A Century of Work and Leisure

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Abstract

Has leisure increased over the last century? Standard measures of hours worked suggest that it has. In this paper, we develop a comprehensive measure of non-leisure hours that includes market work, home production, and schooling for the last 104 years. We also argue for a more consistent definition of "per capita." The new measures reveal a number of interesting 20th Century trends. First, more consistent measures of "per capita" and "potential labor force" suggest a less dramatic decline in hours worked. Second, half of the decline in hours worked per capita has been offset by an increase in hours spent in school. Third, contrary to conventional wisdom, hours spent in home production are actually higher now than they were in the early part of the 20th Century. Finally, leisure per capita is approximately the same now as it was in 1900, around 54 hours a week.

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I. Introduction

In his 1930 essay "Economic Possibilities for Our Grandchildren," John Maynard Keynes predicted that a rise in productivity would result in a large increase in leisure during the next 100 years. He speculated that the central problem for humanity would be using its abundant leisure time in a meaningful way. According to a number of observers, Keynes' prediction about leisure is coming true. For example, Lebergott (1993) and Lomborg (2001) argue that leisure has increased dramatically over the last century.

In contrast, modern growth and business cycle theories accept the long-run stability of leisure per capita as a stylized fact. For example, Prescott (1986) states: "A key growth observation which restricts the utility function is that leisure per capita, l_t, has shown virtually no secular trend while, again, the real wage has increased steadily." This type of statement has been repeated countless times in the RBC literature. In a representative agent model, leisure can be stationary in the face of dramatic rises in the real wage only if the income and substitution effects of real wage changes exactly cancel.

The standard measure of leisure is the difference between the endowment of time and the hours of market work. By this measure, the stability of leisure per capita implies stability of market work per capita. Has market work per capita been stable over the long-run? Maddison's (1995) data show that hours worked per employed person in the U.S. have fallen from around 2,700 hours a year to almost 1,400 hours a year. This number, however, does not take into account changes in labor force participation rates. As an alternative, Figure 1 shows the behavior of the most widely used measure of hours per capita from the real business cycle literature. This series divides total hours worked in business by the civilian noninstitutional

population ages 16 and over. The standard post-WWII series is extended back to 1900 using Kendrick's estimates and Census data. (The data appendix gives details of all data construction.) By this measure, hours per capita have fallen substantially over the last 103 years, from almost 1600 hours a year to below 1000 hours a year.

On its face, Figure 1 suggests that leisure per capita has increased significantly, by almost 550 hours per year. It therefore casts doubt on the types of utility functions used in most DGE models and raises questions about the existence of a balanced growth path.

In this paper, we present evidence that per capita leisure has not increased at all. We offer a new measure that takes into account other major non-leisure uses of time and utilizes alternative measures of the time endowment. In particular, we show the importance of including government employment, time spent in formal schooling, and time spent on housework. Our earlier work on the effects of technology shocks on historical fluctuations adjusted the potential labor force for government employment, school enrollment, and older population to form a new hours per capita measure (Francis and Ramey (2004)). In this paper we develop more comprehensive and better measurements of hours of non-leisure time and the potential workforce.

The new measures reveal a number of interesting 20th Century trends. First, more consistent measures of "per capita" and "potential labor force" suggest a less dramatic decline in hours worked. Second, half of the decline in hours worked per capita has been offset by an increase in hours spent in school. Third, contrary to conventional wisdom, hours spent in home production are actually higher now than they were in the early part of the 20th Century. Finally, leisure per capita is approximately the same now as it was in 1900, between 54 and 55 hours a week using our preferred measure. The new measure also overturns some key results that were

obtained using the standard measure. In particular, estimated labor market distortions are smaller than those obtained using a standard measure.

Section II proposes two alternative measures of the time endowment. Section III provides estimates of hours spent in non-leisure time during the last one hundred years. Section IV combines the estimates from Section II and Section III to produce measures of leisure per capita. Section V shows how the new measures can change conclusions by using the example of Mulligan's estimates of labor market distortions. Finally, Section VI concludes.

II. Alternative Measures of the Time Endowment

In empirical applications, the time endowment is measured as the population multiplied by a measure of total hours per person available. The standard population variable is the civilian non-institutional population aged 16 and over. This is the series reported by the BLS for the post-WWII period. The motivation is as follows. The goal is to measure the potential labor force. Children are omitted because their potential to work is severely limited by labor laws, particularly in the post-WWII period. Inmates of institutions are omitted because their status could prohibit market work. Persons in the armed forces are omitted because they are not available for civilian work.

In this section we will argue against this series on several grounds. First, it is not clear that one should not count the entire population when thinking about the representative agent model. Second, if one does want to limit the time endowment to the potential workforce, it should be done in a consistent manner that reflects the ability to engage in productive activities.

A. The Case for Using Total Population

Most papers use a measure of the "working age" population to construct their per capita variables. It is not clear, though, why working age population is a better measure than the total population.

Consider the following argument. A standard way to write the maximization problem of the representative agent in a DGE model is as follows:

$$\text{Choose } c_t \text{ and } l_t \text{ to maximize } E_0 \sum_{t=0}^{\infty} \beta^t U(c_t, l_t) N_t \qquad \text{subject to various constraints.}$$

c_t is per capita consumption and l_t is per capita leisure. N_t is the period t population. When matching predictions from this type of model to the data, the consumption of the entire population, including children, the elderly, military, and inmates of institution, is counted in aggregate consumption. By analogy, the leisure time of the entire population should be counted in aggregate leisure.[1] Viewed another way, our measure should allow for the possibility that an increase in the number of children or elderly, with their increase in per capita leisure, may have to be offset in equilibrium by a decrease in per capita leisure by individuals between 25 and 54 years of age. If we count only adult hours-population ratios, we may see an increase in hours and not realize that it is offset by an increase in leisure by another segment of the population.

Omitting the population under sixteen has a significant effect on per capita measures. Figure 2 shows the ratio of population ages 0 to 15 divided by the entire population. This ratio falls from 36 percent to 22 percent over the period under study, with a bulge during the 1950s

[1] We are implicitly assuming that leisure hours by children and adults are perfect substitutes in the representative agent utility function. Another possibility would be to construct a representative agent utility function with separate

and 1960s resulting from the baby boom. Thus, part of the measured decline in hours per capita may owe to the use of the restricted population measure in denominator.

B. Better Measures of the Potential Work Force

Even if one wants to focus on the potential work force, the standard measure falls short. There are several inconsistencies in the standard measure that become particularly important when comparing long spans of data back to 1900. Each of these will be discussed in turn.

1. The Time Endowment of Children

The exclusion of all children ages 0 to 15 from the potential workforce is not necessarily suitable for the entire 20th century since the restrictions on child labor have changed so much over the last 100 years. For example, children were considered an important labor input on family farms. Indeed, the current school schedule owes to the historic demand for children's farm labor during the summer. According to the 1910 Census, 25 percent of male children ages 10 to 15 were employed.[2] It is likely that the percentage was even higher in the 19th century. By 1900 standards, children ages 10 and up were certainly part of the potential workforce.

As the 20th century progressed, though, the employment-population ratio of the younger age groups fell dramatically. One reason was that the public became concerned about child labor in the early part of the 20th century, resulting in the passage of restrictive laws by some states. It was not until the Fair Labor Standards Act of 1938, however, that there were far-reaching Federal restrictions. Legislation regarding mandatory schooling, passed by various states over

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terms for leisure hours of different segments of the population, where the weights on each term would be the proportion of the population.

[2] These numbers are based on the fraction that are "gainfully employed" from the *Statistical Abstract*.

the century, also reduced the labor supply of children. Current federal law sets 14 years as the minimum age for "non-hazardous" non-agricultural employment and 10 years for "non-hazardous" agricultural employment. Children under 16 years of old are restricted in terms of the hours of work allowed on school days. Some states have more binding restrictions. For example, California restricts 16 and 17-year olds'hours of work on school days.

The changes in child labor laws and mandatory schooling have restricted current labor supply, but have not necessarily increased leisure time. Rather, hours of effort have been transferred from current market work to investment in human capital. Thus, either the population available for work should be adjusted by schooling rates or total hours "worked" should include hours spent on school. We will take the latter approach when constructing measures of non-leisure time. For the purposes of measuring potential workforce, we include children ages 10 and up.

2. The Potential Labor Supply of the Older Population

The standard potential workforce measure assumes that anyone still alive and not institutionalized can supply labor to the market. There is a good argument for adjusting for the older population, since physical and mental limitations on work ability are more prevalent among the elderly. In fact, when Prescott (2004) compares hours worked by Americans versus Europeans, he omits those 65 and over altogether.

Figure 3 shows the fraction of the population that is 65 and over. This ratio rises from four percent in 1900 to over twelve percent in 2000. Not only has the fraction of the population in this age group increased, but its labor force participation has decreased. The relative labor

force participation rate of those 65 and over relative to the population ages 25 to 64 has fallen dramatically, from over 70 percent to under 14 percent for males.

Why did the labor force participation rate of individuals aged 65 and over fall so much? First, the introduction of and the changes in the generosity of Social Security and Medicare benefits have been a major factor since 1935.[3] A second factor that may play a role is age discrimination and mandatory retirement. Before the late 1970s, many firms imposed mandatory retirement at age 65. The decline in agricultural employment, which was an important source of self-employment, may have made it more difficult to avoid these age restrictions.[4] For those over 65 with less than perfect health, continuing to do a small amount of work on the family farm or in the family business might be less difficult than working enough to maintain a steady job at an establishment.[5] Since the prohibition of mandatory retirement in the late 1980s, there has been a small increase in labor force participation rates of older workers, but nowhere near to where they had been. Yet a third reason that the participation rate of this group has declined is compositional. The fraction of the group ages 65 and older that is much older than 65 has grown over time as well. For example, in 1900 people ages 75 and up constituted 29 percent of the 65 and older group; in 2004 they were almost 50 percent.

The effects of changing institutions on labor force participation rates should not be included in measures of the potential labor force. Ideally, the potential labor force should reflect the inherent employability of the age group, based on the physical and mental ability to work. Two counter trends affect the fraction of older individuals who could potentially work. First, because of increasing life spans, the fraction of the older population that is very old has

[3] For example, see Chart 6 of McGrattan and Rogerson (2004) for the period 1940 to 2000.
[4] As late as 1950, almost half of the self-employed were in agriculture.
[5] In the first half of the 20th Century, the Census did not ask how many hours individuals worked. Thus, we only know if an individual considered himself "gainfully occupied."

increased. This trend decreases the fraction of the old who can work. Second, because of increasing nutrition and medical technology, the incidence of some diseases has fallen, which increases the fraction of the old who can work.[6]

To estimate the fraction of the older population that is capable of working, we use two different types of measures. For the period 1962 to 2003, we use data from the Center for Disease Control's National Health Interview Survey. Two of the questions asked in 2003 are particularly relevant. One asked whether individuals had health conditions that limited their work activity. Unfortunately, this question was only asked beginning in 2003 and only for age groups up to 69 years. Fortunately, another question, which is similar to other questions asked back to 1962 and which is asked for more age groups, shows very similar incidences for overlapping age groups. This question asks whether individuals face limitations in their usual activities due to 1 or more chronic conditions. We use these numbers to estimate the potential employability of the population in age group relative to ages 18-44. That is, for the group ages 65 and over, this variable is:

$$\text{Relative fraction of those 65+ able to work} = \frac{1 - \text{fraction of population age 65+ with health limitations}}{1 - \text{fraction of population ages 18-44 with health limitations}}$$

A similar measure is constructed for those ages 45-64.[7]

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[6] See, for example, Riley (2000) and Costa (2002).

[7] We would prefer to use the age group 55-64 rather than 45-64, since the incidence of health problems starts rising noticeably around age 55. The CDC does not publish estimates for the 55-64 age group separately so we were forced to include some middle-age individuals in our "older" group.

No such health questionnaire is available for the earlier part of the century. Alternative indicators of potential employability are employment-population ratios from the years in which there were no Social Security benefits, few pensions, and few institutional constraints on the employment of older individuals. Thus, for the early part of the century, we use the labor force participation rate of older workers relative to those for the ages 25 to 54 age group in 1900, 1910, 1920, and 1930.[8] Only the rates for men are used, since many women concentrated on household production and therefore did not show up as employed.

Figure 4 shows the estimates of the fractions of the two older groups (relative to adults up to age 44) that can potentially work. For the age group 45-64, the fraction that is employable falls from near unity around 1900 to 85 percent in the late 1970s, and then rises again to 90 percent currently. Some of these changes stem from compositional effects in this age group. For those 65 and over, we estimate that over 70 percent were employable in 1900. This number fell to around 60 percent from 1930 to 1980, and then rose back to 70 percent. These non-monotonic movements are likely the result of the countervailing effects of increases in the fraction that are truly old and increases in health for a given age. The upturns that begin in the early 1980s are consistent with previous findings of an acceleration in the reduction of functional limitations (see Costa (2002)).

3. The Time Endowment Per Person

Hours per capita do not depend on assumptions about the time endowment per person in the potential workforce. Measures of leisure do, however. Assumptions about hours available per person vary widely. Ghez and Becker (1975) assume a baseline time endowment of 8,736 hours a year, based on 24 hours a day, 365 days a year. This is also the measure used in time

[8] We use the *labforce* variable from IPUMs.

diary studies, which account for all time spent during a 24 hours day. Ghez and Becker also consider an alternative time endowment, net of sleeping and personal care time of 70 hours a week, resulting in a net endowment of 5,096 hours a year. Greenwood and Hercowitz (1991) assume 16 hours a day, 7 days a week, amounting to 5,840 hours per year. Mulligan (2002) assumes a time endowment of 2,500 hours a year per person.

We will follow the time diary studies and include 24 hours a day. However, since there is little evidence of significant trends in time spent in personal care (sleeping, eating and grooming), hours spent in these activities are subtracted from the time endowment. According to Robinson and Godbey (1999), personal care time for adults averaged 74 hours a week in 1965 and was very similar in 1975 and 1985. According to the BLS Time Use Survey, the average for those ages 15 and up was also about 74 hours a week. Children do spend more time sleeping according to time diary estimates (e.g. Juster and Stafford (1991)), but we do not make any extra adjustment.[9] Thus, the net time endowment we use is 4,912 hours a year.

To recap the arguments of this section, two alternative new measures of the relevant population are proposed. The first one is simply the entire population, for the reasons stated earlier. The second measure is an adjusted population measure, based on intrinsic employability. It is:

Adjusted Population = Non-institutional Population ages 10-44

+ Population 45 and over adjusted by health estimates.

[9] Adjusting for the extra personal care time for children would decrease our estimates of leisure during the early part of the 20th century since children were a greater fraction of the population then. See Figure 2.

Note that the population measure is not limited to the civilian labor force. Military hours will be included as part of work hours.

III. Comprehensive Measures of Non-Leisure Time

The standard macroeconomics model assumes that there are only two uses of time: leisure and private market work.[10] Understanding the trends in leisure and hours of work demands a more complete accounting of time use. We focus on four uses of time: a more comprehensive measure of paid work, including government hours; time spent commuting to work; time in formal education; and time spent in home production. We will begin by showing how important government hours are in explaining low frequency movements in private hours per capita. Lucas (1988), Rios-Rull (1993), Perli and Sakellaris (1998), and Caselli and Coleman (2001) all consider models with human capital accumulation where one of the costs is the time cost. We will explicitly estimate the amount of time spent in school work over the last century. Benhabib, Rogerson and Wright (1991), Greenwood and Hercowitz (1991), Rios-Rull (1993), among others, consider time spent in home production and how its addition can improve the ability of the DGE model to explain cyclical fluctuations. We will develop estimates of hours spent in home production for the past 100 years.

Consider expanding the standard definitions of work and leisure to include these alternative measures of time. Using the standard log form, we assume the momentary utility function of the representative agent is:

$$U = \log(C_t) + \phi \log(L_t) \qquad \textit{where} \quad L_t = \overline{T} - H_{mt} - H_{ct} - H_{st} - H_{ht}$$

[10] Mulligan (2002), however, includes government hours in his study of labor-leisure distortions.

In this formulation, C is a composite consumption good, L is leisure and $\overline{T}$ is the time endowment per person, net of personal care. The various H's are hours spent in working for pay (H_m), commute time (H_c), school work (H_s), and home production (H_h). This functional form assumes that these hours measures are perfect substitutes in measuring leisure. We will show the importance, both in trends and magnitudes, of the components ignored by standard measures.

A. Paid Work

Most macroeconomic studies use private hours or nonfarm private hours as the measure of paid work. One reason for this choice is the absence of quarterly frequency data on total hours worked.[11] Another reason is that the RBC model assumes that workers and capital are hired based on market incentives, assumptions that may not hold for the government sector.

Omitting the hours of government workers, however, induces significant low frequency movements in hours per capita. Figure 5 shows hours worked in government (both civilian and military) as a percent of total hours worked.[12] Other than the two spikes during the two world wars, the most noticeable movement is the upward trend in government hours as a fraction of total work hours. It is clear that the failure to account for this movement will bias the estimates of hours per capita down in the second half of the century. Moreover, this series has an inverted U-shape in the post-WWII period, matching the U-shape of the standard series that uses only private hours. Government hours as a percent of total hours has a post-WWII peak in 1968. Increased employment of teachers, resulting from the educational demands of the baby boomers, accounts for a third of the increase in government employment from 1948 to 1968.

[11] The BLS quarterly hours index does not include government workers.

In order to characterize accurately trends in hours per capita and in leisure, measured hours should include both private and government hours. We therefore create a measure of total paid work hours.[13] The data from 1900 to 1946 are from Kendrick.[14] Forming this series for the post-WWII period is more difficult. The BLS reports an index of total hours worked in private business, including both establishments and sole proprietors. It does not, however, report hours worked in government. On the other hand, the BEA reports total hours worked in both private and government establishments, but does not include hours worked by sole proprietors. The BEA does offer another series of full-time equivalent persons engaged in private and government industry, including sole proprietors. Therefore, for 1947-2003, we use the ratio of full-time equivalent persons engaged in total to private industries to up-weight the BLS private hours index. We then splice this series to Kendrick's series. See the data appendix for more details. This forms our measure of "work-for-pay hours."

B. Commute Time

The time diary method for accounting for time spent usually adds travel time to the activity in question. Thus, time diary studies combine hours spent at work and travel to work as time spent at "paid work." The only time diary studies that measure commute time, however, begin in 1965.

Time diary data summarized in Robinson and Godbey (1999), Juster and Stafford (1991) and the 2003 BLS Time Use Survey suggest that the average time spent commuting has been a

[12] Hours worked in government enterprises, such as the post office, are included in private hours, both in the Kendrick series before 1947 and the BLS series from 1947 to the present.
[13] "Work-for-pay" is not a completely accurate characterization of these work hours, since they include unpaid hours of family members on farms and in business.
[14] Siu (2004) argues that Kendrick undercounts government hours during WWII because he assumes that military personnel work the same number of hours as civilians. We had not corrected for this problem. This undercounting during WWII does not affect the long-term trends which are the focus of our analysis.

relatively constant ten percent of hours of work from 1965 to 2003. There is little systematic evidence on commute times in the first half of the 20th Century. For urban workers, average commute distances were much lower but modes of transportation (walking and public transit) were slower than during the second half of the 20th Century. By some estimates, the time spent commuting for urban workers remained relatively constant over the 20th Century (Rodrigue (2004)). In the early part of the century, though, a significant fraction of the workers lived in rural areas and were self-employed or unpaid family workers in agriculture. Most of these workers lived at their place of work and spent no time commuting. Thus, the average commute time for all workers might have been somewhat lower in the early part of the 20th Century. In the absence of firm evidence, we assume that commute times in the early part of the sample were also ten percent of total civilian hours worked, just as they were in the last 40 years of the sample.[15] This assumption implies commute times per employed person were higher in the early part of the 20th Century than in the last part, since hours worked per employed person were higher. This implication is not unreasonable since part of the increase in hours per employed person was accomplished by working a sixth day, which required an extra day of commuting.

C. Schooling

One of the most striking trends of the last 100 years is the amount of schooling attained in the United States. Goldin (1999) chronicles the rise in schooling overall, and Goldin and Katz (1998) describe the rise of secondary education in particular. These trends are important for understanding the changes in hours of work and the implications for leisure.

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[15] Military hours are excluded because many military personnel live on bases.

Figure 6 shows the high school enrollment rate, the number of days of school attended per enrolled student in grades K-12, and the college enrollment rate. All three series show significant increases over time. The percent of children ages 14 to 17 enrolled in high school rose from 10 percent in 1900 to 95 percent in 2003. Moreover, for all children enrolled in grades K-12, the number of school days attended rose from under 100 days a year to over 160 days a year. Part of this increase was an increase in scheduled school days and part was a decrease in days absent. Finally, college enrollment rates (relative to the 18-24 age group) rose significantly, particularly after WWII.

These trends translate into a large increase in hours spent in school. We estimate annual school hours as follows:

$$\begin{aligned}\text{Annual school hours} = {} & (\text{enrollment in grades K} - 8) \cdot (\text{avg. days attended by enrollee}) \cdot 6 \text{ hours} \\ & + (\text{enrollment in grades 9 - 12}) \cdot (\text{avg. days attended by enrollee}) \cdot 7 \text{ hours} \\ & + \{(\text{enrollment in college}) \cdot [(\text{fraction full-time}) \\ & + 0.3 \cdot (\text{fraction part-time})] \cdot 165 \text{ days} \cdot 7 \text{ hours}\}\end{aligned}$$

The enrollment data, average days attended by enrolled student (grades K-12), and fraction enrolled in college that are full-time are available from Goldin (1999), the *Digest of Education Statistics*, and *Mini Historical Statistics.* We do not have measures of days attended for college. We assume that annual days spent in college are a constant 165, calculated from 33 weeks times 5 days a week.

We were unable to find data on trends in hours spent per day on schoolwork per enrolled student nationwide, nor on travel times to school. We were, however, able to obtain information

about school hours in California since the 1930s. Our data are based on interviews with Kathryn Ramey, a professional educator who kept records on the length of the school day and number of homework hours in California since the 1930s. The length of the school day appears to have been relatively constant in California over the last 70 years. Grade school typically lasts 7 hours, with about 1 - 1.5 hours for recess and lunch. Homework averages between zero and half an hour a night. Thus, we assume that time spent on schoolwork and travel to school per day attended is 6 hours for grades K-8. The high school day lasts about as long as grade school, but the recess and lunch time is shorter and the amount of homework is greater. We thus assume that high school students spend 7 hours a day on schoolwork per day attended. Based on the BLS 2003 survey of time use, we also assume that college students spend 7 hours a day per day attended.[16] We did not have information on how much time part-time college students spent. We assumed that they spend one-third of the time that full-time students spend.

Figure 7 shows our estimate of school hours as a fraction of total hours worked in the private and government sectors.[17] The combined effects of increases in enrollments and an increase in days attended by those enrolled have led hours spent in school to increase significantly over the last century. The large effect of the post-WWII baby boom is also evident. Hours spent on schoolwork as a fraction of total (non-school) work hours hit peaks above 35 percent in the late 1960s and early 1970s.

[16] According to the BLS time use survey, half of the persons ages 15 and over who are engaged in educational activities during weekdays spend almost three hours a day doing homework on weekends. Since we only count weekdays as days in school, we allocate weekend homework to weekdays in our hours per day measurement.

[17] This graph shows hours spent in school by those ages 5 and above. When we compare school hours to the potential workforce, we only include hours spent in school by those ages 10 and above in order to be consistent.

C. Home Production

A complete accounting of non-leisure time must include time spent in home production. Xenophon (4th century BC) believed that home production was as important as market production, and devoted half of his work *Oeconomicus* to issues of household management (Leeds (1917)). More recently, Becker's (1965) article made modern economists aware of the importance of measuring and modeling home production. To this end, we combine results from various studies to construct a series showing trends in the average number of hours spent on home production.

A number of cross-validation studies show time use diaries to be the most accurate source of estimates for housework (and market work for that matter) (Juster and Stafford (1985, 1991)). Thus, we use estimates based on time diary data to the extent possible. The standard definition of home production includes cooking, cleaning, laundry, management, animal and plant care, repairs, yard work, childcare, shopping, and related travel. (See for example Robinson and Godbey (1999)).

Our studies of the time diary literature indicate that the most important distinctions are for age, gender and employment status. Our strategy for constructing total hours spent in home production is as follows. For each of the relevant age, gender and employment status cells, we first gather as much information as possible on hours of housework for that category. We then interpolate values between years of the time diary studies. Finally, we weight the estimated hours of housework of each cell by the fraction of the population that falls in that cell.

Non-employed Women Ages 18-64

Contrary to the claims of Greenwood, Seshadri and Yorukoglu (2005), most of the evidence does not suggest a decline in housework by full-time housewives during the time of rapid diffusion of appliances. We will begin our analysis by reviewing the various studies.

Vanek (1973, 1974) surveyed a large number of time diary studies and concluded that full-time housewives spent as much time on housework in 1965 as they did in the 1920s. Lebergott (1993, p. 58), on the other hand, argued that the average time spent on housework by women fell from 70 in 1900 to 30 by 1981. His calculations were for both working and non-working women, and were based on anecdotal evidence such as the average workweek of domestic servants in Boston in 1900 and a misreading of Leed's (1917) dissertation.[18] Bryant (1996) restricted his analysis to time use studies that asked almost identical questions and found a modest decline of 14 percent between the mid-1920s and the mid-1960s in the average housework of women. A significant part of the decline was compositional – employed women spend less time on housework.

Figure 8 shows various estimates of time spent on housework by non-employed women. The estimate from 1912 is based on Leed's (1917) study of sixty American-born families in Pennsylvania. All of the families were earning enough to reach a level of "decency" which was generally defined as earning at least $1,000 a year. The average of the sixty housewives' estimates of time spent on housework was 55.8 hours per week. This may be an overestimate, though. For the twelve families that kept time diaries, the estimates of time spent were on average 15 percent above the actual time spent according to the diaries. The total time spent on

[18] In particular, Lebergott claims that Leeds' study shows housewives spend 44 hours a week on kitchen work alone (pages 51 and 59). He mistakenly uses the hours spent by all people in the household, including hired help. We will discuss this issue more below.

housework by all family members including hired help was much higher. All of the families in Leeds' study had some housework done by hired help.

The estimates from the 1920s through 1968 were taken from Vanek's (1973) Table 3.2. Her table shows the estimates from a number of time diary studies of full-time housewives, typically between the ages of 22 and 64. Some estimates were for farm wives, some for rural nonfarm, and some for town and urban. In the figure, we do not distinguish the wives' locations because the estimates are surprisingly similar across these three categories of women. Estimates for 1965, 1975, and 1985 were taken from Robinson and Godbey (1999) and apply to non-employed women ages 18-64 (who are not necessarily married).[19] The 2003 number is based on the new BLS Time Use Survey for 2003 and applies to non-employed women.[20]

What is clear from this graph is the constancy of the weekly hours of housework of full-time housewives from 1912 to the mid-1960s. With the exception of two high estimates that both come from one small study of Idaho families, the estimates from 1912, the 1920s and 1930s all hover between 51 and 56 hours per week. The same is true for the estimates from the 1940s through the 1960s.

One might worry that the estimates from the early sample were not typical of the average full-time housewife. For example, Leeds' families were certainly better off than the low income families living in the tenements in big cities at that time. It is not clear, though, that more housework was done by wives in lower income families. All of Leeds' families had some amount of hired help, something that most low income families could not afford. Vanek (1973, Table 4.13) shows that the hours spent per week by all persons (including hired help) on

[19] Robinson and Godbey (1999) include a chapter that updates their earlier results to 1995. The tables were not detailed enough, however, to reveal individual cell estimates.
[20] See the data appendix for details on how we estimated the hours for the age group from 18 to 64 to make them comparable to the earlier data.

housework was significantly greater for urban college educated wives compared to farm and rural nonfarm wives. Moreover, 90 percent of housewives in the 1920s rural studies reviewed by Vanek had no hired help.

How could the poor maintain a household with no hired help and no modern appliances? A home economist noted during that time "if one is poor it follows as a matter of course that one is dirty" (Hansen (1913)). Having clean clothes, clean dishes, a clean house, and well-cared for children was just another luxury the poor could not afford. Another reason to believe that our estimates are typical of the group we are characterizing is that being a full-time housewife was a luxury. Demographers at the time estimated that among low income families, perhaps as many as one-third of married women worked (Cowan (1983), p. 169). We will be including these women in our estimates of housework by employed women, which we will discuss below.

Between 1965 and 1975, the estimates fall significantly. Robinson and Godbey's estimates, which apply to non-employed women (married or single) show a decline from 51.5 in 1965 to 42 in 1975. After 1975, average hours of non-employed women show a very slight downward trend.

It is surprising that housework did not fall between 1912 and the 1960s, a time of significant diffusion of household appliances. One would think that the introduction of mechanical washing machines alone would have reduced the amount of housework. According to time use studies, it took 4 hours to do a load of laundry by hand and 4.5 hours to iron it. Using electric appliances, it took 41 minutes to wash the load of laundry and under 2 hours to iron it (Greenwood et al (2005)). However, a large number of time diary studies that compared women who had electric appliances to those who did not found that there was no difference in the time spent on housework (Vanek (1973), Bittman et al (2004)). As Ruth Schwartz Cowan points out

in her 1983 book *More Work for Mother,* in the pre-appliance era many families hired laundresses or sent out their laundry to commercial facilities. Because of the large waves of immigration during the early part of the century, the real price of hiring full-time or part-time help was relatively low. At the same time that appliances diffused, immigration restrictions were imposed and the number of domestics employed fell precipitously. These two factors led to a shift from the market to the home in the production of a number of commodities.

In *The Feminine Mystique*, Betty Friedan (1963) explained the constancy of time spent on housework with the law that "housewifery expands to fill the time available." Mokyr (2000) argues that the failure of labor-saving appliances to save labor during this period was the result of a different type of technological progress: the revolution in sanitation and cleanliness, the germ theory of disease, and knowledge about the consequences of nutrition for health. Mokyr presents evidence and a model suggesting that at the very time electric appliances were diffusing, the public became aware of the importance of cleanliness and nutrition for families' health. Thus, the demand for housework rose just as the appliances were introduced. Many have noted that the diffusion of washing machines appeared to cause women to do the laundry much more often. For example, Friedan talks about the 1950s housewife whose family demanded that she launder their sheets twice a week.

A similar phenomenon occurred with time spent on childcare. According to Bryant and Zick (1996), the amount of time married women spent on childcare in 1981 was slightly greater than in 1924, even though family size decreased significantly over that time period. Total time did not decrease because the time spent per child increased. One source of the increase per child was the increase in the education of the population – educated parents tend to spend more time

with their children. Another source of the increase may have been the widely-publicized studies on the effects of parental interaction on children's development.

Based on the estimates presented above we assume that the average hours of housework of non-employed women between ages 18 and 64 were a constant 52 hours a week from 1900 to 1965. We use Robinson and Godbey's 52 hour estimate for 1965 instead of Vanek's 55 hour estimate since her estimate applies to a group that probably worked a few more hours a week (non-employed married women ages 22 to 64). We use the actual time use data estimates in 1965, 1975, 1985, and 2003 and linearly interpolate for the intervening years.

Employed Women Ages 18-64

Vanek (1973, p. 140) reports that a small study found that rural employed women spent 26.8 hours on housework and urban employed women spent 23.6 hours on housework in 1936. Robinson and Godbey's estimates show that between 1965 and 1985, employed women spent between 23.7 and 26.1 hours of week on housework. Hours dipped between 1965 and 1975, but then rose again in 1985. Thus, the available estimates for housework by employed women from the pre-WWII period are very similar to those in the post-WWII period. We use the average of the two earlier estimates of 25 hours a week for 1936 and interpolate between 1936 and 1965. We assume that hours were equal to 25 a week before 1936.

Figure 9 shows the average of the available estimates by gender and employment status for individuals ages 18 to 64. The second line from the top shows the average estimates for employed women.

Non-employed Men Ages 18-64

The only estimates for housework hours of non-employed men are from 1965 and later. They are shown in the second line from the bottom in Figure 9. Hours of non-employed men rose by about 4 hours a week between 1965 and 1985, and another 2.5 hours a week between 1985 and 2003.

In the absence of early estimates for this group, we assume that they did as many hours of housework in the early part of the century as they did in 1965. In particular, we use the 1965 value of 15 hours for the earlier years as well. The potential biases from the lack of data should have very little impact on long-run trends because non-employed men represent a very small segment of the population in the early part of the sample. There are, however, potential biases in the implications for the cyclical behavior of housework by this category. In the early decades of the century, most non-employed men probably had health problems and could not do much housework. In contrast, the majority of non-employed men during the Great Depression were not ill and may have done much more home production than our estimates would imply.

Employed Men Ages 18-64

Finally, the bottom line in Figure 9 shows estimates of the housework done by employed men. The estimates from various studies during the 1920s indicate that employed men spent very little time doing housework, on average 4 hours a week. In contrast, by 1965, they averaged around 11 hours per week, and by 2003, they averaged 15.5 hours a week.

The estimates for the 1920s are from Vanek's survey. She presents results from several studies that asked housewives how many hours of help they received from other adult family

members. The estimates were between 3 to 5 hours a week. One of those studies which isolated husbands in particular found that they contributed 3.3 hours a week.

Are these numbers for the 1920s too low? One question is the accuracy of wives' estimates of husbands' housework time. A recent study using various methods for measuring time spent on housework found that wives' estimates of husbands' housework hours were lower than husbands' estimates of their own housework hours. However, husbands' estimates of housework hours were higher than actual time spent, based on monitoring. In fact, wives' estimates were much closer to actual time spent by husbands than husbands' estimates (Lee and Waite (2005)). Thus, we do not have a reason to believe that wives' estimates are biased downward.

A second factor that makes the lower estimates of employed men's housework in the 1920s plausible is the correlation between housework and the length of the workweek. Robinson (1977, Table 3.2) investigates the effect of workweek length on employed men's housework using the 1965 studies. Whereas men who work 30-39 hours a week average 10.5 hours on housework, those working 55 or more hours a week average 6.4 hours on housework. During the early decades of the century, employed men worked significantly more hours per week than they did in later decades (Pencavel (1986)). Thus, it is not so surprising that they helped less with the housework.

Another possible bias is single versus married men. All of the men in the 1920s studies were married. Do single men do more housework? Robinson (1985, Table 11.2) shows that whereas the average employed married man in 1965 spent 9 hours on housework per week, the average employed single man spent 7.7 hours on housework. Thus, single employed men tend to

do less housework than married employed men, so the 1920s estimates are not likely to be biased downward.[21]

Individuals Ages 65 and Over

The estimates presented so far have dealt only with the 18-64 age group. Robinson and Godbey provide measures in 1985 for those 65 and older. They do not distinguish between employed and non-employed. In 1985, men ages 65 and older spent a little more time on housework than non-employed men between ages 18-64, 22.6 hours versus 20.3. On the other hand, women ages 65 and older spent less time than non-employed women ages 18-64, 30.4 hours versus 39 hours. The source of this latter difference is that most women ages 65 and older do not have young children. The 2003 BLS Time Use Survey records 20.6 hours of housework per week for men ages 65-97 and 28.5 hours of housework per week for women ages 65-97, just slightly below the estimates for 1985.

Gauthier and Smeeding (2001) show historical patterns of time use by elderly adults. Their graphs show that housework for men ages 65 and over in 1975 was about equal to what it was in 1985. Women ages 65 and over spent about 2.2 hours more per week on housework in 1975 than in 1985.[22] Data are not available for those ages 65 and over in 1965. However, the 1975, 1985, and 2003 data suggest that women ages 55-64 spend the same amount of time on housework as women 65-74. Furthermore, the hours spent on housework by women ages 55-64 was the same in 1965 as 1975. Thus, we assume that housework done by women ages 65 and over before 1975 was equal to its value in 1975.

[21] One might ask how single men can survive with so little housework done. Single men are much more likely to turn to the market for their meals and other traditional home production commodities. For example, Chinese restaurants were first established in the U.S. because there were so many single, male Chinese immigrants.
[22] These numbers are rough estimates, based on measurements taken from their graphs.

We do not have evidence on older men before 1975. For this age-gender group, it is important to keep track of employment rates, which were much higher in the early sample. We assume that employed men ages 65 and older do the same amount of housework as employed men ages 18-64. Using that assumption and the fact that 20 percent of men 65 and older were employed in 1975, we estimate that non-employed men ages 65 and older did 25.6 hours of housework a week in 1975. For the earlier years, we assume that the ratio of housework of non-employed men ages 65 and over to men ages 18-64 is equal to the 1975 value.

Children

Since we include all children in one measure of population and children ages 10 and over in another measure, we also need to estimate the housework of children. According to Vanek (1973), in 1926 homemakers reported an average 3.3 hours of housework from children ages 6 to 14 and 5 hours of housework for children ages 15 to 18. Estimates from Juster and Stafford (1991) and Timmer, Eccles and O'Brien (1985) suggest similar numbers for 1981, around 3 hours for children and 5 hours for teenagers. Thus, housework by children has been about constant based on these estimates 60 years apart. We assume that children ages 5-13 worked a constant three hours a week and children ages 14-17 worked five hours a week on housework.

Estimates of Total Measures of Housework

As discussed above, we construct measures of total housework by weighting the estimates of each cell by the fraction of the population in that cell. The data appendix gives details on how we constructed weights for gender, age, and employment categories.

Figure 10 shows the estimates based on several subcategories. The top panel of Figure 10 shows average weekly hours for men and women between ages 18-64. Although average hours within employment category did not change before 1965, average hours of women decreased gradually because of the increase in women's employment rates. Since 1965, average housework done by women has decreased. Average housework done by men has increased gradually over the century.

The bottom panel of Figure 10 shows average weekly hours of housework by adult age group for both sexes combined.[23] For the 18-64 age group, hours show no trend until 1930, when they increase significantly. With the exception of WWII, housework hours stay at a higher level during the 1940s to mid 1960s and then plunge from 1965 to 1975. They recover slightly during the early 1980s and remain relatively constant.

Housework hours increase significantly for the 65 plus age group from 1900 to 1975. Two forces lead to this increase. One is the decrease in male labor force participation rates in this age group. During that part of the century, employed males worked about ten hours less than non-employed males ages 65 and over. Second, because of changing life expectancies, women became a greater fraction of the population ages 65 and over. (Recall that women do more housework than men.) After a peak in 1975, hours decline somewhat so that by 2003 they are about equal to their 1940s levels.

[23] We did not show average hours by children on the graph because it varies between 3 and 5 hours of week and is much lower than hours of housework by adults.

IV. The New Measures of Work, Schooling, and Leisure

A. Trends in Hours Components and Leisure

We are now ready to provide estimates of per capita leisure. Figure 11 shows the subcomponents of the total non-leisure hours measure divided by the entire population. The first thing to note is that the addition of the government and the use of the total population imply that market hours do not fall nearly as much as the standard measure suggests. According to our measure, average annual market hours per capita have only fallen by about 140 hours, rather than 550 hours. School hours, on the other hand, have increased by 95 hours. Home production hours are now 128 hours more per capita than in 1900. Two factors are the source of this increase: (1) the aging of the population (older people do more housework than children) and (2) the increase in the amount of housework done by men. Although women between the ages of 18 and 64 do less housework now, that effect is swamped by the other factors.

Figure 12 shows hours devoted to paid work and to paid work plus school relative to the potential workforce. Recall that the potential workforce uses the noninstitutional population ages 10 and older and weights older individuals by the estimated fraction that are healthy enough to work (relative to the younger age groups). We modify the schooling variable in the numerator to include the hours only of those ages 10 and older by using enrollments for grade 5 and up. Using this measure, paid work per member of the potential labor force has fallen by 260 hours a year since 1900. However, counting paid work and hours spent in school together, average hours in activities oriented toward current or future market work have decreased only 127 hours since 1900.

It is important to note that this estimate is quite sensitive to how the young and old are treated in estimating the potential workforce. In an earlier version of this paper, we had included children ages 5 and up in both numerator and the denominator and had counted only half of population ages 65 and over. Using that measurement, work plus school hours per capita in 2003 were close to their values in 1900. We changed the definition in this paper because we found new data that allowed us to decompose school enrollment among children and new data on the health of the elderly.

Figure 13 compares the implied hours of leisure based on the standard measure of non-leisure hours per capita, which uses private hours divided by the civilian noninstitutional population 16, to our new measures. As discussed earlier, we use the time endowment net of personal care time, which is 4,912 hours per year.

The top graph is just the reverse of the graph shown in Figure 1. The standard RBC measure using only private work hours (solid line) implies a 550 hour increase in leisure per capita since 1900. Even if we add civilian government hours (dashed line), the estimated increase in leisure relative to the population ages 16 and over would still be 465 hours.

The middle graph shows our preferred new measure, which is relative to the entire population. To construct leisure hours we account for hours spent working for pay, commute time, school hours and housework hours. According to this measure, leisure per capita was slightly higher in 1900 than in 2003, 2,853 hours per year in 1900 and 2,811 hours per year in 2003. These estimates imply roughly 54 hours of leisure per week.

The bottom graph of Figure 13 uses the potential workforce in the denominator instead of the entire population. The numerator includes only the hours spent in the various activities by individuals ages 10 and over. This measure paints a similar picture to our more comprehensive

measure. In this case leisure per capita is estimated to be slightly higher now, 2,370 hours in 2003 versus 2,293 hours in 1900.

Thus, both new measures imply the long-run constancy of leisure per capita. There are, nevertheless, some low frequency movements during the century. Leisure per capita hit an all-time high during the Great Depression according to our measures. As discussed earlier in the paper, however, we may have underestimated the amount of home production done during the Great Depression. Our estimates are based in part on the amount of time non-employed men spent on housework in 1965. It is likely that a significant portion of the non-employed men in 1965 had health problems, and therefore did less home production than a man who was unemployed for business cycle reasons. Leisure per capita naturally plummeted during WWII. Leisure per capita using the entire population was relatively high during the 1960s because of the large fraction of children in the population. Our estimates imply that leisure per capita is somewhat lower now than it was in 1975.

In sum, adequately accounting for non-leisure time and being consistent about measuring the time endowment overturns the conclusions drawn from the standard series. While leisure per capita has varied over the last 100 years and has exhibited some low frequency movements, it is the same now as it was 103 years ago. Keynes' predictions on the increase in productivity are proving correct, but it appears that his predictions about a great increase in leisure are not proving true so far.

The results also imply that the standard RBC assumption that income and substitution effects cancel is consistent with the long-run data. What looked like a secular rise in leisure over time using standard measures was actually a mismeasurement of leisure.

B. Comparison to Other Post-WWII Studies

A number of other studies have analyzed trends in work and leisure in the post-WWII period. A controversial study by Schor (1991) argues that leisure declined between the late 1960s and the 1990s. Roberts and Rupert (1995) challenge her conclusions using data from the Panel Study of Income Dynamics. They show that total paid work plus housework hours have been relatively constant for husbands and wives (combined) between the mid-1970s and the late 1980s. Robinson and Godbey (1999), whose estimates of housework and commute hours we use, argue that "free time" increased by about six hours a week between 1965 and 1995. Our measure displayed in the middle panel of Figure 13 suggests a slight decline in leisure per capita over this period of about one hour per week.

Our results, however, are not at odds with Robinson and Godbey's results for two reasons. First, our measures cover all age groups, whereas their analysis of trends focuses only on individuals ages 18 to 64. Second, we count time spent in schooling as non-leisure time whereas they count it as free time. Robinson and Godbey's estimates of total productive activity for ages 18 to 64, which includes paid work, commute and housework, decreases by four hours from 1965 to 1995. We construct a roughly matching estimate by assuming that all paid work hours are done by those ages 18 and 64. Adding our work hours, commute hours and housework estimates for those ages 18 to 64, we find that productive hours decrease by 3.3 hours a week over the same period. Thus, comparable measures show similar changes.

V. More Implications of the Revised Measure of Leisure: Mulligan's Calculation Revisited

Our new measure of leisure has implications for a variety of studies that have used standard measure of hours per capita. As an example, we will concentrate on the implications

for Mulligan's (2002) calculation. Mulligan (2002) calculates labor distortions by comparing measures of the marginal rate of substitution (MRS) relative to the marginal product of labor (MPL). Mulligan uses a simple, but powerful, framework for measuring labor market distortions. In a representative agent model, the following condition should hold:

$$MRS_t = (1 - \tau_t) \cdot MPL_t ,$$

where *MRS* is the marginal rate of substitution between consumption and leisure, *MPL* is the marginal product of labor, and τ is the marginal "tax" or distortion rate. Mulligan includes hours worked in the government sector, so his measure does not suffer from the changing composition of employment between the private sector and government. His measure of potential hours is the population ages 15 and older times 2500 hours per year.

We re-calculate Mulligan's distortion rates in the context of an extended model which includes human capital accumulation and home production. In particular, consider the following model which merges elements of King, Plosser, Rebelo (1988) and Benhabib, Rogerson and Wright (1991):[24]

$$U = \log(C_{mt}) + \theta_h \log(C_{ht}) + \phi \log(L_t) \qquad \text{Momentary utility}$$

$$Y_t = (V_t K_t)^{1-\alpha} (H_{mt} E_t)^{\alpha} \qquad \text{Market goods technology}$$

$$C_{ht} = (X_t K_t)^{1-\eta} (H_{ht} E_t)^{\eta} \qquad \text{Home goods technology}$$

$$K_{t+1} = (1-\delta) K_t + I_t \qquad \text{Physical capital accumulation}$$

$$E_{t+1} = (1-\delta_E) E_t + G_{Et}^{\ 1-\nu} (H_{st} E_t)^{\nu} \qquad \text{Human capital accumulation}$$

[24] We only need the first two equations of the model for our present purposes, but it is useful to be concrete about what is going on in the rest of the economy.

$$G_{Et} + G_{Ot} = w_t H_{mt} \tau_t + T_t \qquad \text{Government budget constraint}$$

$$L_t = \bar{T} - H_{mt} - H_{ct} - H_{st} - H_{ht} \qquad \text{Time constraint}$$

$$H_{ct} = \vartheta H_{mt} \qquad \text{Required commuting time}$$

$$Y_t = C_{mt} + I_t + G_{Et} + G_{Ot} \qquad \text{Resource constraint}$$

Utility is a separable function of market consumption C_m, home good consumption C_h, and leisure L. We assume preferences of this form so that we do not need to measure home production output. Market goods Y are produced with physical capital K and hours H_m, whose productivity is affected by the stock of human capital, E. (Note that Y includes goods that are purchased by the government and H_m includes both private sector and government sector hours.) V is the fraction of total physical capital that is allocated to market good production. Home goods are produced similarly. Human capital is produced with government expenditures on education G_E and hours devoted to schooling, and accumulates according to the equation above.[25] Government expenditures consist of expenditures on education and other goods, and allows for the possibility of distortionary taxes on labor, τ_t. The time constraint takes into account hours worked for pay, commute times, hours devoted to human capital accumulation, and hours devoted to home production and leisure.

Using our specification of preferences and market goods technology, Mulligan's implied labor market distortion is:

$$\tau_t = 1 - \frac{MRS_t}{MPL_t}$$

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[25] Since education outputs are counted as part of GDP it is easier to model education as purchased by the government from total output rather than including another sector and measuring multi-sector GDP.

$$\text{where } MRS_t = \frac{\phi C_{mt}}{\bar{T} - H_{mt} - H_{ct} - H_{st} - H_{ht}} \quad \text{and} \quad MPL_t = \frac{\alpha Y_t}{H_{mt}}$$

In contrast to Mulligan, we subtract commute time, hours spent in school and home production from the time endowment to create leisure. Notice that commute time, school hours and housework hours do not appear in the term involving the marginal product of labor since only hours devoted to current production are used to calculate the marginal product of labor.

We calculate the implied tax two ways: (1) using only hours worked for pay (private plus government) as the non-leisure time use and using the noninstitutional population 16 and over; and (2) using our measure of leisure relative to the entire population. To calibrate the ratio ϕ/α, we use the value that sets the minimum implied distortion at 0. That value is 2.92 for the first measure and 3.72 for the second measure.

Figure 14 shows graphs of the implied tax calculated the two ways, plus Barro and Sahasakul's (1986) estimated marginal tax rate on labor income. Both estimates suggest an increase in distortions just after the introduction of the income tax, but the implied distortions are larger than the tax rate. From the 1920s on, the standard leisure series implies a higher distortion than the new series. Both jump dramatically from 1929 to 1934. The standard measure shows a noticeably greater increase in distortions in the post-WWII period, with a slight decline after 1980. It suggests that the distortion rate is currently 47 percent. In contrast, the new measure shows a peak in distortions in the early 1960s, and then a steady decline. The distortionary tax rate implied by the new data is about equal to the Barro-Sahasakul estimated tax rate by 1990, and falls to 30 percent in 2003.

In sum, this exercise shows how the use of our new leisure series can lead to different conclusions about the labor market when data and theory are combined to take measurements. It is likely that a number of other conclusions in the literature have been affected by the use of the standard hours series.

VI. Conclusion

This paper has studied trends in time endowment, market work, home production, schooling and leisure. We first argued that the standard practice of using the civilian non-institutional population ages 16 and over as a measure of the economy's time endowment was not justified. We suggested the use of total population as a per capita measure and a more consistent measure of potential labor force. We then developed more comprehensive measures of non-leisure time, including work in government, hours spent in school, and home production. We used a variety of data sources to produce series on aggregate hours spent in school and in home production back to 1900.

The new measures give a very different impression of trends in leisure. In contrast to the standard measure, which implies that per capita leisure time has increased by 550 hours per year, the new measure suggests that leisure per capita now is essentially the same as it was in 1900. Thus, Keynes' prediction about an increase in leisure has not yet materialized. Researchers who use DGE models in which income and substitution effects exactly cancel can rest assured that the assumption is consistent with the data.

Data Appendix

Population:

Estimates of population by age group are from the Census and the CPS. Specific sources are *Mini Historical Statistics*, *Statistical Abstract, Demographic Trends in the 20th Century, Economic Report of the President, 2003*, Table B-34, and CPS statistics from the BLS. Only the resident population was available before 1939 and after 1980. To obtain a better estimate of the total population, we added the number of armed forces overseas during WWI. Most series were available annually. Several subcategories were available only decennial. We interpolated fractions of larger categories between decades in these cases.

Institutional Population:

Decennial values for 1900-1950 for inmates of institutions were from Census extracts from IPUMS, using the variable "Relate." Later decennial values were from published Census tables. The fraction institutionalized was interpolated between decennial years.

Potential Working Population for Older Individuals:

1. For 1962-2003, we used data from the CDC, *Series 10: Data from the National Health Interview Survey* available at:
   http://www.cdc.gov/nchs/products/pubs/pubd/series/sr10/ser10.htm
   We used responses to the questions concerning limitations on activities due to chronic health problems. There were changes in the questions between 1967-68, 1981-81, and 1996-97. We used the levels given in 2003 and spliced back using percentage point changes in the old series. We used the fraction without limitations for the older age groups (ages 45-64 and ages 65+) relative to the fraction without limitations for the age group teen to 44.

2. For 1900-1930, we used the relative labor force participation rates of the older groups relative to those ages 25-44. Labor force participation rates were taken from the IPUMS census extract based on a value of "2" for the labforce variable.

Hours in Private Business:

Data Sources: 1900-1946: John Kendrick, *Productivity Trends in the United States*, 1961, Table A-X. 1947-2002: BLS Productivity data from www.bls.gov.

Series Creation: The 1947-2002 BLS index was multiplied by the ratio of the Kendrick data in 1947 to the BLS index in 1947.

Government Hours and Total Market Hours

1900 -1946 data are from Kendrick *Productivity Trends in the United States*, 1961, Table A-X. From 1947-2002, government hours are calculated as the difference between total hours and private hours. Private hours were created as described above. A total hours index was created by scaling up the BLS private hours index by the ratio of total to private persons engaged by industry. The series for this ratio are from BEA NIPA Table 6.8. Note that Kendrick and the BLS include workers in government enterprises (such as the post office) as private workers. Thus, we subtracted these workers from the BEA number for government workers. We then spliced the total hours index to the Kendrick total hours numbers using the 1947 overlap.

School Hours:

Enrollment: The K-12 school enrollment numbers were obtained by combining information from the *Digest of Education Statistics, 2002* and Claudia Goldin "A Brief History of Education in the U.S." August 1999, NBER working paper H0119. Higher education enrollment was from *Mini Historical Statistics, HS-21.* For several years, the numbers were only reported every other year. Missing years were filled in with interpolation.

Average days attended per enrolled student: Data for K-12 students are from Goldin, Table CG.A.6. We assume that full-time college students engage in significant school activities for 5 days a week, 33 weeks a year.

Fraction of college students who are full-time: The fraction of college students who were enrolled fulltime was available only from 1963 – 1998 from the *Digest of Education Statistics*. We used the 1963 fraction for the years before 1963 and the 1998 fraction for the years after 1998.

Hours spent per day in school: We could not find a time series of average hours spent per day of school attended. As discussed in the text, we used information on California from Kathryn Ramey and the BLS Time Use Survey. We assume that students spend 6 hours a day on schoolwork per day attended in grades K-8. Using time use surveys from the BLS on individuals ages 15 and over engaged in educational activities, we assume that high school and college students spend 7 hours per day of attendance.

The labor force by age group is available for the years 1900, 1920, 1930,1940, and annually from 1948. We calculated the labor force participation rate as the labor force divided by the non-institutional population. Before 1948, we linearly interpolated the numbers between decades.

Home Production:

Within age-gender-employment group, the main data for home production is from Vanek's (1973) dissertation, Robinson and Godbey (1997), articles in the Juster and Stafford (1985) volume, Juster and Stafford's (1991) survey, and the BLS Time Use Survey (http://www.bls.gov/news.release/pdf/atus.pdf).

Published tables from the BLS Time Use Survey do not give data for all of the cells. For example, they show housework by gender and employment status for those ages 18 and over. Separately, they show housework for those ages 65 and over. To estimate housework for the four gender-employment categories between the ages of 18 and 64, we use information on the fraction of those ages 18-64 versus 65 and use the BLS estimates to back out the information from the totals given.

To create total hours spent in housework, we had to use employment-population ratios and fractions of the population by age and gender. The following is a description of the procedures used.

1. For the period from 1900-1920, we used decennial census estimates of population and labor force by gender from IPUMs. To convert labor force to employment, we used Weir's (1992) unemployment estimates. The 1930 Census gives employment and labor force numbers. According to the 1930 data women's unemployment rates were 78% of men's unemployment rates. We assume the same ratio for the earlier years. The censuses of 1920 and 1930 are known to have undercounted female employment in agriculture because of the nature of questions asked. We up-weight female agricultural employment numbers by assuming that the fraction of male to female employment in agriculture was equal to its value in 1910.

2. To interpolate between decennial numbers between 1900 and 1930 in a way that captures the cyclicality of employment, we first calculate the annual ratio of total employment (from Kendrick) to the population ages 14 and over. Second, we calculate the ratio of the decennial employment-population ratio for each age and gender group relative to the Kendrick-based number. Third, we interpolate the ratio and then multiply it by the Kendrick number to obtain an estimate of annual employment-population ratios for each group.

3. For 1930 – 1940 we have annual CPS employment numbers, but not by gender and not by age. We use the CPS employment-population ratios to interpolate the ratios for each of our groups.

4. For 1940-1947, we have annual CPS employment numbers by gender. We use the implied ratios to interpolate for each of our groups.

5. For 1948 on, we have annual CPS civilian employment numbers by gender and age. We add military employment by gender to the 18-64 age group. The military data are from Mini Historical Statistics and official DOD data.

6. We weight the estimates of housework for each of the following cells by the fraction of the population involved: (1) employed males ages 18-64; (2) non-employed males ages 18-64; (3) employed females ages 18-64; (4) non-employed females ages 18-64; (5) employed males 65+; (6) non-employed males 65+; (7) females 65+; (8) children ages 5-13; (9) children ages 14-17.

Consumption and GDP:

From 1929 to the present, the consumption and GDP data are from the BEA. We used nominal nondurable consumption plus services divided by nominal GDP. Before 1929, we use Kendrick's nominal consumption and GDP data. We adjust his total consumption data to bring it closer to nondurables and services using some consumption by category measures for a few years in the early period from *Historical Statistics.*

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Figure 1
Annual Hours Worked in Business
Divided by Civilian Non-Institutional Population Ages 16+

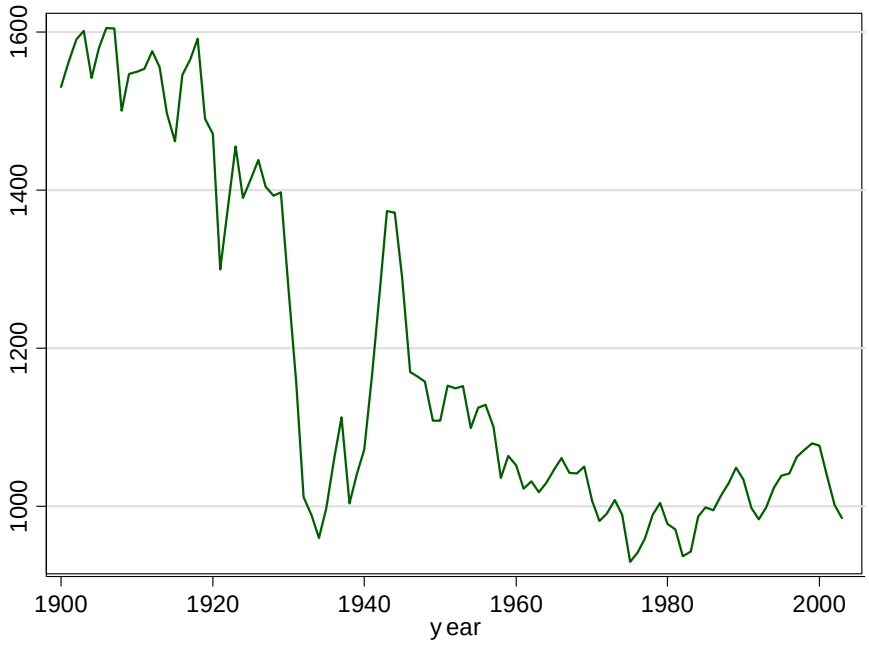


Figure 2
Population Ages 0-15 as a Fraction of Total Population

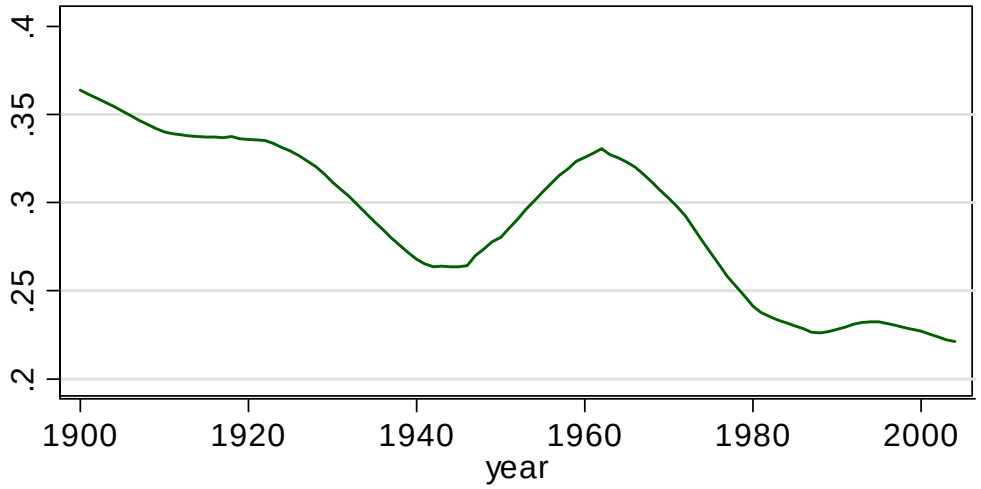


Figure 3
Population Ages 65+ as a Fraction of Total Population

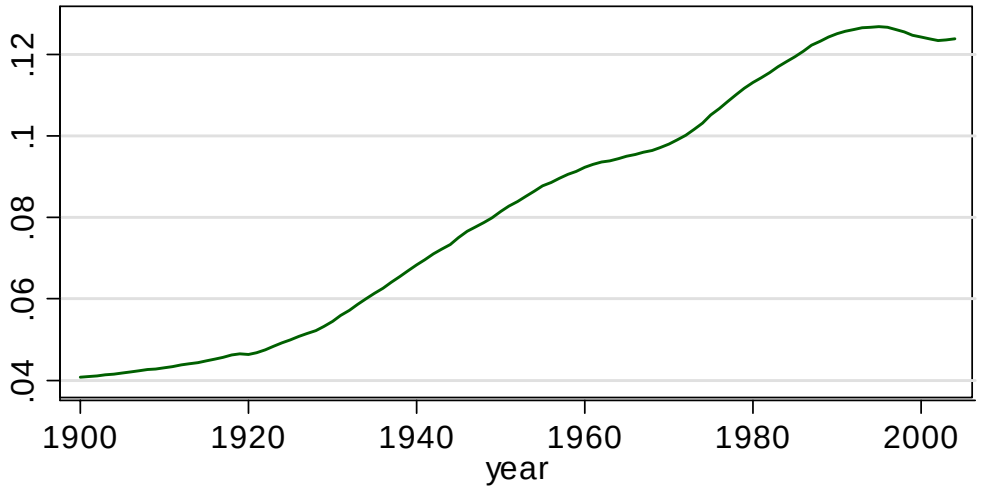


Figure 4
Estimated Fraction of the Population Healthy Enough to Work
(relative to those ages 18-44)

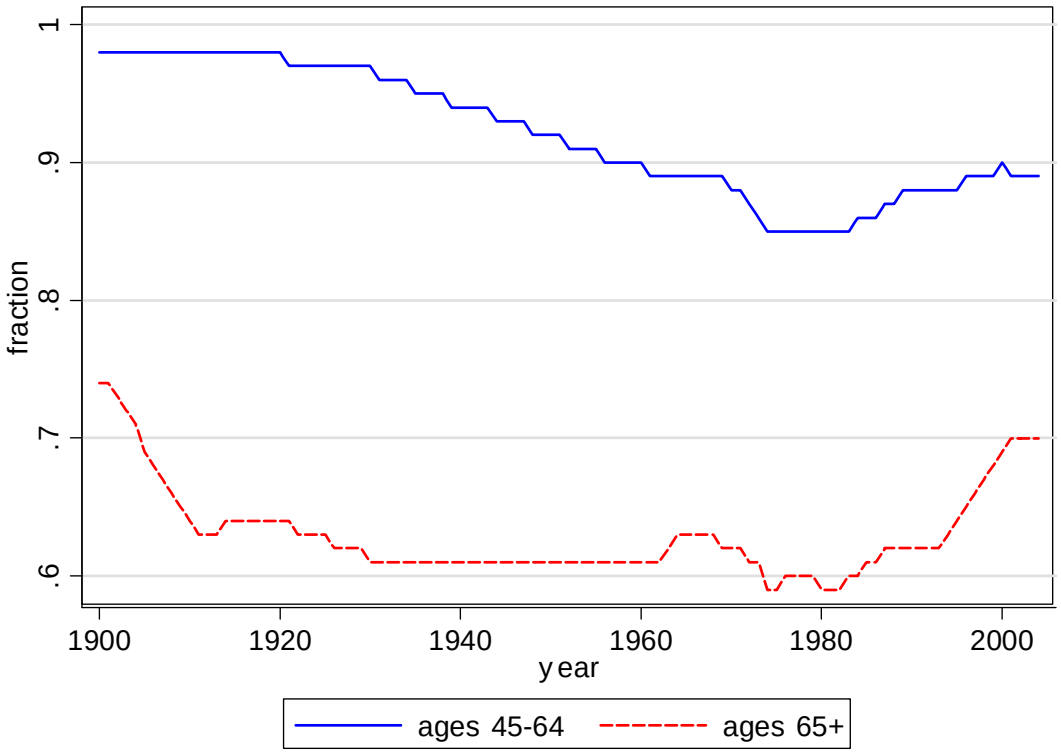


Figure 5

Government Hours as a Fraction of Total Work Hours

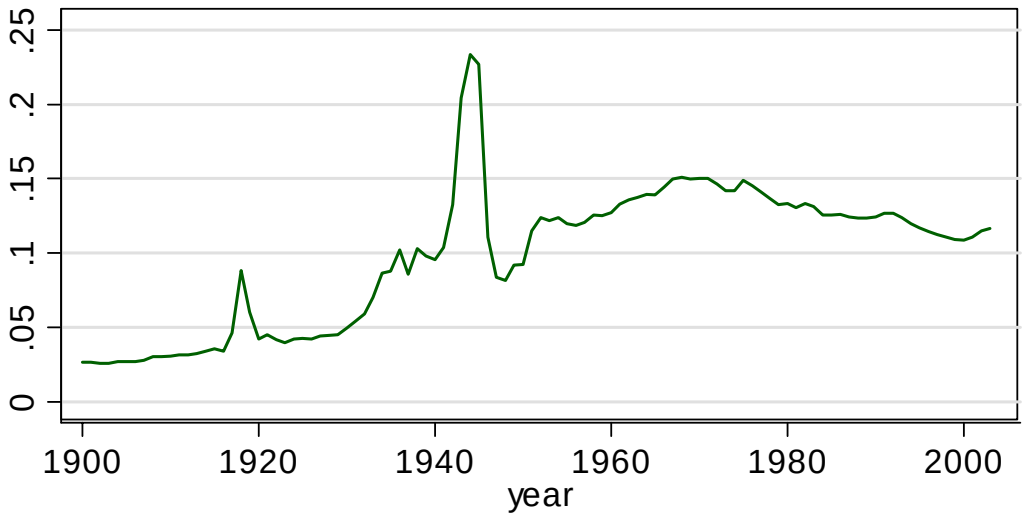


Figure 6. School Enrollment Rates

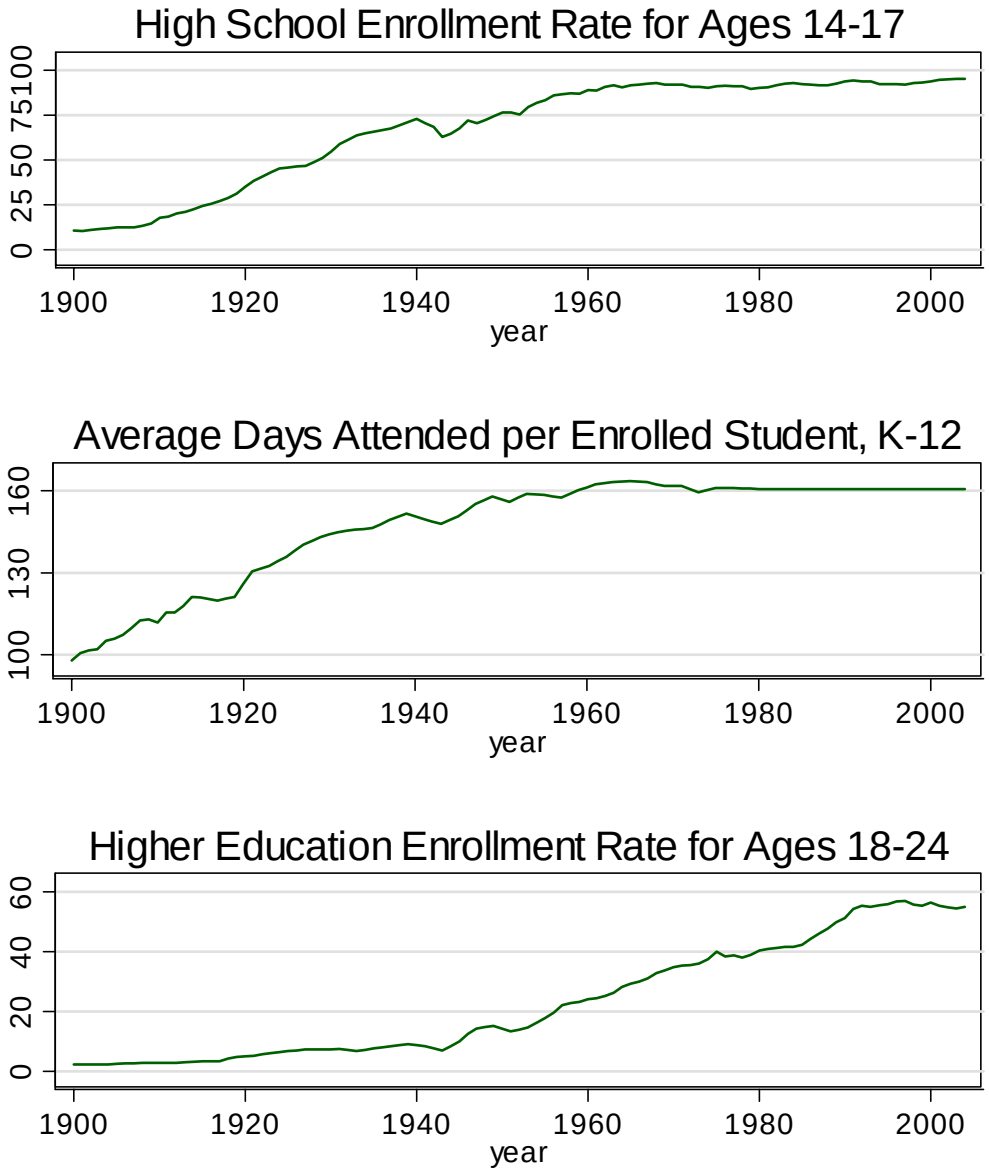


Figure 7. Hours Spent in School as a Fraction of Total Market Work

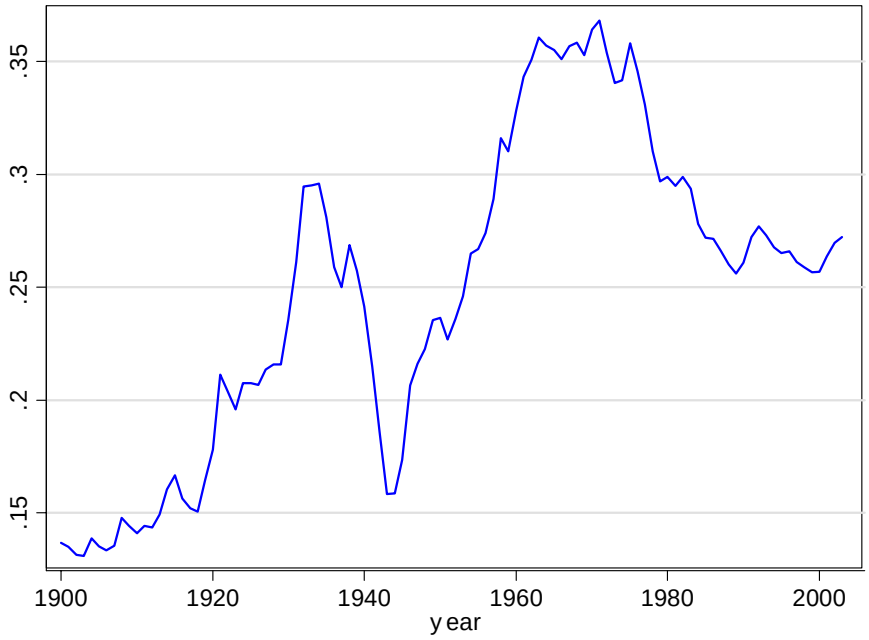


Figure 8. Estimates of Hours of Housework per Week by Non-employed Women Ages 18-64

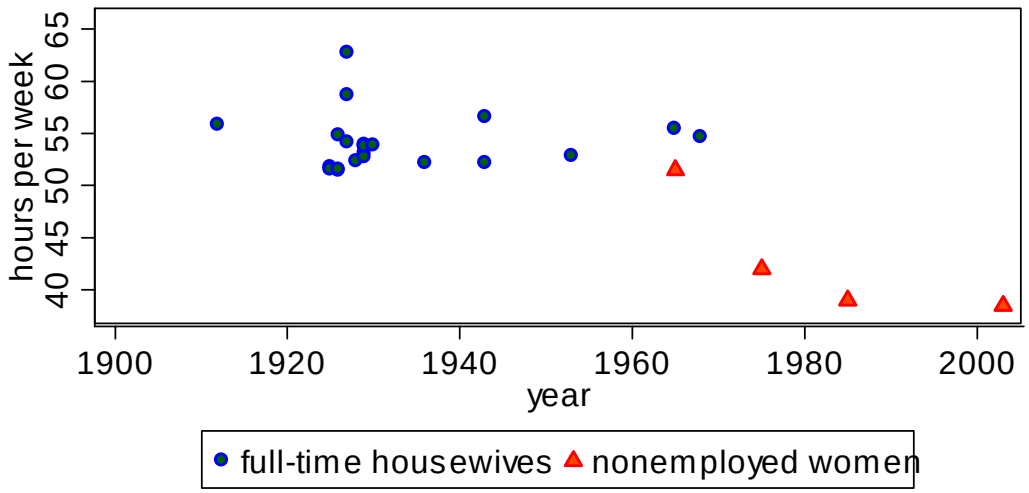


Figure 9. Estimates of Housework by Employment & Sex Category (ages 18-64)

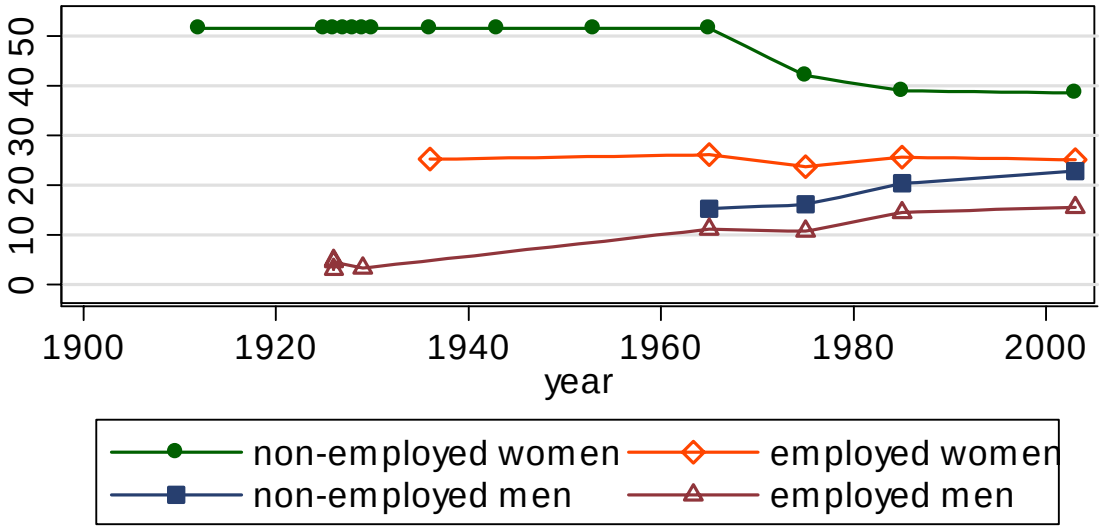
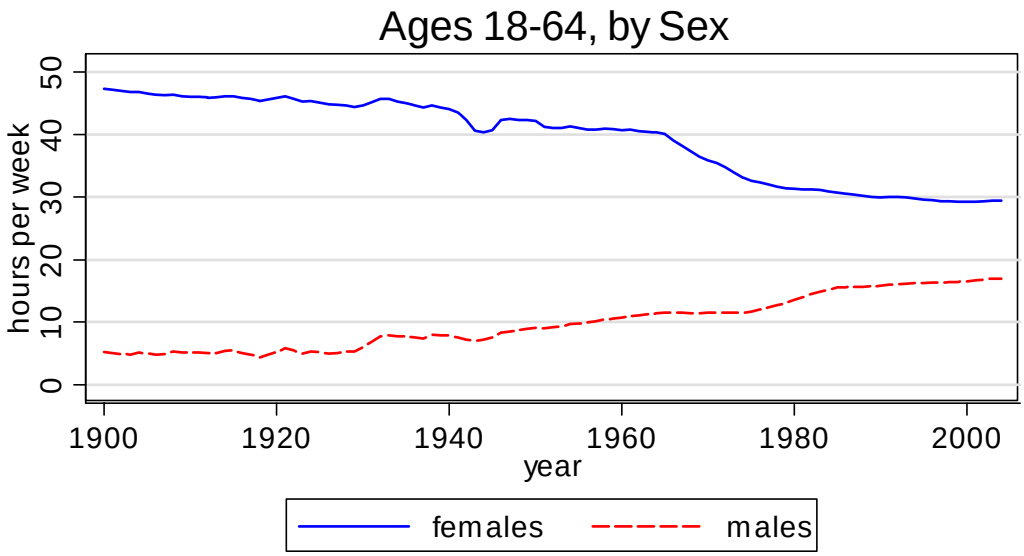


Figure 10. Average Weekly Hours of Housework of Adults



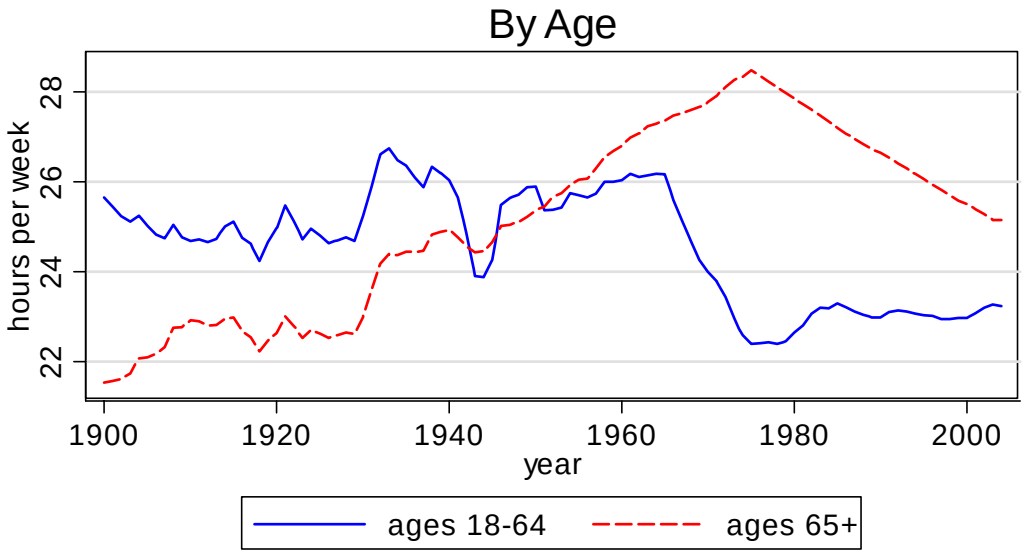


Figure 11. Hours Per Capita

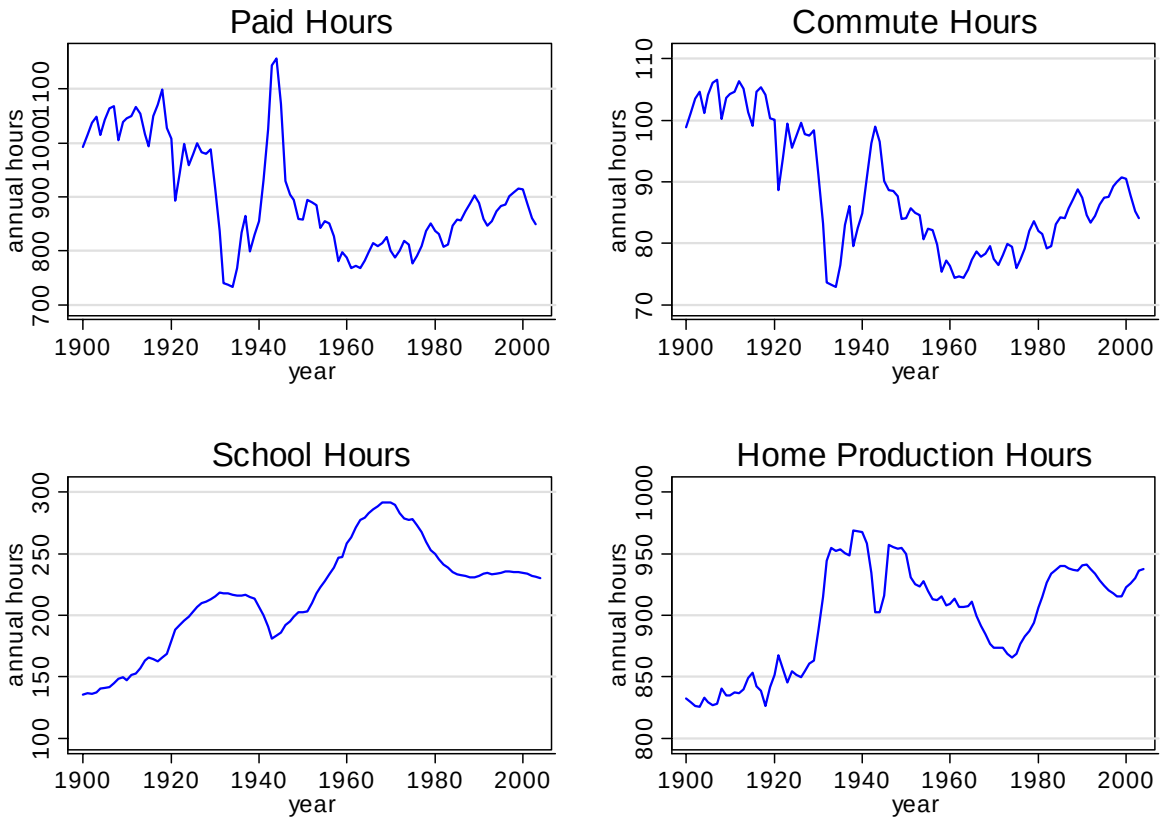


Figure 12. Market Oriented Hours
(relative to potential workforce)

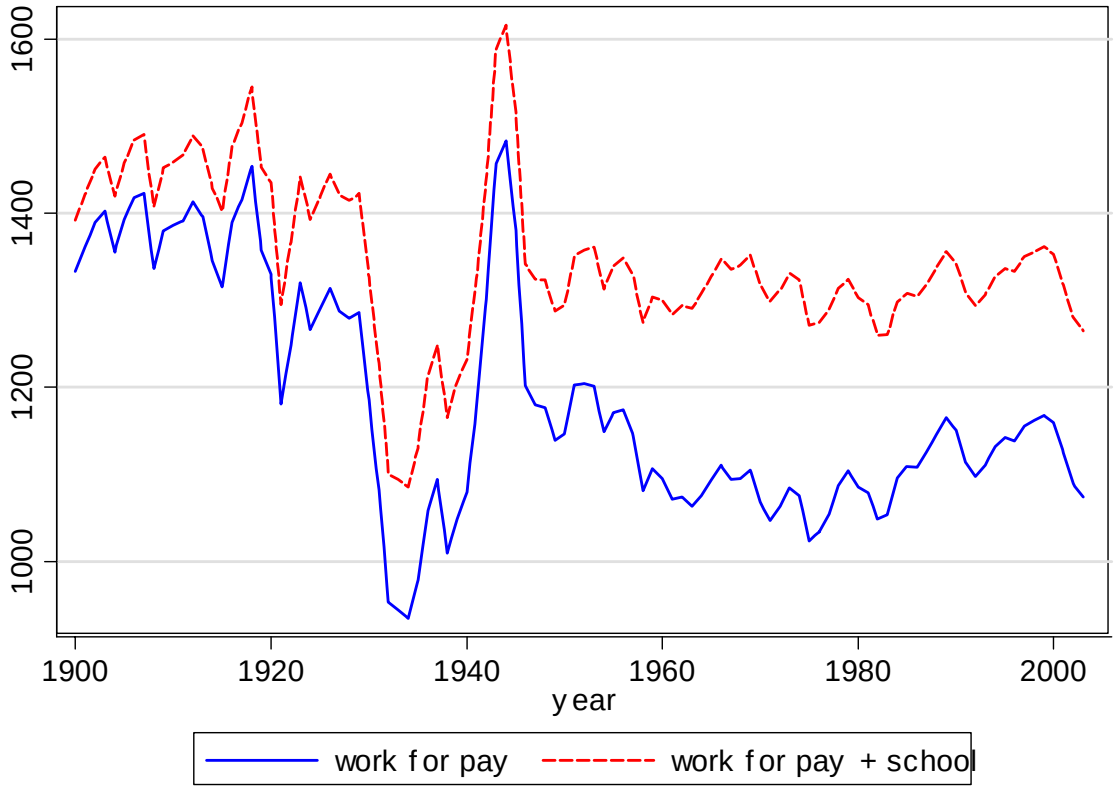


Figure 13. Measures of Annual Leisure Hours Per Capita

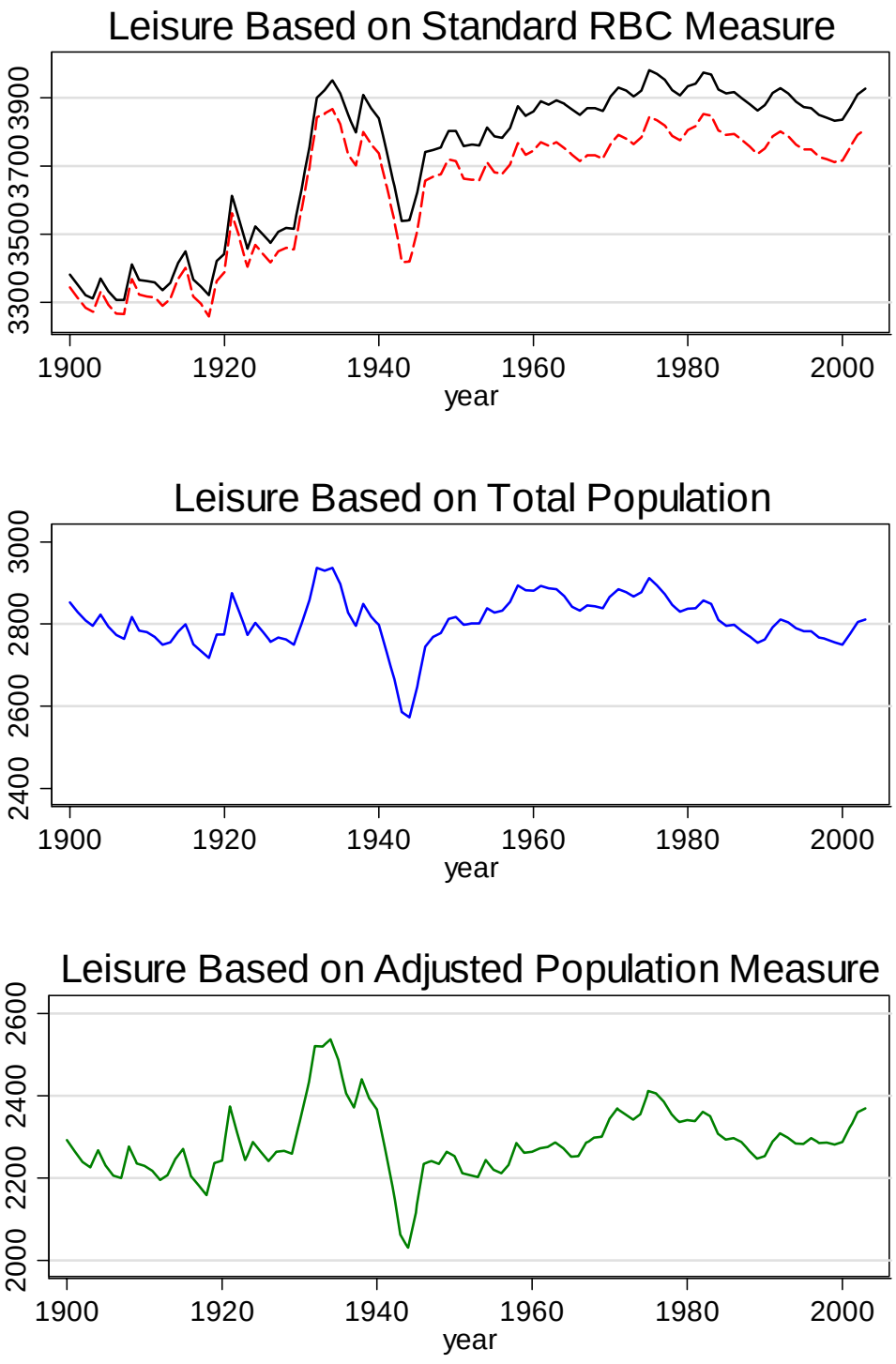


Figure 14. Alternative Measures of Labor Market Distortions