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The Decline in Work Time and the Increase in Free Time of Manufacturing Employees from 1890 to World War I

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Abstract
This paper adds to the long debate over the capacity of unorganized employees to obtain and protect their interests by contracting in free labor markets. It does so by calculating perhaps the first estimate of the income elasticity of demand for leisure time, using data from the U.S. Census of Manufactures for manufacturing employees from 1890 to 1914, the classic period of alleged widespread labor exploitation. Recent data on the history of per capita real income growth is also reported along with other indicators of human well-being. Last, an estimate of the elasticity of labor supply in manufacturing during 1900–1914 is reported.

JEL Codes: N30, O43, P17
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I. Introduction

Economic theory says that leisure time should be a normal good, of which workers and other persons want *more* as their incomes rise. That is, it should have positive income elasticity of demand. As capital accumulation and technical advances raise real output and income per person, part of the gains can be taken in higher compensation and part can be taken in reduced work time. Rising real income should result in workers contracting in labor markets for shorter work days and more days off. Does history support this theory?

There certainly are alternative perspectives. From the beginnings of the post–Civil War union movement, unionists and their progressive political and intellectual allies claimed that, despite rising productivity, workers not only were being held down to near-subsistence wage levels by their corporate and other capitalist employers, but were being forced to work excessively long hours. As the complaint went, unorganized workers lacked sufficient

"bargaining power" to prevent or correct such abuses (Webb and Webb, 1964 pp.217, 561, 654–701). Endlessly repeated, this argument eventually gained sanctification by the U.S. Supreme Court in *West Coast Hotel v. Parrish,* 300 U.S. 379 (1937).[1] Which of these two views is correct?

II. Ancient Poverty and Modern Progress

It is true that over much of human history, progress was very slow, when it occurred at all. By current estimates, over the 16th and 17th centuries, which roughly marked the terminus of the medieval period, real per-capita income in Europe grew at an annual compound rate of only 0.1 percent (Gaylor and Weil, 2000, p.808). By this author's calculation, that rate of growth would take 694 years to double any initial level of real income per person, and in fact, those were relatively prosperous and progressive centuries. Over the 1000 years before that, the annual compound rate of increase in output per capita averaged *zero* (Maddison, 1982). Even into the 1700s, as R. W. Fogel has recently shown, food production was so low that the poorer classes in Europe and Britain were chronically malnourished. Many lacked enough food energy, above that required for basal metabolism and digestion, to allow them to work more than a few hours each day. People were stunted (short) and wasted (light) by modern comparison. Immune systems were weak, disease and famine common, and life spans short (Fogel, 1999, pp.2–4; 1994).

Between 1700 and 1820, however, with medieval mercantilism in decline and the industrial and agricultural revolutions starting in Britain, European annual output growth per capita rose to a 0.2 percent compound rate (Gaylor and Weil, 2000, p.808), which would double people's real incomes in only 347 years. Starting from such low income levels, however, this improvement almost certainly resulted in workers initially contracting for *longer* average workdays, as desperate people gained the capacity – and jumped at the opportunity – to work longer and earn more. Even at such income levels, leisure should theoretically be a normal good, but a *luxury* good, which could be indulged in only after significant real income gains. Leisure, after all, does not mean not working because one is too weak or sick to work, but having free time *and* both the income and the health with

[1] The most comprehensive historical treatment of the "inadequate bargaining power" argument is to be found in Dickman (1987).

which to enjoy it. There is therefore some truth to the claim of 19th century socialists that the length of the workday of the laboring classes had risen during the early industrial revolution.[2] However, it had little to do with capitalist exploitation of workers. Only later, as incomes and literacy (which is another luxury good) rose enough to support such a class of socialist critics, and leisure time began to come within the financial reach and desire of ordinary persons, could it be portrayed that way.

With the partial exception of the Southern states, with their plantation agriculture and racial slavery, fortunate conditions and sensible policies kept nearly all but the very earliest American colonists from being subject to medieval living conditions. Hereditary aristocratic land tenure was never established on the North American continent. With abundant land, private ownership, and labor scarcity, per capita real incomes in the colonies quickly rose above those of English citizens, though they stagnated during much of the 18th century due to punitive British government policies of colonial taxation, mercantile exploitation, and rapid colonial immigration (North, 1983, ch.IV).

Those policies motivated a revolution, and afterward, the constitution establishing the United States, with its limited government, property rights protection, and free market economy, created a set of incentives motivating enormous entrepreneurship, technical innovation, and productive resource use. Real output and income rose at a rapid rate from the beginning of the republic in 1789, and did so *particularly* after the Civil War. Data in *Historical Statistics of the United States* reveal that the real annual incomes of non-farm employees grew at nearly 1.7 percent per year between 1865 and 1900 (Edwards, 1998, pp.100–1). That was nearly seventeen times faster than the 0.1 percent annual growth rate cited above for Europe during the 16th and 17th centuries, and would double a person's real income in only 43 years. This estimate may be too low. Using more recent data, North (1983, p.123) reports that annual compound growth in real income per person in the United States between the Civil War and World War I occurred at a 2 percent rate.

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[2] Hutt (1954, p. 178) cites certain reformers of the day as admitting that workers were not only attracted to factory work by relatively *high* wages, but would actually *quit* and change jobs if their employers reduced hours, so they could work longer and earn more.

Actually, even that astonishing rate of growth in real incomes would tend to *understate* the rate of improvement in the well-being of ordinary Americans occurring at the time under two conditions. First, the gain in material living standards, in part involving increased quantity, quality, and variety of food per person, should have strengthened immune systems, reduced infant and adult mortality rates, and lengthened life spans, so that people had more time to enjoy their higher incomes (Van den Berg, 2002, pp.185–86). Unambiguously, this happened. Mean life expectancy in the United States rose from 35 years in 1800 to approximately 48 years in 1900, and was over 50 before World War I. Second, the value to people of any free time they have for recreational and other discretionary non-employment activities is not captured in measures of the purchasing power of their incomes. If the amount of time people spent working to earn their higher real incomes declined over time, leaving them with more free time, then such monetary measures again tend to understate the ongoing improvement in their well-being. So what was happening to work time?

III. Free Time for Workers

Near the end of the 19th century, data on annual days and daily hours of work of certain types of employees began to be compiled and published by the U.S. government, making it possible to gauge the effect of rising productivity and real income on work time. Data from the U.S. Census of Manufactures published in *Historical Statistics of the United States,* Part 1 (1975) show that from 1890 to 1914, the year World War I began in Europe, the average number of days worked annually by employees in manufacturing industries fell from 294 to 281. This amounts to approximately a 4.4 percent decline in days worked per year over those 25 years.

Over the same period, however, the average length of the workday in manufacturing fell from 10.02 hours to 9.28 hours (as shown graphically in Figure 1), a 7.4 percent decline. Multiplying average days worked per year by average hours per workday in 1890 yields $294 \times 10.02 \approx 2{,}945.9$ hours worked by the typical manufacturing employee. By 1914 average hours worked had fallen to $281 \times 9.28 \approx 2{,}607.7$ hours, as shown in Figure 2. Average annual hours of labor per manufacturing employee had therefore declined by approximately 11.5 percent in just a quarter of a century.

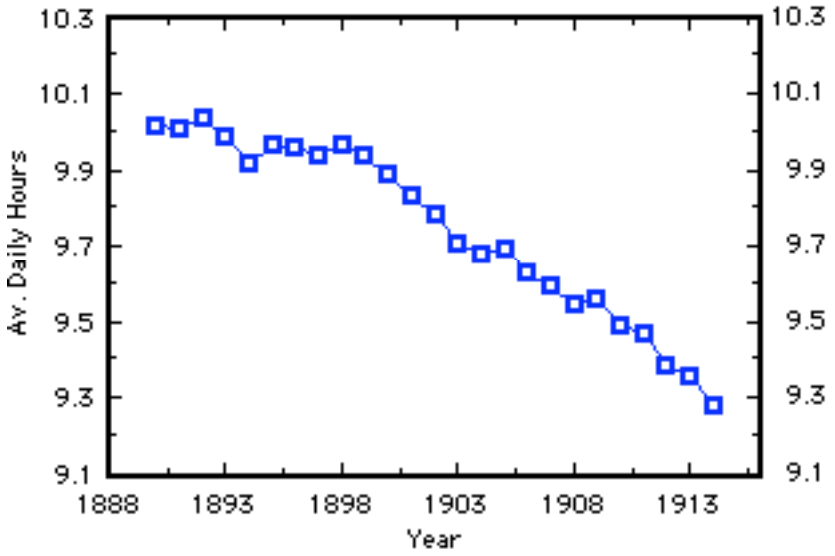

Figure 1. Average daily work hours of U.S. manufacturing employees, 1890–1914. Source: *Historical Statistics of The United States, Part 1*, (U.S. Department of Commerce, 1975), series 847.

The reduction of average hours worked per day between 1890 and 1914 by 0.74 hour, and of average days worked to 281, is equivalent to approximately an additional 8.7 days off in 1914 because $0.74 \times 281 \approx 207.9$ hours, and $207.9/24 \approx 8.7$ days. As an approximation, this reduces actual days worked in 1914 further to $281 - 8.7 \approx 272.3$. From this one can roughly estimate the percentage change in days of free time available to the typical manufacturing employee as follows:

Free time 1890: $365 - 294 = 71$ days.
Free time 1914: $365 - 272.3 = 92.7$ days.
ΔDays of free time $= 92.7 - 71 = 21.7$
$\%\Delta$Days of free time $= 21.7/71 \approx 0.305$ or +30.5%.

It appears, then, that discretionary non-work time available to manufacturing employees increased significantly over the period from 1890 to 1914. A complication, of course, is that this calculation does not account for non-work time on days of work. It is difficult to know how much of that was actual free time in 1890, but by Fogel's

estimate of only 1.8 hours per day in 1885 (Fogel, 2000, p.184), it probably did not exceed two hours. Thus, some inaccuracy must exist in the calculation just given. For reasons to be explained in Section IV below, however, such discretionary time after work was increasing over time. If so, the calculation above is probably an underestimate of the actual increase in discretionary time available to manufacturing workers for leisure activities over the 1890–1914 period.

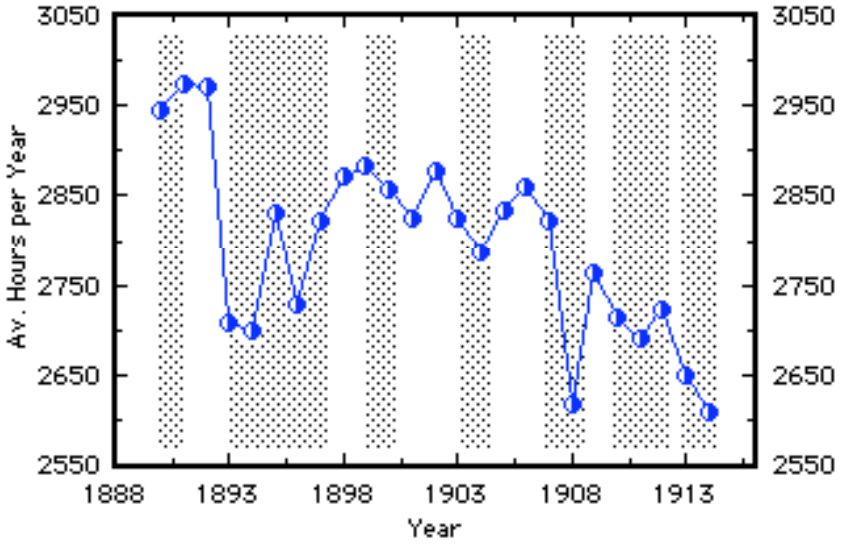

Figure 2. Average annual work hours of manufacturing employees, 1890–1914. Source: computed from *Historical Statistics of the United States, Part 2,* (U.S. Department of Commerce, 1975), series 845–876. Note: The shaded areas show NBER business cycle contractions and expansions, including the large 1893–1897 depression.

Was this rise in free time a consequence of rising real income? Almost certainly it was. Using the 1967 base year Consumer Price Index (CPI) values (which the Commerce Department recently extended clear back through the 19th century) to adjust the hourly nominal wages, I estimate that the average real hourly wage in manufacturing increased 37.7 percent from 1890 to 1914. The time pattern of that variable is shown in Figure 3. And because by definition the income elasticity of demand for a good is the ratio of the percent change in the amount demanded to the percent change in income, the estimated income elasticity of demand for leisure time

over those 24 years is 30.5/37.7 ≈ 0.81, which is strongly positive. Free time definitely is a normal good.

One might think that this calculation is too simple and that this estimated income elasticity of demand for leisure time too high. After all, the difference between the real annual income per employee they would have earned in 1914 had their annual hours of work not declined and their realized real incomes that year is precisely the real income each manufacturing worker gave up on average to "purchase" their additional free time. So, in principle, one would think one should use that higher estimated percentage change in real income in the denominator of the elasticity ratio. In fact, however, calculating their income change that way yields the same 37.7 percent obtained by simply taking the percent change in their hourly real wage over the period.

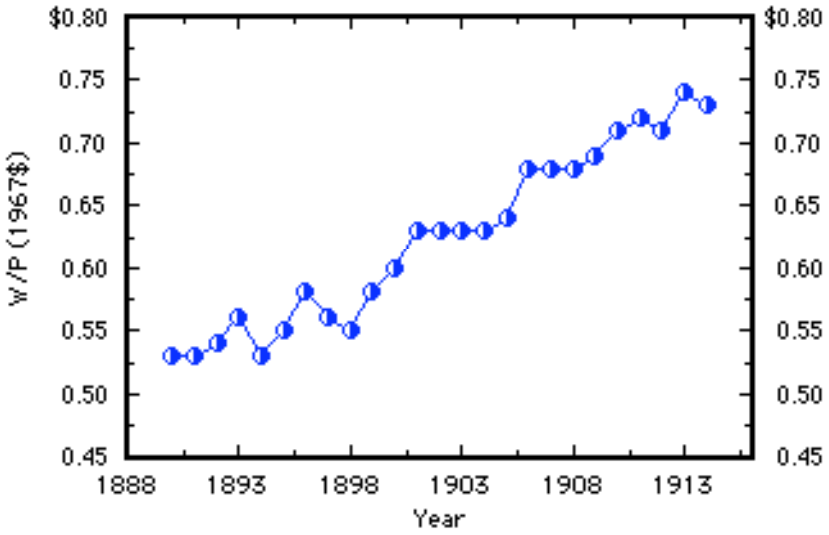

Figure 3. Hourly real wage rates of U.S. manufacturing employees, 1890–1914. Sources: Nominal wage data are from *Historical Statistics of the United States, Part 2* (U.S. Department of Commerce, 1975), series D-848. CPI values used to compute the real wage are from series E-135.

Progressive historians have often claimed that the modern short workday resulted from pressure by unions and from state laws mandating shorter workdays (Shannon, 1974, p.107; Faulkner, 1968, p.258; Hofstadter, 1955, p.240). Though systematic time series are not available for the post–Civil War period, starting from almost

nothing union density must have been small even at its height in the 1880s and early 1890s, and is known to have actually declined during that latter decade when unions suffered several major defeats. In 1900 only about 3 percent of the U.S. labor force was unionized. Density then began rising and experienced a spurt of growth during World War I before declining again throughout the 1920s (Reynolds, 1984).

As for reduced hours laws, before the war only a few states had passed them, they applied only to particular industries, and state supreme courts frequently declared such laws to be unconstitutional on 14th Amendment "liberty of contract" grounds (Jacobs, 1954, pp.78–84). Following the lead of the state courts, the U.S. Supreme Court later did the same in the landmark case of Lochner v. New York, 198 U.S. 45 (1905), invalidating the New York Bakeshop Act that set maximum work hours for journeymen employees. That decision greatly deterred the states from making or enforcing such laws. So it seems clear that market processes were acting to rapidly raise the real incomes, reduce the work time, and increase the free time available to employees long before unions and/or reduced hours legislation could have had major effects.

This interpretation is reinforced by the fact that employee real incomes actually rose more rapidly in the service sector of the economy than they did in the manufacturing sector during the early 20th century even though union density was much smaller there. So the evidence contradicts the claim of progressives and unionists in the late 19th and early 20th centuries that unorganized workers of their day had inadequate "bargaining power" relative to their employers and were unable to obtain and protect their interests by contracting in the market. It is true that workdays shortened even more rapidly after the U.S. entered World War I, unions became much stronger (due to deliberate actions of the Wilson administration), and more states passed reduced hours laws. However, Robert Whaples (1990) has shown that even then natural economic factors had far more powerful effects in reducing work time than did union strength and progressive legislation.

IV. Free Time and the Labor Supply

One last point requires some clarification. It might be assumed that when workers began to contract for shorter workdays and more days off as their real incomes rose, their labor supply would turn out

to be a *negative* function of the real wage, contrary to the normal assumption that supply of an economic good (including labor) is a *positive* function of its relative price. However, a rise in the real wage logically has a substitution effect working in the opposite direction of the income effect. That is, *by raising the opportunity cost of alternative uses of time, a rising real wage should attract additional people (with higher reservation wages) into the labor market,* raising the labor force participation rate. Thus, even if average daily and annual hours per worker decline due to the income effect, labor supply could still be a positive function of the real wage.

A contributing factor here is that, in the late 19th century, time was also being freed up *in the home* by innovations in *consumer goods*. Efficient wood- and coal-burning cast iron stoves replaced open fireplaces, making homes more comfortable while steadily reducing chopping and stoking time. Natural gas ovens became available in the 1890s and steadily expanded in use, as did electric irons, kettles, toasters (electric stoves, refrigerators, and washing machines came later) and, after 1908, home vacuums, all saving time and making life easier. Running water supplied through internal plumbing, first in urban homes and later in rural ones, saved untold hours of water carrying by men, women, and children. There was a dynamic interaction between these forces because many of those attracted into the labor force as the real wage rose were women whose time requirements for primary tasks in the home were being diminished by such product innovations. Census data show that the female labor force participation rate (percent of adult females in the labor force) rose from 18.9 in 1890 to 20.6 in 1900 and 25.4 in 1910.

Surprisingly, staunch progressives of that day found this entry of women into the labor force distressing, believing that it both threatened to reduce wage rates for male employees and represented decay in the family structure. Consequently, they advocated, as an "enlightened" social reform, minimum wage laws for women only, with the *openly stated intent* of pricing as many women as possible out of employment and back into the home (Leonard, 2005). By 1924, 15 states had enacted such laws, and they had significant disemployment effects (Thies, 1991, 2002). Nevertheless, entry of women into the labor force continued as real wages rose.

On the other hand, there was another source of *withdrawal* from the labor force attributable to the rise in real wages, in addition to the reduction in the daily and annual work hours of employees. Child

labor (i.e. employment), which had been necessary throughout history for the survival of many families simply due to primitive methods of production, steadily and naturally diminished after the Civil War. One reason for this was that rising agricultural productivity, combined with income-inelastic demand for most food crops, steadily reduced the fraction of the labor force employed in agriculture, which was always the most child-labor intensive industry. From approximately 85 percent of the labor force in 1790, agricultural employment had fallen to only 30 percent or so by 1910 (Council of Economic Advisers, 1992, pp.113–14). For another, as the real wage earned by parents in manufacturing and other types of employment increased, they could afford to keep their children out of work and in school longer, and most did so. Education for their children was also a normal good.

Progressives of the day thought that capitalism was the cause of, rather than the cure for, child labor and advocated legislation to end it. They may be partly forgiven for this misunderstanding. It has only recently been discovered and documented that Francis A. Walker, Director of the Census for 1870 and 1880, secretly adjusted the collected data on employment of women, children, and older men in the Census of Manufactures in ways not followed by subsequent Census officials so that the published data showed false labor force and employment trends for the remainder of the 19th century (Carter and Sutch, 1996). Thus, child labor appeared to be increasing clear through 1900 when in fact it was decreasing. This led progressives such as Edith Abbot (1908) to claim that industrialization, with its mechanized factory production, was drawing more children out of the home and into employment. Only after 1910 did the actual declining trend of child labor begin to appear in the Census data. Still, it is another self-congratulatory error of the progressives to have presumed that this historic decline was primarily a result of the child labor legislation they championed. That was not so (Moehling, 1999; Brown, 1992; Sanderson, 1974). Child labor declined naturally with industrialization, productivity growth, and rising real wages.[3]

Although it is theoretically possible for either the substitution effect or the income effect of a rising real wage to dominate, a multiple regression analysis by this author finds that at the turn of the

[3] Hutt (1954, p.180) seems to have recognized even before 1926 that the same forces had generated the same effect in Britain.

century both the total number of manufacturing employees and total person-hours of manufacturing employment were positive functions of the real wage (allowing simultaneously for the effect of growth in the population age fourteen and over, and for substitution between manufacturing and other types of employment due to relative income changes). Data was only complete for 1900–1914, but I estimate the elasticity of manufacturing employment with respect to the real wage over that period to be 0.838, so that, *ceteris paribus,* each percentage point increase in the real wage of manufacturing employees increased such employment by more than eight-tenths of a percentage point. Thus, the decline in average daily and annual hours worked and the increase of free time for manufacturing employees in the late 19th and early 20th centuries did not stop manufacturing employment overall from responding positively to the rising real wage.

V. Conclusion

Evidence is strong and continues to accumulate that the real incomes, life spans, and free time of ordinary persons were all increasing with extreme rapidity in the progressive era (particularly in contrast with earlier medieval conditions). This cannot reasonably be attributed to union strength or progressive legislation. Consequently, it really is difficult to believe that workers were unable to obtain and protect their interests by contracting in labor markets and hence were systematically subjected to underpayment and excessive work hours by their corporate and other capitalist employers.

Of course "difficult" does not mean "impossible." By some definitions, "exploitation" (say, monopsonistic firms paying workers MRP < VMP) might even be *consistent* with rapidly rising real incomes, health, and life spans of employees as productivity rose. Falling work time and rising free time for largely unorganized employees, though, such that free time is empirically a normal good – as demonstrated here – seems hard to square with *any* definition of labor exploitation, though it is consistent with the efficient operation of free labor markets predicted by economic theory.

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