparts. This suggests that the difference in the daily wage rate between size classes is due to differences in labor productivity per hour of work, and may be related to a need to compensate workers for the greater intensity of labor or other aversive conditions in larger firms. It also supports our claim that the lower average wage in small firms is not an artifact explained by a greater prevalence of part-time operations.

<sup>17</sup>The chief source of the discrepancies between the unweighted and weighted means is that wage rates in Pennsylvania, Delaware, and New Jersey vary substantially with the size of firm. There are also a few cases, however, attributable to very large firms with atypically high or low wage rates. The best example of this is a rural New Jersey glass factory which employed several hundred workers at over \$450 a year in 1860.

<sup>18</sup>As is clear from the numbers of firms and employees reported within parentheses in the tables, there was a marked shift over time in the distribution of resources from smaller to larger establishments. This pattern likely reflects the competitive pressures on the former.

<sup>19</sup>Although there are seldom references to precise firm sizes, there appears to be a clear consensus among economic, labor, and technological historians that the reliance on traditional artisans with a general set of skills typically declined with the number of employees -- after adjusting for industry. Blanche E. Hazard, The Organization of the Boot and Shoe Industry in Massachusetts Before 1875 (Cambridge, 1921); Pearce Davis, The Development of the American Glass Industry (Cambridge, 1949); H.J. Habakkuk, American and British Technology

in the Nineteenth Century: The Search for Labour-Saving Inventions (Cambridge, 1962); Hirsch, Roots; Goldin and Sokoloff, "Women, Children, and Industrialization;" Wilentz, Chants Democratic; and Ross, Workers on the Edge. The new technologies in manufacturing generally involved extensive division of labor within the firm, and required larger scales of production. It is not straightforward, however, to infer from this "stylized fact" that the proportion of adult male employees who were skilled artisans decreased with firm size. Women and children filled many of the unskilled positions, and large enterprises often employed artisans as supervisors or for tasks which could not easily be sub-divided or left to others. Nevertheless, the judgment that small (5 or fewer workers) establishments had the highest proportion of adult male employees who were artisans appears sound, because they had little potential for separation of tasks. The literature has generally treated traditional artisans as the model for a skilled worker, partially because of special concern with how they fared as a group. For other purposes, a broader definition might be preferred, and the attributes that allowed one to work productively under the new organizations of labor might reasonably be viewed as a type of skill.

<sup>20</sup>In addition to Kenneth L. Sokoloff, "Was the Transition;" "Productivity Growth in Manufacturing;" and "Manufacturing Productivity Growth During the Antebellum Period," in Robert E. Gallman and John Wallis, eds., The Standard of Living in Early 19th Century America (Chicago, forthcoming); see Tchakerian, "Structure and Performance," for his finding that the difference in productivity between small and large firms was greater in the South than in the Midwest, and much greater in either region than in the Northeast. His results support the interpretation that firms which were insulated from broad markets had markedly lower

productivity. The results of the regressions in Table 4 and 5 below also indicate declining quantitative significance and concentration in rural districts.

<sup>21</sup>Although stringent measures and sensitivity tests have been employed to cope with the possibility of the 1820 wage estimates being contaminated by the inclusion of part-time firms (see the note to Table 1), it is conceivable that we did not go far enough with the establishments in the Middle Atlantic. However, the New England estimates for that year seem totally unaffected by this problem, and daily wage rates from the 1832 McLane Report sustain the finding that small firms in the Middle Atlantic offered lower compensation. If the 1850 and 1860 samples were afflicted with this problem, the results would be biased to understate the extent of real wage growth. In general, since the qualitative results hold within both sub-regions, and part-time firms appear unlikely to have affected the New England estimates, the findings seem robust.

<sup>22</sup>The discrepancy is puzzling, but may be related to the small number of observations for the 1820s, or the disproportionate representation of urban areas, in their northeastern sample. Margo and Villaflor, *Growth of Wages*."

<sup>23</sup>The surprisingly close fit between our estimates and Rothenberg's lends support to the downplaying of the part-time firm problem, and strengthens the case for a relatively well integrated labor market in districts close to major product markets. It may be, however, that the percentage gap between our estimates and the others is underestimated because of workers receiving higher wages when paid by the day, or because the assumption of 310 days of work per year is too high.

<sup>24</sup>In addition to the problems associated with the limited number of commodity price series available and the lack of adequate measures for housing costs, there is also uncertainty about the division of expenditures between general categories of expenses and between commodities within those categories. These seemingly fine points can affect the qualitative results because of the many radical changes in relative prices experienced during this period. For example, if indexes of food prices incorporated Matthew Carey's estimates (Larkin, Reshaping, p. 175) that common laborers in Philadelphia spent more on tea and sugar than meat (at the household level), they would decline much more over time than they do with more conventional weights. Moreover, when relative prices vary substantially across geographic areas, as in the early nineteenth century, it is difficult to make a meaningful comparison of real wages across them without allowing for quite different market baskets being consumed. Studies of how the relative wages for two groups vary over time can be similarly flawed if expenditure patterns differ across the characteristics of interest. For excellent discussions of the issues involved in studying consumer prices during this era, see Dorothy S. Brady, "Price Deflators for Final Product Estimates," in Dorothy S. Brady, ed., Output, Employment, and Productivity in the United States After 1800 (New York, 1966); "Relative Prices;" and "Consumption and the Style of Life." Ethel D. Hoover, "Wholesale and Retail Prices in the Nineteenth Century," Journal of Economic History, 17 (September 1958), pp. 298-316; and "Retail Prices After 1850," in Studies in Income and Wealth, 24, Trends in the American Economy in the Nineteenth Century (Princeton, 1960). Paul A. David and Peter Solar, "A Bicentenary Contribution to the History of the Cost of Living in America," Research in Economic History, 2 (1977), pp. 1-80. Robert A. Margo, "Wages and Prices During the Antebellum Period: A Survey and New Evidence," in

Robert E. Gallman and John Wallis, eds., The Standard of Living in Early 19th Century America (Chicago, forthcoming).

<sup>25</sup>We adopt these two indexes as "bounds" for the presentation of results, because they represent extremes among the alternatives. Of course, since all of the others suffer from the problems discussed in Appendix A, the "true" index could lie outside of our "bounds."

<sup>26</sup>The indexes for the prices paid to Vermont farmers for grains, livestock, dairy products, and vegetables rise between 1820 and 1860 relative to those for the wholesale prices of bread/grains, meat/fish, dairy products, and fruit/vegetables in New York (see Figures 6 through 9 below). Conversely, the Vermont retail prices for clothing and other manufactures, building materials, and imported foods fall relative to the wholesale prices in New York (Adams, Prices Paid By Vermont Farmers). Most of the divergence in movements, or presumed convergence in levels, occurs during the late 1840s and 1850s when railroads were being constructed at an intense pace throughout the Northeast (Fishlow, American Railroads).

<sup>27</sup>Given that the changes in relative prices referred to in footnote 26 are not all that substantial, and tend to offset each other, the implicit assumption may not be far wrong.

<sup>28</sup>There were a number of major transportation improvements, such as the Erie Canal, completed during the 1820s, and the years after the cyclical trough of 1820-21 through 1832 appear to have escaped any significant downturn. See Robert W. Fogel, Railroads and American Economic Growth (Baltimore, 1964); Sokoloff, "Productivity Growth in Manufacturing;" Sokoloff, "Inventive Activity;" and Meyer, MacGill, et al., History of Transportation.

<sup>29</sup>From 1846 through 1857, immigration was extraordinarily heavy, with some of the largest inflows as a proportion of the population on record between 1847 and 1854. For the annual totals, see United States Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970 (Washington, D.C., 1975), C-89. Such a vast expansion of the labor supply can account for the coincidence of a roughly constant marginal product of labor (wage) with increases in average labor productivity (Sokoloff, "Productivity Growth in Manufacturing") when there is technical change.

<sup>30</sup>Although many had been craftsmen in their home countries, immigrants appear less skilled in manufacturing on average than natives. See Hirsch, Roots; Wilentz, Chants Democratic; and Ross, Workers on the Edge for discussions. Moreover, in the sample of Civil War recruits discussed below, the foreign-born were disproportionately concentrated in large Middle Atlantic cities, and much more likely to be classified as laborers than were the natives.

<sup>31</sup>See Faler, Mechanics and Manufacturers; Prude, Coming of Industrial Order; and Wilentz, Chants Democratic, for examples of such arguments. However, the transition from the artisanal shop to the non-mechanized factory, as well as the geographic spread of competitive product markets, was largely over in the Northeast by 1850. See Hirsch, Roots; Lindstrom, Economic Development; Sokoloff, "Productivity Growth in Manufacturing;" and Sokoloff, "Inventive Activity."

<sup>32</sup>Two phases of technological change which may conceivably have had such effects. The first was marked by changes in the organization of production within a non-mechanized establishment, but appears to have been accompanied by significant increases in real wages.

During the late 1840s and 1850s, however, mechanized technologies spread to many of the previously labor-intensive industries. This development, which is reflected in the acceleration of capital deepening between 1850 and 1860, might have facilitated the substitution of less-skilled workers for artisans and contributed to slowing the growth of real wages generally. See Hirsch, Roots; and Sokoloff, "Productivity Growth in Manufacturing."

<sup>33</sup>For treatments of cyclicity by labor historians, see Faler, Mechanics and Manufacturers; and Wilentz, Chants Democratic. Agricultural supply shocks seem to have preceded, and perhaps triggered, macroeconomic downturns in both cases. For a year-by-year chronology, see Willard Thorp, Business Annals (New York, 1926). For the macroeconomic theory concerning the effects of supply-side shocks, see Robert J. Barro, Macroeconomics (New York, 1984).

<sup>34</sup>See the discussions in Percy W. Bidwell and John I. Falconer, History of Agriculture in the Northern United States, 1620-1860 (New York, 1941); Paul W. Gates, The Farmer's Age: Agriculture, 1815-1860 (New York, 1960); and Wilentz, Chants Democratic.

<sup>35</sup>This commentary appeared on the front page of the May 1837 issue of The Cultivator, a popular monthly on agriculture published in Albany.

<sup>36</sup>For a systematic examination of the responsiveness of wages to changes in the price level, see Claudia Goldin and Robert A. Margo, "Wages, Prices, and Labor Markets Before the Civil War," in this volume. See Peter Temin, The Jacksonian Economy (New York, 1969), for a monetary interpretation of the increase in the price level during the mid-1830s. An analogous specie-based story could also link the rising prices of the 1850s to gold strikes. Such theories do not easily account for why food prices adjust disproportionately.

<sup>37</sup>Lord Ernle, English Farming Past and Present (New York, 1922); Robert L. Jones, History of Agriculture in Ontario, 1613-1880 (Toronto, 1946); J.D. Chambers and G.E. Mingay, The Agricultural Revolution, 1775-1880 (London, 1966); Gates, The Farmer's Age; and B.R. Mitchell, European Historical Statistics, 1750-1975 (New York, 1980).

<sup>38</sup>State of New York, Census of the State of New York for 1855 (Albany, 1857), p. liv. (1857, liv).

<sup>39</sup>In contrast, David R. Weir, "Labor Market Performance and Demographic Change in Nineteenth Century France," unpublished working paper (New Haven, 1990), finds that the urban-rural wage gaps in England and France widen over much of the nineteenth century.

<sup>40</sup>Part of the average improvement is associated with the increasing proportion of the small firms located in urban counties.

<sup>41</sup>This requirement could be satisfied by competing employers within the same district. Geographic mobility, however, would expand the scope of potential competitors, and thus increase the likelihood of a worker sharing in the returns to productivity growth.

<sup>42</sup>For other evidence of mobility between jobs, see Alexander J. Field, "Sectoral Shift in Antebellum Massachusetts: A Reconsideration," Explorations in Economic History (April 1978), pp. 146-171; Prude, Coming of Industrial Order; and Stephan Thernstrom, The Other Bostonians: Poverty and Progress in the American Metropolis (Cambridge, 1973).

<sup>43</sup>Fogel, "Nutrition and the Decline in Mortality;" and Georgia C. Villaflor and Kenneth L.



Sokoloff, "Migration in Colonial America: Evidence from the Militia Muster Rolls," Social Science History, 6 (Fall 1982), pp. 539-570.

<sup>44</sup>If one includes a variable for the percentage of the population which was foreign born into cross-sectional wage regressions for 1850 or 1860, the estimated coefficient is not significantly different from zero. This finding is consistent with the view that the labor markets were well integrated throughout most of the Northeast.

<sup>45</sup>David W. Galenson and Clayne L. Pope, "Precedence and Wealth: Evidence for Nineteenth Century Utah," in this volume; and Thernstrom, The Other Bostonians. The proportion of foreign-born recruits who were laborers relative to that for natives was higher in cities than in rural areas.