Productivity in Manufacturing and the Length of the Working Day: Evidence from the 1880 Census of Manufactures

by

Jeremy Atack*
Fred Bateman**
Robert A. Margo***

Working Paper No. 317

November 2000

*Professor of Economics and of History, Vanderbilt University, and Research Associate, National Bureau of Economic Research
**Nicholas A. Beadles Professor of Economics, University of Georgia
***Professor of Economics and of History, Vanderbilt University, and Research Associate, National Bureau of Economic Research, and Visiting Senior Scholar, The Jerome Levy Economics Institute of Bard College

Corresponding author: Robert A. Margo
The Jerome Levy Economics Institute of Bard College
Blithewood
Annandale-on-Hudson, NY 12504-5000
margo@levy.edu

ABSTRACT

Data from the manuscript census of manufacturing are used to estimate the effects of the length of the working day on output and wages. We find that the elasticity of output with respect to daily hours worked was positive but less than one—implying diminishing returns to increases in working hours. When the annual number of days worked is held constant, the average annual wage is found to be positively related to daily hours worked, but again the elasticity less than 1.0. At the modal value of daily hours (ten hours per day), it appears that from the standpoint of employers, the marginal benefits of a shorter working day (a lower wage bill) were approximately offset by the marginal cost (lower output).

INTRODUCTION

The nineteenth century witnessed far-reaching changes in the nature and organization of industrial production. Traditional non-mechanized establishments – artisan shops – were displaced by mechanized water or steam-driven plants and extensive division of labor increased the average size of firms (Chandler 1977; Sokoloff 1984). In these new mills and "factories", the centralized nature of motive power generation and the growing interdependence of tasks led to the imposition of a new discipline on labor, a faster and more intense pace of work, and a reduction in seasonal "downtime". In earlier times, daily work hours "from sun to sun" had been tolerable when employers worked alongside their employees setting the pace, especially when tasks were regularly interrupted by inclement weather and other factors beyond anyone's control. But as mechanization spread and work effort intensified, calls by workers for "shorter hours" became more common.

One route to a shorter working day was through legislative action via the political process. Beginning with New Hampshire in 1847, a number of states passed laws limiting employment of adult workers to ten hours per day. However, most scholars believe that the early hours laws were ineffective, essentially because they were not (or constitutionally speaking, could not be) enforced. Another route to shorter hours, collective action by workers (striking), was similarly ineffective. Employers simply hired replacement workers, while the strikers found themselves either blacklisted, or forced back to work under the same or more onerous conditions (Commons, et. al. 1926).

Instead, the length of the working day in late 19th century American manufacturing appears to have been the outcome of decisions made at the level of individual establishments in the context of a competitive market for labor. Workers may have desired shorter hours, but owners (or their agents, that is, the managers and superintendents) would go along only if the value of lost output per day, if any, could be offset by lower daily costs of operation. Assuming that non-labor (that is, capital) costs per day were largely invariant to the length of the working day, lowering variable costs meant a willingness on the part of workers to accept a lower daily wage in return for shorter daily hours.

In this paper, we use recently-collected archival data to investigate the effects of daily hours of work on manufacturing output and on wages. Our analysis is based on a sample of establishments from the manuscripts of the 1880 census of manufactures. These data included questions on the length of the working day and months of operation, as well as more traditional questions about outputs, inputs, and labor costs. We use these data to estimate the "marginal product" of hours, which we then compare with the analogous effect of hours on wages.

Our findings shed considerable light on the benefits and costs of variations in the length of the working day in the late 19th century. We find that, while the effects of hours on output and wages were both positive, the elasticities were less than one; that is, a reduction in hours from, say, ten to nine per day – a 10 percent reduction – would result in a less than proportionate reduction in value added and in wages, thus raising productivity per hour and the effective hourly wage. Given plausible estimates of labor's share, and assuming that daily non-labor costs were independent of daily hours, the marginal benefit to employers of shortening daily hours – lower labor costs – appears to have been close to the marginal cost (the reduction in value added). Our results imply that, in the absence of binding labor legislation or effective strikes, "shorter hours" in 1880 would have required a different set of economic "fundamentals" – for example, a greater willingness on the part of workers to accept a lower daily wage for a shorter working day, or different technologies that increased output per hour.

THE LENGTH OF THE WORKING DAY IN MANUFACTURING, 1830-1880

Legislation and Collective Action

In the 1880s the goal of the American labor movement was the "eight-hour" day. Only a small portion of American manufacturing workers, however, were so employed; the vast majority worked ten hours (or somewhat more) at the time (Atack and Bateman 1992). However, workers could take some comfort in the fact that the trend in daily hours of work over the preceding fifty years had been distinctly downward.

The earliest available contemporaneous data on daily hours appear in the Treasury Department's McLane Report of 1832. These data, which pertain mostly to establishments located in the Northeast, suggest a typical day's work was slight under 11.5 hours, or about an hour and a half longer than in 1880 (see below and Atack and Bateman 1992). The intervening censuses of manufacturing (1850-1870) did not, unfortunately, ask about daily hours; however, two well-known late 19th century sources on wages – the so-called "Weeks" and "Aldrich" reports did. Both sources are retrospective, in the sense that they pertain to establishments in existence at the time of the survey – 1880, in the case of Weeks, and the early 1890s, in the case of Aldrich. Although there are differences in levels between the two – in particular, the Aldrich report suggests higher levels of daily hours (about three-quarters of a hour's difference) in the 1850s through the 1870s, both surveys suggest that a secular (if modest) decline in hours took place in the three to five decades preceding 1880. Moreover, the Census of Manufactures data for 1880 suggest that the average worker labored just about 10 hours per day at that time (Atack and Bateman 1992).[1]

Industrial workers saw the potential benefits of political intervention after the federal government reduced hours of work, beginning with President Martin Van Buren's 1840 executive order setting a ten hour day for federal employees, followed by the adoption of an eight-hour day in 1869 (Richardson 1908, p. 602; Cahill 1932, p. 69-71). As noted earlier, the first state law attempting to regulate daily hours was passed by New Hampshire in 1847. The law specified ten hours as the legal work day and that no person could be required to work longer "except in pursuance of an express contract requiring a greater time."[2] Although the legislature made no provisions for enforcement nor were penalties for violations enacted, many manufacturers in the state required their employees to sign such "express contracts" or face termination.

Laws similar to New Hampshire statute were passed Pennsylvania (1848), Maine (1848), New Jersey (1851), New York (1853), Rhode Island (1853), California (1853), Georgia (1853) and Connecticut (1855).[3] Although some of these laws improved upon New Hampshire's by

[1] The average establishment worked slightly longer than ten hours per day as the more numerous small establishments (in terms of employment) worked longer hours than the larger establishments even after controlling for industry and location; see Atack and Bateman (1992).

[2] State of New Hampshire, 1847 Sessions Laws, Ch. 4.

[3] See State of California, Session Laws of 1853, ch. 131, p. 187; State of Connecticut, Session Laws of 1855, ch. 45; State of Georgia, Code of 1861, sec. 1847; State of Maine, Session Laws 1848, ch. 83;

establishing penalties for violations, all were either indifferently or simply not enforced, and all of these regardless preserved the loophole of an "express contract" requiring long hours.

Except for the Georgia act which pertained solely to white labor, these early laws made no distinctions between different types of workers. A second generation of laws, however, made the argument that women needed greater protection from long daily hours on the grounds that the health and well-being of future generations might be otherwise compromised. Moreover, in the case of women, "while ordinarily men can rest when their day's toll is over ... there are few working girls who do not have at least mending and laundering to do in the evenings, and married women must take the entire care of their homes and children before and after work" (Commons and Andrews 1927, p. 202).

The first state to enact protective hours legislation for women was Ohio in 1852; the law stipulated that employers could not *compel* [emphasis added] women to work longer than ten hours per day, under penalty of a $5 to $50 fine. Similar laws were later passed by Minnesota, Wisconsin, and the Dakota Territory.[4] The fact that women could not be compelled to work more than ten hours per day, however, did not preclude the possibility that they could *voluntarily* (that is, contractually) do so, a loophole that legal scholars and labor historians have viewed as fatal flaw (see, for example, Commons and Andrews 1927, p. 202; Goldin 1988).

Perhaps the main legislative battleground in the fight for shorter hours was Massachusetts. Although petitions were made to the state legislature requesting passage of a ten-hour law as early as the 1840s, a law regulating hours of work by women was not enacted until 1874.[5] By comparison with other states, the 1874 Massachusetts law had more bite,

---

State of New Jersey, Session Laws 1851, pp. 321-322. State of New York, Session Laws 1853, ch. 641; State of Pennsylvania, Session Laws 1848, Act 227; State of Rhode Island, Session Laws 1853, p. 245. The New Jersey law applied to cotton, woolen, silk, paper, glass, and flax factories, and to iron and brass works.

[4] State of Ohio, Sessions Laws 1852, v. 50, p. 187; Dakota Territory Legislature, Dakota Session Laws 1862-63, ch. 49; State of Minnesota, Session Laws 1858, ch. 66; State of Wisconsin, Session Laws 1867, ch. 83.

[5] Persons (1911, pp. 24-27). In 1845, for example, the Massachusetts State House received at least four petitions requesting a ten-hour law; see State of Massachusetts, House Document No. 50, March 1845 as quoted in Commons (1958), vol. 8, pp. 133-151.

containing provisions for penalties against employers found guilty of "willfully employing" women longer than ten hours per day. Morever, in 1879 the law was rewritten, striking the word "willfully", allegedly making prosecution even easier (Goldmark 1912, p. 213).[6]

Laws regulating hours of work by children posed fewer legal dilemmas than those directed at adults. As minors, children could not legally enter into contracts, and thus constitutional problems involving the interference with private contracts did not arise. As a result, laws regulating hours by children were passed somewhat before laws regulating hours by adults. Connecticut and Massachusetts passed laws restricting children to ten hour days in 1842, and by 1879 fully 13 states had similar laws on their books.[7]

Were any of the early laws directed at women or children effective at reducing daily hours? Our reading of the legislative history suggests that the answer is "no" but this is not the same as an econometric test. Unfortunately, econometric tests using standard "difference-in-difference" methods cannot be implemented, because we lack evidence on daily hours at the state level in manufacturing censuses prior to 1880.[8] Moreover, the evidence on daily hours in the 1880 manufacturing census does not distinguish between hours of work for men, women, or children. About the best that can be done with the available evidence for 1880 is shown in Table 1, where we report the results of an multi-variate analysis of daily hours.[9] The key independent variables are interaction terms involving the percent women (or children) and hours legislation specific to women, or to children.[10] The presumption is that, if the laws directed at women or

[6] State of Massachusetts, Laws 1874, Ch. 74. The law was justified on the grounds that long hours were deleterious to the health of women, and thus future generations, the regulation of daily hours fell under the police protection of the state.

[7] State of Connecticut, Laws 1842, ch. 28; State of Massachusetts, Laws 1842, ch. 60. See also Ogburn (1912), Table 30, pp. 108-109.

[8] To implement a "difference-in-differences" test we would need a panel data set of states, some of which passed laws over the period under study and some of which did not. With such a panel we could control for state fixed effects; see Moehling (1999).

[9] The dependent variable, average daily hours, is defined in section 3. As in section 3, we restrict attention to establishments with daily hours between seven and twelve.

[10] We restrict the sample to establishments located in states that had an hours law specific to women, or to children (or both), or no law at all; that is, we exclude establishments in states that had laws that did not

children were effective at all and employers were unable to reduce hours for one group without reducing them for all workers, the coefficients of the interaction terms should be negative. As is evident, the interaction effect is negative for women, but tiny (and statistically insignificant) while that for children is the wrong sign (although also statistically insignificant). This evidence is far from definitive since we cannot, with the available data, control for state fixed effects, which may confound the coefficients of the interaction terms. However, the absence of a legislative effect of laws regulating hours of work by children is consistent with other studies showing that early child labor laws – and closely related compulsory schooling laws – were similarly ineffective (Landes and Solmon 1972; Moehling 1999).

Another potential mechanism for reducing hours was the strike. Demands for shorter hours were among the earliest industrial disputes in the United States (Commons, et. al. 1926, p. 69). However, in terms of frequency of the stated cause, strikes over shorter hours were comparatively rare. For example, of 762 strikes in the 1880 calendar year documented in the Weeks report, only 7 involved demands for shorter hours (U.S. Department of the Interior 1886, p. 25). Even after 1880, when there was a growing emphasis in strikes on shorter hours, the length of the working day does not appear to have been the dominant issue in most labor disputes (U.S. Department of Labor 1896, p. 29).

THEORETICAL FRAMEWORK

In the absence of binding legislation or effective strikes, it is reasonable to assume that employers chose the length of the working day. In doing so, we assume that the choice struck a balance between benefits to the employer – increased production, for example, with a longer day – against costs – for example, a higher daily wage. Such a model of employer behavior is not novel per se; elements of it, for example, appear in the labor economics literature (Barzel 1973) and in the literature on aggregate production functions and on business cycles (Feldstein 1967; Lucas 1970; Bernanke 1986). However its use so far by economic historians has been quite

---

distinguish between the sex or age of workers.

limited (an exception is Whaples 1990).[11]

As a point of departure, let q(K,L,s) be the flow of output in value added terms over some period of time s, with K = capital and L = labor. We think of s as the shortest possible period of production; in our application, s is an "hour", but the exact length of s is left unspecified. Letting time begin at zero, total output over a period of length T is the integral of q from zero to T:

$$\int^{T} q(K,L,s)ds = Q(K,L,T)$$

One possible specification of q(K,L,s) is q(K,L); that is, conditional on L and K, a constant independent of s. Thus

$$Q(K,L,T) = q(K,L)T$$

This is the specification adopted, for example, in studies of aggregate production functions in which the period T is annual; q(K,L) is Cobb-Douglas with constant returns to K and L; and K and L are defined, respectively, as annual machine and labor hours (see Feldstein 1968). If this specification of annual production were literally true we could, with no loss of generality, rewrite equation (2) as

$$Q(K,L,T) = q(K,L)HD$$

where H = daily hours and D = annual days of operation. We could further sub-divide D into days per week and weeks per year. However, during the 19th century the length of the work week appears to have been (more or less) fixed at six days per week, with very little variation, except perhaps for holidays. Thus, we follow the previous literature and treat H as the "intensive margin" in terms of time spent at work.

Equation (3) specifies that annual output is constant returns with respect to H and D. Thus for example, two establishments with the same q(K,L) could achieve the same level of Q even if they had different values of H and D, provided the product H x D (annual hours) was the same at both

---

[11] However, a major difference between this paper and Whaples (1990; or Bernanke, 1986) is that we estimate the marginal product of hours and the effect of hours on wages, whereas Whaples uses the model to explain hours declines after 1914.

establishments.

There are, however, good *a-priori* and historical reasons to doubt the constant returns assumption in this relationship. Labor productivity may be quite low at very low levels of H, for example, if workers need some "start-up" time to adapt to the work environment whereas, at high levels of H, diminishing returns may set in due to worker fatigue (Goldmark 1912; Vernon 1921; Barzel 1973). Although the invention (and diffusion) of artificial lighting enabled the same hours year-round (along with night work) and the switch to steam power reduced the effects of inclement weather on productivity, seasonality was still a fact of life in late 19th century manufacturing. That is, productivity was likely to be higher at certain times of the year than others, for reasons beyond the control of employers and workers.

For both reasons we rewrite the production function (eq. 3) as Q(K,L, H, D) and assume that employers maximize profits on an annual basis:

$$\text{Max } \Pi = Q(K,L,H,D) - w(H,D)L - r(D)K$$

where, because Q is in value-added terms, the implicit assumption is that the price of output is unity. In writing the profit function in this manner, we follow the previous literature (Bernake 1986; Whaples 1990) that annual capital costs may depend on the length of the work year -- in particular, $r'(D) > 0$ -- but are independent of daily hours of operation.[12]

The wage function w(H,D) can be derived in a thought-experiment similar to the one above for annual production. Let w(s) be the wage for the period s. Over a period of length T, say a year, total wage payments per worker are

$$\int_0^T w(s)ds = W(T)$$

If w(s) were independent of s – a constant – then W(T) = wT = wHD, where, as before, H is daily

[12] This is surely true for the opportunity cost of the capital invested in the firm (that is, foregone interest) but it may be less true for depreciation; that is, physical capital used for, say, twelve hours per day may need to have been replaced more frequently than physical capital used ten hours per day.

hours and D is annual days. With this specification of the wage function workers are indifferent between different combinations of H and D, so long as the product (H x D) is held constant.

However, a "constant returns" specification of the wage function cannot be literally true. Individuals, in general, are not indifferent to working, say, twenty hour days versus ten hour days even if annual hours are fixed. At high values of H the opportunity cost of time spent working – whether measured in terms of the value of foregone leisure or, more speculatively, in the deleterious effects of long hours on health – will rise, implying that beyond a certain level of daily hours, w must rise -- the "marginal" hourly wage will exceed average hourly earnings. In addition, if there are any fixed costs of going to work, w(s) will be discontinuous and strictly positive at zero hours (see Bernanke 1986).

In maximizing profits, we assume that employers can choose L, K, and H, but that D – annual days of operation – is pre-determined.[13] Thus, the first order conditions are

$$Q_L = w(H,D)$$
$$Q_K = r(D)$$
$$Q_h = w_H(H,D)L$$

The first two first-order conditions are the conventional marginal productivity conditions: in choosing L and K, the employer equates the ratio of marginal products to the ratio of factor prices. The third first-order condition can be re-written

$$\varepsilon_{QH} = \alpha\varepsilon_{wH}$$

where ε indicates an elasticity and α is labor's share.[14] The intuitive interpretation of the hours

[13] As a historical matter this is not literally true; by varying their location or their choice of power type (steam power, for example) an establishment could increase its control over seasonality. For the purposes of the model, we treat location and the use of steam power as fixed; however, our empirical analysis includes both factors (see section 4).

[14] If capital costs are not independent of the length of the working day, the first order condition is modified as follows

$$\varepsilon_{Qh} = \alpha_L\varepsilon_{Wh} + (1-\alpha_L)\varepsilon_{rh}$$

condition is straightforward: in elasticity form, the marginal benefit of a small increase (or decrease) in daily hours must equal the marginal cost which, in terms of the model, is the wage elasticity multiplied by labor's share (wL/Q).

For the second-order conditions to be satisfied, it is sufficient that Q be concave in H (diminishing returns to hours, or $Q_{HH} < 0$) at the optimum, and $w(H,D)$ be convex in H ($w_{HH} > 0$). In our empirical work we choose functional forms for Q and w such that these conditions will be satisfied by specification.

DATA AND EMPIRICAL ANALYSIS

Our empirical analysis is based on a sample of approximately 7,300 establishments drawn from the manuscripts of the 1880 census of manufacturing (Atack and Bateman 1999). The sample is random and nationally representative of the universe of surviving manuscript schedules. The census enumerators were directed to obtain information through personal inquiry of cognizant parties of the value of capital invested in each enterprise; the average number of adult male, adult female, and child workers employed; the total annual wage bill; the aggregate value of inputs and outputs; the type of power used (in horsepower, if steam or water); months of operation on full-time, three-quarter's time, two-third's time, and half-time, from which full-time equivalent months can be calculated; the number of hours per day in a "typical" day, by six-month period (November-April and May-October), among other data.

Because of the nature of the responses to the questions on hours (integer values are almost always reported) it is presumed that the data refer to scheduled, as opposed to, actual hours (see Atack and Bateman 1992). For the purposes of our analysis, we compute H, average daily hours as follows:

$$H = \text{int}\,(H_{winter} + H_{summer})/2 \text{ if } H_W, H_S > 0$$

Note that the new term on the right hand side ($(1-\alpha_L)\varepsilon_{rh}$) will be positive as long as capital is subject to physical depreciation. Thus, if capital costs per day did vary with daily hours, our method (that is, measuring $\alpha_L \varepsilon_{Wh}$) will understate the cost savings of shorter hours. The degree of understatement is arguably small, however, because $(1-\alpha_L)$ is typically on the order of 0.25-0.3 (as it is in our data; see section 4) and, as argued in footnote 10, certain capital costs are fixed on a daily basis.

$$H = H_{winter} \text{ if } H_{summer} = 0 \text{ (or not reported)}$$
$$H = H_{summer} \text{ if } H_{winter} = 0 \text{ (or not reported)}$$

where "winter" refers to November through April, and "summer" refers to May through October. The "int" function returns the integer value after taking the average of winter and summer hours. We further restrict our attention to establishments for which hours varied between seven and twelve per day, on the grounds that values outside this range were either in error, or may indicate the presence of multiple shifts. Fully 98 percent of the sample observations fall within the 7 to 12 hour range. As has been established previously, the mean value of average daily hours in this sample was slightly more than ten hours per day (10 hours, five minutes; see Atack and Batemen 1992).

We define "full-time" equivalent months of operation, M, to be

M = months on full-time + 0.75* months on three-quarter's time + 0.67* months on two-third's time + 0.5* months on half-time

where a full-time equivalent month equals approximately 26 days (25.75) of work. Days in operation, D = M x 25.75. Thus a full-time work year consisted of 309 days (=12 x 25.75).

Our model of production specifies ln Q, the log of value added, to be

$$\ln Q = X\beta + \alpha_L \ln L + \alpha_K \ln K + \alpha_D \ln D + \alpha_H \ln H + \varepsilon$$

where the X's are additional variables discussed below, L is the "adjusted" labor input, K is capital, D is number of days in operation, H is average daily hours, and ε is an error term. Value added is the difference between the value of output and the value of raw materials. We do not impose any prior constraints on the output elasticities (the α's). If $\alpha_L + \alpha_K = 1$, there are constant returns to hourly production. Note that, with this specification of the production function (that is, Cobb-Douglas), the output elasticity of hours (ε_{QH}) is simply α_H. If α_H is positive but less than one, an additional hour of work will raise output but with diminishing returns. As discussed earlier, we also expect that α_D to be positive but less than one because of seasonal influences on productivity that were beyond the control of owners, managers, or workers.

The census reported the number of adult male, adult female, and child employees. Rather than simply summing these to determine the labor input, L, we adjust for gender and age composition as follows:

$$L = Men + 0.6*women + 0.5*children$$

The weights multiplying the number of women (0.6) and children (0.5) are based on estimates of their wages relative to adult men, and are assumed to reflect differences in productivity.[15]

There is no consensus among economic historians as to whether it is necessary to adjust the labor input further to take account of owners. In their respective studies of economies of scale in antebellum manufacturing, Atack (1977) made no adjustment for the entrepreneurial labor input while Sokoloff (1984) added one to his estimate of the labor input.[16] We report results using both approaches; however we note that the existence of economies of scale in hourly production in the 1880 data is sensitive to the adjustment for the entrepreneurial labor input.[17] Capital, K, is measured as the value of real and personal estate invested in the enterprise. We also include a dummy variable, STEAM, taking the value one, if steam power was utilized.

Included in the X variables are dummy variables for establishments located in urban areas (population 2,500 or more), the state in which the establishment was located, and industry dummies based on two-digit SIC codes (see Atack and Bateman 1999). The urban and state dummies capture any variation in productivity due to location (for example, because of agglomeration economies in the case of the urban dummy) or geographic differences in output prices. The industry dummies are included for similar reasons, as well as the fact that we lack sufficient numbers of observations to

[15] These are the weights implied by the coefficients of percent female and percent children in the wage equation. The wage coefficient of percent female is -0.501; because the dependent variable is in logarithms, the implied female/male ratio is 0.6 (= exp (-0.501)). The wage coefficient of percent children is -0.694; the implied child/male ratio is 0.5 (= exp(-0.694)).

[16] Sokoloff (1984) made this adjustment (among others) to the 1850 data, which (like the 1880 data) report no information about owners of the establishments.

[17] It is easy to see that adding one to the number of workers increases the likelihood of finding evidence of economies of scale. The addition of one worker lowers output per worker in very small establishments (for example, 1-5 workers) while having virtually no effect in large establishments (over 100 workers, say). A similar sensitivity of the finding of economies of scale in 1850 manufacturing to the adjustment for the entrepreneurial labor input is reported by Sokoloff (1984).

estimate production functions by industry.

Our specification of the wage equation is,

$$\ln w = Z\delta + \gamma_H H + \gamma_D D + \upsilon$$

where the Z's are additional variables discussed below, and υ is an error term. As long as $\gamma_H > 0$, the wage equation will be convex in H ($w_{HH} > 0$). Included in Z are the steam power, urban, state, and industry dummies also included in the specification of the production function; the log of the capital-to-labor ratio; the percent women; and the percent children. The dependent variable, ln w, is the log of the average annual wage, defined to be the total wage bill divided by the number of workers. Observations are weighted by the number of workers prior to estimation.

Although the 1880 sample is nationally representative of the universe of surviving manuscript schedules, certain industries are known to under-represented. Firms in these industries were to be enumerated by "industry experts" who were chosen for their detailed knowledge of conditions specific to the industry. Unfortunately, despite an exhaustive search of relevant archives, none of the schedules taken by these experts has ever been found (Delle Donne 1973). As it happens, the dividing line between regular enumerators and experts was somewhat blurred in practice; schedules that should have been prepared by experts were, in some cases, prepared by regular enumerators, and have made their way into the sample. Thus, while establishments in the "expert" industries are under-represented in the sample, there are not wholly absent. To the extent that their inclusion in the sample was a random event, no bias should arise, particularly given that we control for industry in the estimations.

The production function coefficients are shown in Table 2 and the wage coefficients in Table 3 (except for the state and industry coefficients, which due to their numbers, are not reported).[18] Both regressions fit the data well, judging by the R^2. The signs of the coefficients are generally as expected and, moreover, the magnitudes seem quite plausible.

The nature of returns to scale in hourly production is sensitive to the adjustment for the entrepreneurial labor input. If no adjustment is made, there is evidence of decreasing returns (the

[18] These coefficients are available from Robert Margo on request.

sum of the output elasticities of labor and capital is less than one); whereas, if an adjustment is made (recall that we add one to the value of the labor input) increasing returns are indicated.[19] In either case, however, the relative magnitudes of the capital and labor coefficients are plausible, especially in light of the less-capital intensive nature of 19th century manufacturing compared with its 20th century counterpart. Urban firms appear to have been more productive than rural firms although, as noted above, because the dependent variable is expressed in value-added terms, this difference may also reflect differences in output prices as well as productivity.

The key variable of interest is H, average daily hours. Our estimate of the elasticity of value added with respect to daily hours is about 0.24, regardless of whether or not an adjustment is made for the entrepreneurial labor input. The estimate is significantly less than one, implying (at the margin) diminishing returns to increases in daily hours.[20] Consequently, the reverse is also true: a reduction in hours would increase output per worker-hour, although total daily output would still fall.[21] We also find diminishing returns to increases in days of operation per year; that is, the output elasticity of days per year (about 0.61, also regardless of whether or not an adjustment is made for the entrepreneurial labor input) was less than one. However, increasing the number of days per year had a bigger positive impact on output at the margin than increasing daily hours (holding the length of the work year constant), suggesting that establishments were constrained by seasonal factors (Engerman and Goldin 1993).

---

[19] However, even if the adjustment is made for the entrepreneurial labor input, the estimated degree of economies of scale, as indicated by the sum of the output elasticity of labor and capital (1.033 = 0.796 + 0.237) is somewhat less than that estimated by Sokoloff's (1984) for manufacturing in 1850 using an identical adjustment for the entrepreneurial labor input (= 1.11, see Sokoloff 1984, p. 373). In future work with the 1880 sample we plan to further examine the issue of economies of scale in daily production and to attempt to reconcile our findings with Sokoloff's.

[20] Diminishing returns in H requires that the second derivative of the production function with respect to H ($= \alpha_H (\alpha_H - 1)Q/H^2$) be negative (at positive H), which is satisfied if $\alpha_H < 1$.

[21] Some qualitative evidence that employers were aware of this phenomenon is available in a unique survey conducted by the Massachusetts Bureau of Labor Statistics in 1880. The Bureau surveyed workers and owners about the effects of hours reductions, primarily in the textile industry in New England. When asked whether the same amount of output could be produced in a shorter work week (in this case, a uniform 60 hour week, 6 days per week, 10 hours per day), fully 87 percent of the employers stated that it was not possible, without hiring additional workers (or using more capital per worker). See State of Massachusetts (1881), p. 388.

We conducted two extensions of the production function estimations. First, we modified the production function to allow for interactions between daily hours, and the levels of the labor and capital inputs, and also included a squared term in (log) daily hours. If the technology of hourly production varied with daily hours we would expect to see significant interaction effects. However, the coefficients of the interaction terms were always very small and statistically insignificant. If, Including the log of daily hours and its square produced a positive coefficient on the linear term and a negative coefficient on the squared ter. However, because the range over which hours was allowed to vary in the sample was rather narrow by construction (recall that this is seven to twelve hours per day) neither coefficient was estimated with any precision.

Turning to the wage equation, we find substantial differences with respect to gender and age; women and children earned far less than adult men. Urban wages were substantially higher than rural wages and, although not shown, there were economically significant differences across states and industries. Capital intensive establishments, and establishments using steam power, paid higher wages; elsewhere, we argue that these wage effects largely reflected differences in skill composition across establishments (Atack, Bateman, and Margo 2000).

We find a significantly positive effect of daily hours on the annual wage, holding constant annual days of operation. The converse was also true; holding constant average daily hours, the annual wage was increasing in annual days of operation. Evaluated at the most commonly observed value – ten hours per day – the elasticity of output with respect to daily hours was approximately 0.37. Thus, for example, if an employer at ten hours per day were to choose to reduce daily hours to nine – a reduction of 10 percent – he could expect that, holding constant annual days of operation (and the other variables in the regression), the average annual wage would decline by 3.7 percent.[22]

Our model of employer behavior specifies that, at the optimal choice of daily hours, the elasticity of output with respect to hours (ε_{QH}) should equal the elasticity of the wage with respect to hours multiplied by labor's share (α_L x ε_{wH}). The estimate of the output elasticity of hours is taken directly from the production function (the estimated value of α_H) whereas the elasticity of the wage with respect to daily hours is computed, as above, at ten hours per day. There are two ways to

[22] Again, the Massachusetts survey discussed in footnote 18 indicates that employers believed that daily earnings would fall if daily hours decreased – when asked, 52.1 percent of the 545 workers surveyed thought wages would decline with a shorter workday.

estimate labor's share in our data: as the output elasticity of labor in the production function or directly, from the data on the annual wage bill and value added.[23] The results of these calculations are shown in Table 4.

Using the output elasticity of labor to estimate labor's share, the term $\alpha_L \times \varepsilon_{wh}$ ranges from 0.241 to 0.285, depending on whether or not the adjustment is made for the entrepreneurial labor input. Multiplying the wage elasticity of hours by the direct estimate of labor's share (0.542), yields a somewhat lower estimate of daily labor cost savings of shorter hours (0.200). If we average the three estimates of labor's share (= 0.66), the term $\alpha_L \times \varepsilon_{wh}$ is 0.242.

Taken at face value, the results in Table 4 suggest that the marginal benefits (to employers) of increases in daily hours beyond ten per day might have (slightly) exceeded the marginal costs in terms of a higher wage bill. However, the model assumed that capital (more generally, non-labor) costs were fixed on a daily basis. Allowing for even a small positive relationship between daily hours and daily capital costs re-establishes the equivalence of the marginal benefits and marginal costs of varying daily hours. With this slight modification to the model, therefore, our estimates of the effects of hours on productivity and wages suggest that ten hours was the profit-maximizing length of the working day, for the typical employer in 1880.[24]

SUMMARY COMMENTS

We have shown that there were positive, but diminishing, returns to daily hours in terms of production in late 19th century manufacturing, and that manufacturing workers were apparently willing to accept a lower daily wage (but a higher hourly wage) for shorter daily hours. Assuming that non-labor costs were fixed on a daily basis, the typical employer evidently had little incentive

---

[23] Note that the production function estimate of labor's share (and consequently, the estimate of $\alpha_L \times \varepsilon_{wH}$) is slightly higher when the adjustment is made for the entrepreneurial labor input.

[24] Setting the output elasticity of hours equal to 0.28, and labor's share equal to 0.66, we solve for the elasticity of capital costs with respect to hours

$$0.28 = 0.24 + 0.34\varepsilon_{rh}$$

implying $\varepsilon_{rh} = 0.12$.

to reduce daily hours downward, because the marginal benefit of doing so (lower labor costs) was essentially offset by the marginal cost (lower valued added).

Perhaps the most important implication of our findings is the validation of the view that, in the absence of collective action or government intervention, only changes in economic "fundamentals" – labor demand and labor supply – could have altered the typical length of the working day in the late 19th century (Cahill 1932; Whaples 1990; Rosenbloom and Sundstrom 1990). And, in point of fact, daily hours did not change much between 1880 and 1900. If the typical establishment in 1880 operated for ten hours per day, the working day at its counterpart in 1900 was not much shorter – perhaps 30 minutes shorter, or so, on average (U.S. Department of Commerce 1975).

However, between 1909 and 1919, the length of the work week in manufacturing fell by six hours, as the eight-hour day became reality for almost half of the manufacturing labor force.[25] Analysis of city-level data on hours in manufacturing in 1914 and 1919 establishes that changes in the nature of labor supply and demand did, in fact, contribute to the decline in hours during this short five-year period. A tight labor market, occasioned by rapid growth in the demand for labor due to World War One, coupled with a sharp reduction in the availability of immigrant labor, altered the identity of the "marginal" worker in manufacturing; no longer were workers willing to labor ten, or even nine hours per day, even at higher wages. During the first two decades of the twentieth century manufacturers began to rely increasingly on electricity purchased offsite for their power requirements, rather than generate power on-site. This shift in the nature of energy use increased the cost savings that could be realized through shorter hours, for it was no longer necessary to "run machines ... long hours in an attempt to reduce fixed costs per unit" (Whaples 1990, p. 405).

Yet changes in economic fundamentals were not the sole factors behind the decline in hours after 1914. Growth in union power, along with intervention by the federal government during the war years, along with the passage of numerous state laws directed at reducing hours of work among women, also contributed to hours declines in the 1910s (Whaples 1990, pp. 401-404; Goldin 1988). Given the additional importance of legislation and collective action during the 1910s, future research on secular decline in shorter hours should concentrate on the reasons why both approaches to

[25] The discussion in this paragraph draws heavily on Whaples (1990); see also Goldin (1988).

shorter hours were so ineffective in the 19th century.

REFERENCES

Atack, Jeremy. 1977. "Returns to Scale in Antebellum United States Manufacturing." *Explorations in Economic History* 14 (October): 337-359.

Atack, Jeremy, and Fred Bateman. 1991. "Whom Did Protectionist Legislation Protect? Evidence from 1880." National Bureau of Economic Research Historical Working Paper No. 33.

Atack, Jeremy, and Fred Bateman. 1992. "How Long Was the Workday in 1880?" *Journal of Economic History* 52 (March): 129-160.

Atack, Jeremy and Fred Bateman. 1999. "U.S. Historical Statistics: Nineteenth-Century U.S. Industrial Development through the Eyes of the Census of Manufactures: A New Resource for Historical Research." *Historical Methods* 32 (Fall): 177-188.

Barzel, Yorim. 1973. "The Determination of Daily Hours and Wages." *Quarterly Journal of Economics* 87 (May): 220-238.

Bernanke, Ben. 1986. "Employment, Hours, and Earnings in the Depression: An Analysis of Eight Manufacturing Industries." *American Economic Review* (March): 82-109.

Cahill, Marion Cotter. 1932. *Shorter Hours*. New York: Columbia University Press.

Chandler, Alfred. 1977. *The Visible Hand.* Cambridge, Mass.: Harvard University Press.

Commons, John R., et. al. 1926. *History of Labor in the United States.* New York: MacMillan.

Commons, John R., and John B. Andrews. 1927. *Principles of Labor Legislation.* New York: Harper and Brothers.

Delle Donne, C.R. 1973. *Federal Census Schedules, 1850-1880: Primary Sources for Historical Research.* National Archives and Records Service Reference Information Paper No. 67, General Services Administration, Washington D.C.

Engerman, Stanley, and Claudia Goldin. 1993. "Seasonality in Nineteenth Century Labor Markets." In Schaefer, D. and T. Weiss, eds. *Economic Development in Historical Perspective.* Stanford, Calif.: Stanford University Press.

Feldstein, Martin. 1967. "Specification of the Labor Input in the Aggregate Production Function." *Review of Economic Studies* 34 (October): 375-386.

Goldin, Claudia. 1988. "Maximum Hours Legislation and Female Employment: A Reassessment." *Journal of Political Economy* 96 (February): 189-205.

Goldmark, Josephine. 1912. *Fatigue and Efficiency.* New York: Russell Sage Foundation.

Landes, William M., and Lewis C. Solmon. 1972. "Compulsory Schooling: An Economic Analysis of Law and Social Change in the Nineteenth Century." *Journal of Economic History* 22: 54-91.

Lucas, Robert E., Jr. 1970. "Capacity, Overtime, and Empirical Production Functions." *American Economic Review Papers and Proceedings* 60 (May): 23-27.

Massachusetts, State of. 1881. *Bureau of Labor Statistics, Twelfth Annual Report.* Boston: Rand, Avery and Company.

Moehling, Carolyn M. 1999. "State Child Labor Laws and the Decline of Child Labor." Explorations in Economic History 36: 72-106.

Ogburn, William F. 1912. "Progress and Uniformity in Child-Labor Legislation: A Study in Statistical Measurement." *Studies in History, Economics, and Public Law*. New York: Columbia University.

Persons, Charles E. 1911. "The Early History of Factory Legislation in Massachusetts from 1825 to the Passage of the Ten Hour Law in 1874." In Kingsbury, S. ed. *Labor Laws and Their Enforcement with Special Reference to Massachusetts.* New York: Longmans, for the Women's Educational and Industrial Union.

Richardson, James D. 1908. *A Compilation of the Messages and Papers of the Presidents, 1789-1907.* Washington, D.C.: U.S. Government Printing Office.

Rosenbloom, Joshua L., and William A. Sundstrom. 1990. "The Decline in Hours of Work in U.S. Labor Markets, 1890-1903." Mimeo, Department of Economics, University of Kansas, August.

Sokoloff, Kenneth. 1984. "Was the Transition from the Artisanal Shop to the Non-Mechanized Factory Associated With Gains in Efficiency? Evidence from the U.S. Manufacturing Censuses of 1820 and 1850." *Explorations in Economic History* 21 (October): 351-382.

U.S. Department of Commerce. 1975. *Historical Statistics of the United States.* Washington, D.C.: U.S. Government Printing Office.

U.S. Department of the Interior. 1886. *Report on Strikes and Lockouts.* Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Labor. 1896. "Tenth Annual Report of the Commissioner of Labor. 1894. Strikes and Lockouts". Washington, DC: U.S. Government Printing Office.

Vernon, H. M. 1921. *Industrial Fatigue and Efficiency*. London: Routledge.

Whaples, Robert. 1990. "Winning the Eight-Hour Day, 1909-1919." *Journal of Economic History* 50 (June): 393-406.

Table 1: The Effect of Hours Laws on Daily Hours of Work: Cross-Section Estimates for 1880

	Coefficient	| T-statistic |
Percent Female x Female Hours Law	-0.029	0.128
Percent Children x Child Hours Law	0.272	1.302
N	5,160	
Adjusted R^2	0.063	

Dependent variable is average daily hours of work; see text. Sample is restricted to establishments with average daily hours between 7 and 12, and located in states without any hours law, in states with a law regulating hours for women, or in states with a law regulating hours for children. Also included in the regression are a constant term, percent female, percent children, the number of workers, an urban dummy (located in a city or town of population 2,500 or more), and two-digit (SIC) industry dummies (see Atack and Bateman 1999). Information on hours laws are compiled from a variety of sources; see Atack and Bateman (1991, notes to Table 2).

Table 2: Regressions of Value-Added: 1880 Manufacturing Sample

	No Entrepreneurial Adjustment	Entrepreneurial Adjustment
Constant	3.241 (13.358)	2.831 (11.743)
Log (labor)	0.652 (63.438)	0.796 (64.180)
Log (capital):	0.240 (32.718)	0.237 (32.359)
Log (average daily hours)	0.281 (3.129)	0.293 (3.280)
Log (full-time equivalent months)	0.611 (22.679)	0.597 (30.306)
Urban = 1	0.403 (22.679)	0.407 (22.982)
Steam Power = 1	0.095 (4.256)	0.089 (4.097)
State Dummies?	Yes	Yes
Industry Dummies?	Yes	Yes
N	7,342	7,342
Adjusted R^2	0.787	0.789

T-statistics in parentheses. Dependent variable is log of value added (= value of output minus value of raw materials). The coefficient of Log (labor) is the estimate of α_L; that of Log (capital) is the estimate of α_K; that of Log (average daily hours) is the estimate of α_H; and that of Log (full-time equivalent months) is the estimate of α_D. Sample consists of establishments with average daily hours between 7 and 12 (see text for definition of average daily hours) and which hired at least one worker. No entrepreneurial adjustment: labor input is men + 0.6*women+0.5*children. Entrepreneurial adjustment: labor input is 1 + men + 0.6*women+0.5*children.

Table 3: Regression of Average Annual Wage: 1880 Manufacturing Establishments

	Coefficient	| T-statistic |
Constant	2.479	14.284
Percent Women	-0.501	14.234
Percent Children	-0.694	11.044
Average Daily Hours x 10	0.369	4.071
Full-time Equivalent Months	0.115	37.993
Log (Capital/Labor)	0.158	24.894
Urban = 1	0.266	16.154
Steam Power = 1	0.088	6.337
State Dummies?	Yes	
Industry Dummies?	Yes	
N	7,139	
Adjusted R^2	0.526	

Sample: See Table 2. The number of observations is smaller than in Table 2 because some establishments failed to report their wage bill. Observations are weighted by the number of workers prior to estimation.

Table 4: Were Daily Hours Chosen Optimally in 1880?

	Output Elasticity of Daily Hours	Labor's share x Wage Elasticity of Daily Hours
No Entrepreneurial Adjustment of Labor Input	0.281	0.241 (= 0. 37 x 0.652)
Entrepreneurial Adjustment of Labor Input	0.293	0.295 (= 0.37 x 0.796)
Direct Estimate of Labor's Share		0.200 (= 0.37 x 0.541)

This table compares, in elasticity form, the marginal effect on value-added of a change in daily hours (ε_{QH}) to the marginal effect on daily costs of a change in hours. Under the assumption that non-labor costs are fixed on a daily basis, the marginal effect on costs is labor's share multiplied by the wage elasticity of daily hours ($= \alpha_L \times \varepsilon_{wH}$). Output Elasticity of Daily Hours: from Table 2. Labor's share, Row 1, above: output elasticity of labor (from Table 2, no entrepreneurial adjustment); labor's share, Row 2, above: output elasticity of labor (from Table 2, entrepreneurial adjustment). Direct estimate of labor's share: mean value of ratio of annual wage bill/value added (= 0.541).

WORKING PAPER SERIES

MONEY AND TAXES: THE CHARTALIST APPROACH, NO. 222
L. Randall Wray, January 1998

THE KALECKIAN ANALYSIS AND THE NEW MILLENNIUM, NO. 223
Malcolm Sawyer, January 1998
Published in *Review of Political Economy*, vol. 11, no. 3, July 1999

THE DIAGNOSTIC IMAGING EQUIPMENT INDUSTRY: WHAT PROGNOSIS FOR GOOD JOBS? NO. 224
Chris Tilly with Michael Handel, January 1998

THE DEVELOPMENT AND REFORM OF THE MODERN INTERNATIONAL FINANCIAL SYSTEM, NO. 225
L. Randall Wray, January 1998
Published in *Foundations of International Economics: Post Keynesian Perspectives*, Routledge, 1999, J. Deprez and J. Harvey, eds.

THE POLITICAL ECONOMY OF CORPORATE GOVERNANCE IN GERMANY, NO. 226
Mary O'Sullivan, February 1998
Published in *Contests for Corporate Control*, Oxford University Press, 2000

THE JAPANESE FINANCIAL CRISIS, CORPORATE GOVERNANCE, AND SUSTAINABLE PROSPERITY, NO. 227
William Lazonick, February 1998

EDUCATION'S HISPANIC CHALLENGE, NO. 228
Georges Vernez, March 1998

E PLURIBUS UNUM: BILINGUALISM AND LANGUAGE LOSS IN THE SECOND GENERATION, NO. 229
Alejandro Portes and Lingxin Hao, March 1998

THE ROMANCE OF ASSIMILATION: STUDYING THE DEMOGRAPHIC OUTCOMES OF ETHNIC INTERMARRIAGE IN AMERICAN HISTORY, NO. 230
Joel Perlmann, March 1998

THE HIERARCHY OF MONEY, NO. 231
Stephanie Bell, April 1998

THE ASIAN DISEASE: PLAUSIBLE DIAGNOSES, POSSIBLE REMEDIES, NO. 232
Martin Mayer, April 1998

PUBLIC CAPITAL AND ECONOMIC GROWTH: ISSUES OF QUANTITY, FINANCE, AND EFFICIENCY, NO. 233
David Alan Aschauer, April 1998
Published in *Economic Development and Cultural Change*, vol. 48, no. 2, January 2000

YES "IT" DID HAPPEN AGAIN—A MINSKY CRISIS HAPPENED IN ASIA, NO. 234
J. A. Kregel, April 1998

EAST ASIA IS NOT MEXICO: THE DIFFERENCE BETWEEN BALANCE OF PAYMENTS CRISES AND DEBT DEFLATIONS, NO. 235
J. A. Kregel, May 1998

AN IMPORTANT INCONSISTENCY AT THE HEART OF THE STANDARD MACROECONOMIC MODEL, NO. 236
Wynne Godley and Anwar Shaikh, May 1998

SPEED OF TECHNICAL PROGRESS AND LENGTH OF THE AVERAGE INTERJOB PERIOD, NO. 237
William J. Baumol and Edward N. Wolff, May 1998

THE MACROECONOMICS OF INDUSTRIAL STRATEGY, NO. 238
Philip Arestis and Malcolm Sawyer, June 1998

AN ETHICAL FRAMEWORK FOR COST-EFFECTIVE MEDICINE: CONFRONTING THE RISKS IN MANAGED CARE, NO. 239
Walter M. Cadette, July 1998

THE PLACE OF CULTURAL EXPLANATIONS AND HISTORICAL SPECIFICITY IN DISCUSSIONS OF MODES OF INCORPORATION AND SEGMENTED ASSIMILATION, NO. 240
Joel Perlmann, July 1998

OPTIMAL FINANCING BY MONEY AND TAXES OF PRODUCTIVE AND UNPRODUCTIVE GOVERNMENT SPENDING: EFFECTS ON ECONOMIC GROWTH, INFLATION, AND WELFARE, NO. 241
David Alan Aschauer, July 1998

MONEY AND CREDIT IN A KEYNESIAN MODEL OF INCOME DETERMINATION, NO. 242
Wynne Godley, July 1998
Published in *Cambridge Journal of Economics*, vol. 23, no. 4, July 1999

STATE TYPE AND CONGRESSIONAL VOTING ON THE MINIMUM WAGE, NO. 243
Oren M. Levin-Waldman, July 1998

CAN TAXES AND BONDS FINANCE GOVERNMENT SPENDING? NO. 244
Stephanie Bell, July 1998

RECIPROCITY AND THE GUARANTEED INCOME, NO. 245
Karl Widerquist, July 1998
Published in* Politics and Society, *Vol. 27, No. 3, September 1999.

DERIVATIVES AND GLOBAL CAPITAL FLOWS: APPLICATIONS TO ASIA, NO. 246
J. A. Kregel, August 1998

THE "INABILITY TO BE SELF-RELIANT" AS AN INDICATOR OF POVERTY: TRENDS FOR THE U.S., 1975-1995, NO. 247
Robert Haveman and Andrew Bershadker, August 1998

CAN EXPENDITURE CUTS ELIMINATE A BUDGET DEFICIT? THE AUSTRALIAN EXPERIENCE, NO. 248
George Argyrous, August 1998

THE AMERICAN WAGE STRUCTURE 1920-1947, NO. 249
Thomas Ferguson and James K. Galbraith, August 1998

EXPLAINING LONG-TERM EXCHANGE RATE BEHAVIOR IN THE UNITED STATES AND JAPAN, NO. 250
Anwar Shaikh and Rania Antonopoulos, September 1998

PAUL DAVIDSON'S ECONOMICS, NO. 251
Richard P.F. Holt, J. Barkley Rosser Jr., L. Randall Wray, September 1998

MODERN MONEY, NO. 252
L.Randall Wray, September 1998
Published *in What is Money?* John Smithin, ed., Routledge, 2000

FINANCE AND THE MACROECONOMIC PROCESS IN A CLASSICAL GROWTH AND CYCLES MODEL, NO. 253
Jamee K. Moudud, October 1998

TOWARD A NEW INSTRUMENTAL MACRO-ECONOMICS: ABBA LERNER AND ADOLPH LOWE ON ECONOMIC METHOD, THEORY, HISTORY, AND POLICY, NO. 254
Mathew Forstater, October 1998

ECONOMIC TIME, NO. 255
John F. Henry and L. Randall Wray, October 1998

THE MINIMUM WAGE IN HISTORICAL PERSPECTIVE: PROGRESSIVE REFORMERS AND THE CONSTITUTIONAL JURISPRUDENCE OF "LIBERTY OF CONTRACT", NO. 256
Oren M. Levin Waldman, November 1998

IS KEYNESIANISM INSTITUTIONALIST? AN IRREVERENT OVERVIEW OF THE HISTORY OF MONEY FROM THE BEGINNING OF THE BEGINNING TO THE PRESENT, NO. 257
L. Randall Wray, November 1998

(FULL) EMPLOYMENT POLICY: THEORY AND PRACTICE, NO. 258
Dimitri B.Papadimitriou, December 1998
Published in **Commitment to Full Employment: Macroeconomic and Social Policy in Memory of William Vickrey** ***(M.E. Sharpe, 2000)***

CONSTRUCTING LONG AND DENSE TIME-SERIES OF INEQUALITY USING THE THEIL INDEX, NO. 259
Pedro Conceição and James K. Galbraith, December 1998
Published in *Eastern Economic Journal,* vol. 11, no. 4, October 1999

GOVERNMENT SPENDING AND GROWTH CYCLES: FISCAL POLICY IN A DYNAMIC CONTEXT, NO. 260
Jamee K. Moudud, December 1998

THEORIES OF VALUE AND THE MONETARY THEORY OF PRODUCTION, NO. 261
L. Randall Wray, January 1999

THE 1966 FINANCIAL CRISIS: A CASE OF MINSKIAN INSTABILITY? NO. 262
L. Randall Wray, January 1999
Published in the *Review of Political Economy,* vol. 11, no. 4, October 1999

FROM COMMON MARKET TO EMU: A HISTORICAL PERSPECTIVE OF EUROPEAN ECONOMIC AND MONETARY INTEGRATION, NO. 263
Philip Arestis, Kevin McCauley, and Malcolm Sawyer, February 1999

FURTHER EVIDENCE ON THE DISTRIBUTIONAL EFFECTS OF DISINFLATIONARY MONETARY POLICY, NO. 264
Willem Thorbecke, February 1999

REAL EXCHANGE RATES AND THE INTERNATIONAL MOBILITY OF CAPITAL, NO. 265
Anwar Shaikh, March 1999

MINSKY'S ANALYSIS, THE EUROPEAN SINGLE CURRENCY, AND THE GLOBAL FINANCIAL SYSTEM, NO. 266
Malcolm Sawyer, March 1999

THE MINIMUM WAGE AND REGIONAL WAGE STRUCTURE: IMPLICATIONS FOR INCOME DISTRIBUTION, NO. 267
Oren Levin-Waldman, March 1999

RISK REDUCTION IN THE NEW FINANCIAL ARCHITECTURE: REALITIES, FALLACIES, AND PROPOSALS, NO. 268
Martin Mayer, April 1999

DEMAND CONSTRAINTS AND ECONOMIC GROWTH, NO. 269
Marc-André Pigeon and L. Randall Wray, May 1999

CAN SOCIAL SECURITY BE SAVED? NO. 270
Dimitri B. Papadimitriou and L. Randall Wray, May 1999

CAN RESCHEDULING EXPLAIN THE NEW JERSEY MINIMUM WAGE STUDIES? NO. 271
Thomas R. Michl, July 1999

Functional Finance and Full Employment: Lessons from Lerner for Today, No. 272
Mathew Forstater, July 1999
Published in *Journal of Economic Issues*, vol. 33, no., 2, June 1999

Savings-Recycling Public Employment: An Assets-Based Approach to Full Employment and Price Stability, No. 273
Mathew Forstater, July 1999
Published in *Journal of Post Keynesian Economics*, vol. 22, no. 3, Spring 2000

The Independent European Central Bank: Keynesian Alternatives, No. 274
Philip Arestis, July 1999

Minsky's Analysis of Financial Capitalism, No. 275
Dimitri B. Papadimitriou and L. Randall Wray, July 1999

Lessons from the Asian Crisis: A Central Banker's Perspective, No. 276
Laurence H. Meyer, August 1999

Hyman Minsky's Theory of Capitalist Development, No. 277
Charles J. Whalen, August 1999

Minsky and the Mainstream: Has Recent Research Rediscovered Financial Keynesianism? No. 278
Steven M. Fazzari, August 1999

Monetary Policy in an Era of Capital Market Inflation, No. 279
Jan Toporowski, September 1999

The Rhetorical Evolution of the Minimum Wage, No. 280
Oren M. Levin-Waldman, September 1999

Open Economy Macroeconomics Using Models of Closed Systems, No. 281
Wynne Godley, September 1999

The Economic and Monetary Union: Current and Future Prospects, No. 282
Philip Arestis and Malcolm Sawyer, October 1999

Financing Long-Term Care: Options for Policy, No. 283
Walter M. Cadette, October 1999

The Distribution of Wages: A Non-parametric Decomposition, No. 284
Conchita D'Ambrosio, October 1999

Computers and the Wage Structure, No. 285
Michael J. Handel, October 1999

The History of Wage Inequality in America, 1820 to 1970, No. 286
Robert A. Margo, November 1999

Functional Finance: What, Why, and How? No. 287
Stephanie Bell, November 1999

Is There a Wage Payoff to Innovative Work Practices? No. 288
Michael J. Handel and Maury Gittleman, November 1999

New Perspectives on the Guaranteed Income, No. 289
Karl Widerquist, November 1999

Finance in a Classical and Harrodian Cyclical Growth Model, No. 290
Jamee K. Moudud, December 1999

THE SOCIAL WAGE, WELFARE POLICY, AND THE PHASES OF CAPITAL ACCUMULATION, NO. 291
Jamee K. Moudud and Ajit Zacharias, December 1999

WHY DO POLITICAL ACTION COMMITTEES GIVE MONEY TO CANDIDATES? CAMPAIGN CONTRIBUTIONS, POLICY CHOICES, AND ELECTION OUTCOMES, NO. 292
Christopher Magee, December 1999

EMPLOYMENT INEQUALITIES, NO. 293
Andrew Glyn and Wiemer Salverda, December 1999

THE BRAZILIAN CRISIS: FROM INERTIAL INFLATION TO FISCAL FRAGILITY, NO. 294
Jan Kregel, February, 2000

IS THERE A SKILLS CRISIS? TRENDS IN JOB SKILL REQUIREMENTS, TECHNOLOGY, AND WAGE INEQUALITY IN THE UNITED STATES, NO. 295
Michael Handel, February 2000

AN ALTERNATIVE STABILITY PACT FOR THE EUROPEAN UNION, NO. 296
Philip Arestis, Kevin McCauley, and Malcolm Sawyer, March 2000

WHAT'S BEHIND THE RECENT RISE IN PROFITABILITY? NO. 297
Edward N. Wolff, March 2000

KRUGMAN ON THE LIQUIDITY TRAP: WHY INFLATION WON'T BRING RECOVERY IN JAPAN, NO. 298
J. A. Kregel, March 2000

THE PUBLIC COMMODITIES PROBLEM, NO. 299
Karl Widerquist, March 2000

RECENT TRENDS IN WEALTH OWNERSHIP, 1983-1998, NO. 300
Edward N. Wolff, May 2000

TRENDS IN DIRECT MEASURES OF JOB SKILL REQUIREMENTS, NO. 301
Michael J. Handel, May 2000

KALECKIAN MODELS OF GROWTH IN A STOCK-FLOW MONETAR FRAMEWORK: A NEO-KALDORIAN MODEL, NO. 302
Marc Lavoie and Wynne Godley, June 2000

"IT" HAPPENED, BUT NOT AGAIN: A MINSKIAN ANALYSIS OF JAPAN'S LOST DECADE, NO. 303
Marc André Pigeon, June 2000

FAMILY STRUCTURE, RACE, AND WEALTH OWNERSHIP: A LONGITUDINAL EXPLORATION OF WEALTH ACCUMULATION PROCESSES, NO. 304
Lisa A. Keister, July 2000

CAN EUROPEAN BANKS SURVIVE A UNIFIED CURRENCY IN A NATIONALLY SEGMENTED CAPITAL MARKET? NO. 305
J.A. Kregel, July 2000

HOUSEHOLD SAVINGS IN GERMANY, NO. 306
Axel Börsch-Supan, Anette Reil-Held, Ralf Rodepeter, Reinhold Schnabel, and Joachim Winter, July, 2000

AN EXAMINATION OF CHANGES IN THE DISTRIBUTION OF WEALTH FROM 1989 TO 1998: EVIDENCE FROM THE SURVEY OF CONSUMER FINANCES, NO. 307
Arthur B. Kennickell, July 2000

DISCONTINUITIES IN THE DISTRIBUTION OF GREAT WEALTH: SECTORAL FORCES OLD AND NEW, NO. 308
Leonard Broom and William Shay, August 2000

PROFITS: THE VIEWS OF JEROME LEVY AND MICHAL KALECKI, NO. 309
S Jay Levy, August 2000

RACE AND THE VALUE OF OWNER-OCCUPIED HOUSING, 1940–1990, NO. 310
William J. Collins and Robert A. Margo, August 2000

RACIAL WEALTH DISPARITIES: IS THE GAP CLOSING? NO. 311
Maury Gittleman and Edward N. Wolff, August 2000

DEMOGRAPHIC OUTCOMES OF ETHNIC INTERMARRIAGE IN AMERICAN HISTORY: ITALIAN-AMERICANS THROUGH FOUR GENERATIONS, NO. 312
Joel Perlmann, September 2000

CRA GRADE INFLATION, NO. 313
Kenneth H. Thomas, September 2000

ASSET OWNERSHIP ACROSS GENERATIONS, NO. 314
Ngina S. Chiteji and Frank F. Stafford, September 2000

CROWDING IN OR CROWDING OUT? A CLASSICAL-HARRODIAN PERSPECTIVE, NO. 315
Jamee K. Moudud, October 2000

HARROD VERSUS THIRLWALL: A REASSESSMENT OF EXPORT-LED GROWTH, NO. 316
Jamee K. Moudud, November 2000

PRODUCTIVITY IN MANUFACTURING AND THE LENGTH OF THE WORKING DAY: EVIDENCE FROM THE 1880 CENSUS OF MANUFACTURES, NO. 317
Jeremy Atack, Fred Bateman, Robert A. Margo, November 2000
