CHAPTER 4

The Macroeconomics of Time Allocation

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Contents

Abstract

In this chapter we explore the macroeconomics of time allocation. We begin with an overview of the trends in market hours in the United States, both in the aggregate and for key subsamples. After introducing a Beckerian theoretical framework, the chapter then discusses key empirical patterns of time allocation, both in the time series (including business cycle properties) and over the life cycle. We focus on several core nonmarket activities, including home production, child care, and leisure. The chapter concludes with a discussion of why these patterns are important to macroeconomics and spells out directions for future research.

Keywords

Time allocation, Home production, Labor supply, Employment, Leisure, Nonseparable preferences

JEL Classification Codes

J22, E24

Handbook of Macroeconomics, Volume 2A
ISSN 1574-0048, http://dx.doi.org/10.1016/bs.hesmac.2016.06.004

1. INTRODUCTION

What drives the time series variation in labor supply? During the last decade, the employment to population ratio of prime-age workers has fallen sharply—particularly for lower skilled workers. As market work falls, how do households allocate their time? Why does labor supply vary so much at business cycle frequencies? Can the ability to produce at home make labor supply more elastic? Can innovations in home production technology explain the rise in female employment and the convergence of male and female labor supply elasticities? Why does consumption vary over the life cycle? As market work falls after middle age, how do household individuals allocate their time? As individuals age, do they allocate more time to home production and shopping reducing their observed market expenditure for a constant consumption basket?

In this chapter, we introduce readers to the importance of time allocation for life cycle, business cycle, and long-run time series movements in labor supply and market consumption. Becker's Presidential Address (1989) provides a nice argument in favor of linking micro time allocation and associated expenditure decisions to key macroeconomic outcomes. The goal of the chapter is to provide an introduction to the literature that examines these issues. In doing so, we highlight differences by both gender and years of accumulated schooling. As we show, the time series and life cycle patterns in time use differ markedly between men and women. Likewise, the time series and life cycle patterns also differ across skill groups. For example, the time women allocate to market work has risen sharply over the last five decades relative to men. Simultaneously, the time women allocate to home production has fallen sharply over the last five decades relative to men. However, the trends in leisure time are nearly identical between men and women. Yet, less-skilled men and women experienced a much larger increase in leisure than higher skilled men and women over the same period.

The chapter begins by exploring patterns in market work over time. We illustrate these patterns over time for different age, sex, and skill groups. These patterns set the stage for the work that follows. In Section 2, we outline a Beckerian model of consumption with multiple goods. The model illustrates the key forces illustrating how changes in the way time is allocated outside of the market sector can explain time series, life cycle, and business cycle movements in both the time allocated to market work and market consumption. This model while simple is quite powerful. Individuals are endowed with a given amount of time and, with said endowment, make choices on how it is allocated across activities given the prices and technologies they face.

In Sections 3–5, we document the time series, business cycle, and life cycle variation in individual time use, respectively. We primarily focus on three uses of time aside from market work. First, we look at home production broadly. These activities include activities like cooking, cleaning, shopping, doing laundry, moving the lawn, and caring for older adults. Second, we look at child care. In doing so, we discuss why the literature treats child care as a distinct activity relative to home production. Lastly, we look at the time individuals spend in leisure activities. This category includes time spent

watching television, socializing, going to the movies, playing video games, exercising, and sleeping. On occasion, we discuss the trends in the remaining time-use categories like job search, accumulating human capital, and participating in civic organizations. Throughout all of these sections, we also set these facts in the broader macroeconomics literature. In the final section, we close with a few comments on a future research agenda.

2. TRENDS IN MARKET WORK

In this section we set the stage by reviewing and updating some familiar trends in market labor. In the remainder of the chapter, we discuss how trends in market hours are complemented by trends in other time-intensive activities. The next section provides a theoretical framework which highlights why measuring time allocation across multiple activities may be useful in understanding market hours.

Fig. 1 shows the trends in male hours worked per week allocated to market work (left axis) and employment propensity (right axis) from 1967 through 2014. To compute this

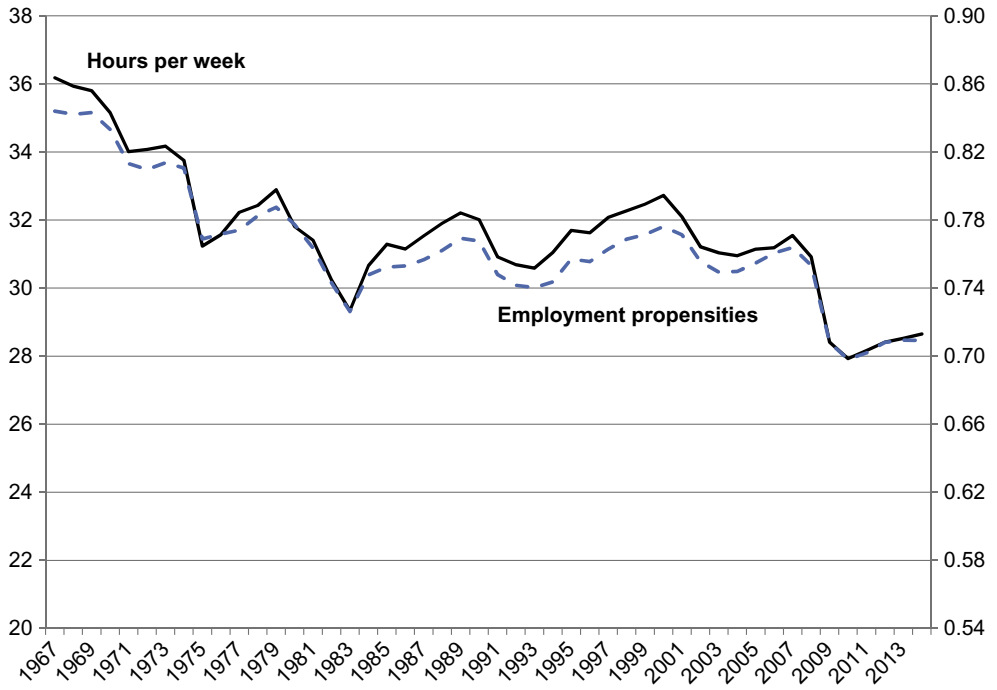


Fig. 1 CPS trends in market hours and employment rates: all men (21–75). Note: Figure shows the trends in market hours per week worked (*solid line—left axis*) and employment propensities (*dashed line—right axis*) between 1967 and 2014. Data come from the March Current Population Survey. The sample includes all men between the ages of 21 and 75 (inclusive) within the survey. Hours worked per week in the market are based on the self-reported response to a question of how many hours the individual worked last week. Employment propensities are based on the amount of people who report being employed in a given week.

figure (and all figures within this section), we use data from the March Current Population Survey (CPS).[a] The only restriction we placed on the data was to restrict the sample to include men between the ages of 21 and 75 (inclusive). Hours per week is measured as the individual's self-reported hours worked on all jobs during the prior week. For those that did not work last week, hours per week is measured as zero. The employment propensity is a dummy variable that takes the value of 1 if the individual reported having a job (regardless of whether or not they worked any hours last week).

As seen from Fig. 1, male hours per week have fallen sharply since the late 1960s. In 1967, the typical male between the ages of 21 and 75 worked roughly 36 h per week. That number fell steadily to the 1980s where, on average, men worked about 31 h per week. During the 2008 recession, male hours fell to only about 28 h per week. That number has not rebounded as of 2014. The movement in hours per week is almost entirely driven by movements on the extensive margin of labor supply. As seen from Fig. 1, employment propensities moved in lock step with the hours movement over this time period. Put another way, hours per week worked conditional on being employed remained roughly constant over this 47-year period. Prior to the 2008 recession, roughly 77% of men in the 21–75 age range were employed. That number fell to 70% during the recession and it has only rebounded to 71% by 2014.

Fig. 2 shows hours per week, conditional on working, for men during the 1967–2014 period. Hours worked per week, conditional on working, have remained roughly constant over the last 50 years. Since 1970, hours worked per week, conditional on working, have bounced around between 40 and 42 h per week. Since the early 2000s, there has been a persistent decline in hours worked per week, conditional on working, from 42 h per week to roughly 40 h per week in 2009. The low hours per week, conditional on working, has remained roughly constant since 2009.

Fig. 3 shows the similar patterns for women. Between the late 1960s and the late 1990s, female time allocated to market work increased sharply. Both hours per week and employment propensities increased continuously during this period. Starting in 2000, however, female hours worked per week and employment propensities fell. The trends in female hours and employment propensities matched their male counterparts. Fig. 4 shows hours per week, conditional on working, for women during the 1967–2014 period. Like men, hours worked per week, conditional on working, have remained roughly constant over the last 50 years. Since 1980, hours worked per week, conditional on working, have remained roughly constant at about 35 h per week. This shows that for women essentially all the change in total hours since 1980 is due to changes in the extensive margin of employment.

Figs. 5 and 6 show the same patterns by educational attainment for men (Fig. 5) and women (Fig. 6). We define higher educated as individuals who completed a bachelor's

[a] We downloaded the data directly from the Integrated Public Use Microdat Series (IPUMS) website: https://www.ipums.org.

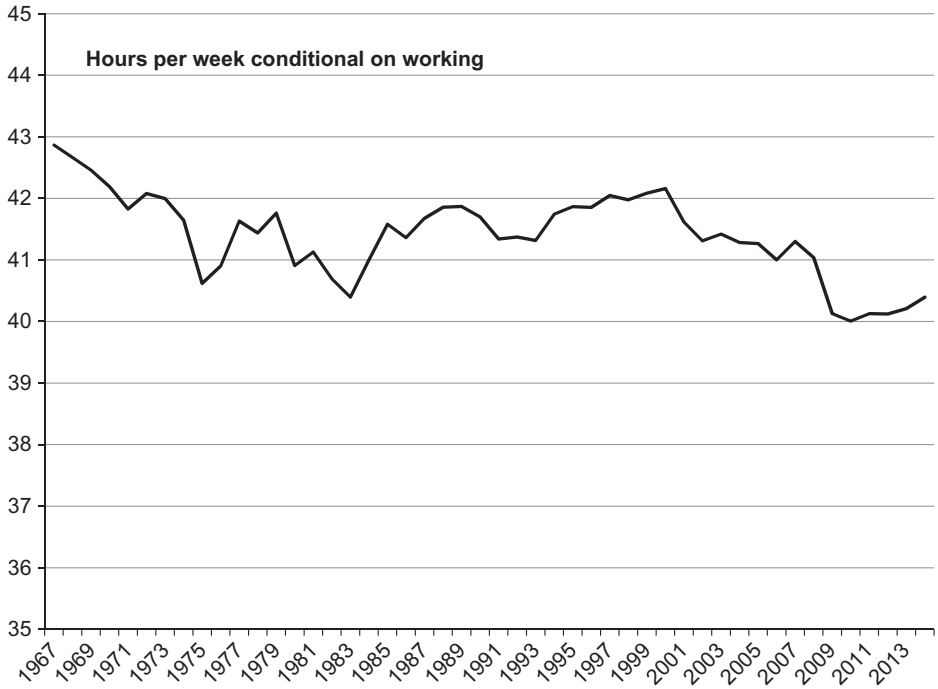


Fig. 2 CPS trends in market hours and employment rates: employed men. Note: Figure shows the trends in market hours per week worked for men, conditional on working. The sample is the same as Fig. 1.

degree or higher. Lower educated individuals include anyone with less than a bachelor's degree. Given that the population has been aging during this time period, Figs. 7 and 8 show the trends in hours work by sex, skill, and age. Fig. 7A shows the patterns for four age groups for higher skilled men. The age groups are 21–40, 41–55, 56–65, and 66–75. Figs. 7B and 8A and B show the analogous age breakdown for lower skilled men, higher skilled women, and lower skilled women, respectively.

The patterns in Figs. 5–8 highlight many of the questions that frame our subsequent analysis. First, hours allocated to market work is falling for men of both skill levels since the late 1960s. Higher educated men experienced a decline in market work hours from about 43 h a week in 1967 to about 34 h a week in 2008. Much of this decline was concentrated prior to 1980 and after 1999. As the population aged during this time, a greater fraction of individuals became retired. In Fig. 7A, we see that hours worked declined for every age group of higher skilled men during the last 47 years. Higher skilled men aged 56–65 saw the largest decline. In 1967, these men worked on average 40 h a week. That number fell to about 30 h a week in 1990 has been relatively constant throughout—even during the 2008 recession. High-skilled men aged 41–55 experienced a steady decline in

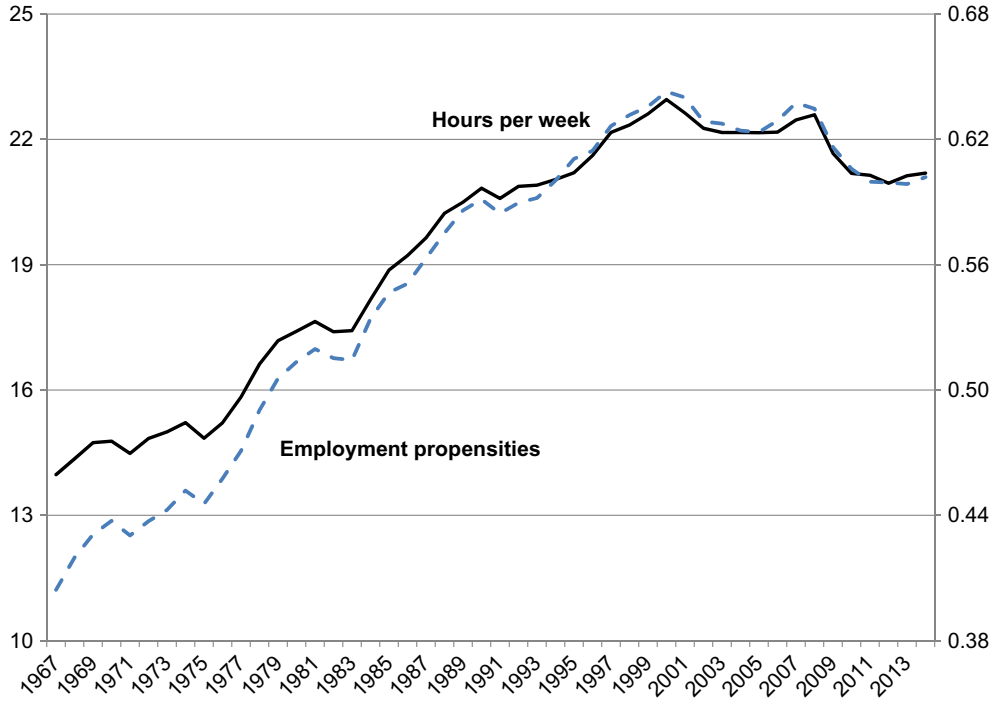


Fig. 3 CPS trends in market hours and employment rates: all women (21–75). Note: Figure shows the trends in market hours per week worked (*solid line—left axis*) and employment propensities (*dashed line—right axis*) between 1967 and 2014. Data come from the March Current Population Survey. The sample includes all women between the ages of 21 and 75 (inclusive) within the survey. Hours worked per week in the market are based on the self-reported response to a question of how many hours the individual worked last week. Employment propensities are based on the amount of people who report being employed in a given week.

hours worked since the late 1960s from 45 h per week in 1967 to 40 h a week in 2014. Like the trend for all high-skilled men regardless of age, much of the decline took place prior to 1980 and after 1999. Younger high-skilled men (those aged 21–40) had relative flat hours through 1999. But, since the late 1990s, younger higher skilled men have reduced their hours from 41 h per week to about 37 h per week in 2014. Conversely, higher skilled men aged 66–75 have increased their hours worked by about 3–4 h.

The qualitative decline in market hours is roughly similar for lower skilled men within each age group. The main quantitative difference, however, is that the declines were much more dramatic for low-skilled men between the ages of 21 and 40 and between the ages of 41 and 55. For this group of relatively young men, there was a marked decline in hours worked relative to their higher educated counterparts. In 1967, younger lower skilled men worked roughly 40 h per week. Yet, by 2014, lower educated men between the ages of 21–40 are only working just over 28 h per week. This 12 h per week decline

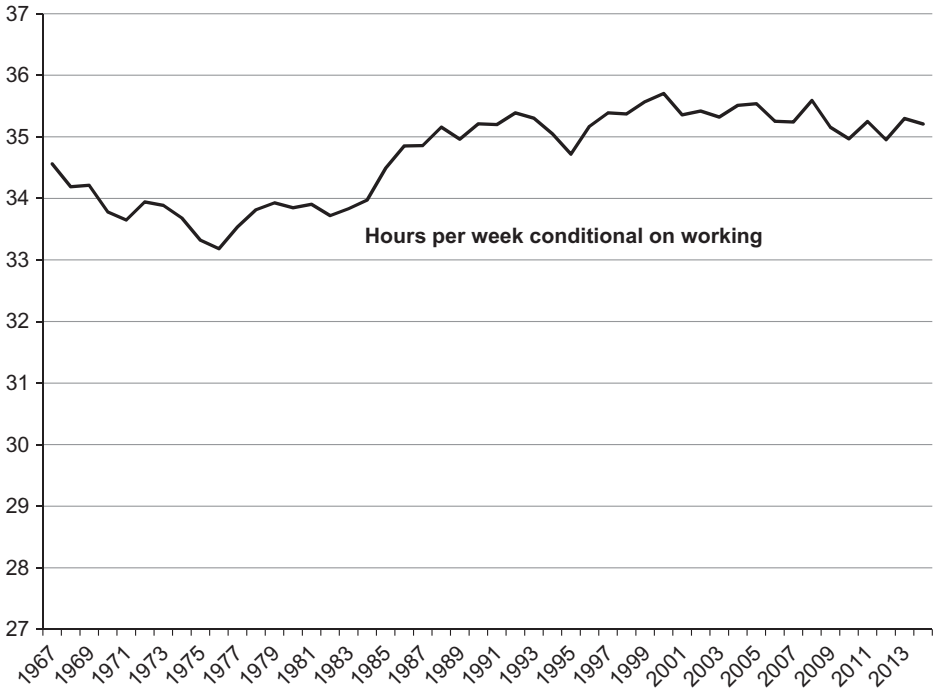


Fig. 4 CPS trends in market hours: employed women. Note: Figure shows the trends in market hours per week worked for women, conditional on working. The sample is the same as Fig. 3.

dwarfs 5-h decline for higher educated men in the same age range. Lower skilled men aged 41–55 decreased their market work hours by 8 h per week on average. This is larger than the 5-h decline experienced by the higher skilled men of the same age. Much of this divergence occurred starting after 1999. Young lower skilled men have dramatically reduced their hours during the last 15 years. As with the patterns in Fig. 1, essentially all of the action is on the extensive margin of employment. There was relatively little movement in hours worked per week conditional on being employed. The increase in inequality in employment propensities between higher and lower prime-aged men is a defining feature of time use since 2000.

Like with men, higher skilled women consistently work more in the market sector than lower skilled women. Like their male counterparts, higher skilled prime-aged women (those 21–40 and those 41–55) reduced their market work hours slightly during the 2000s. This comes as a reversal of trends during the prior decades. From 1967 through 1990, prime-aged higher skilled women increased their market hours by roughly 6–9 h per week. Again, like their male counterparts, prime-aged lower skilled women saw a dramatic reduction in market work hours during the 2000s. For example, younger low-skilled women (those aged 21–40) reduced their market work hours by roughly

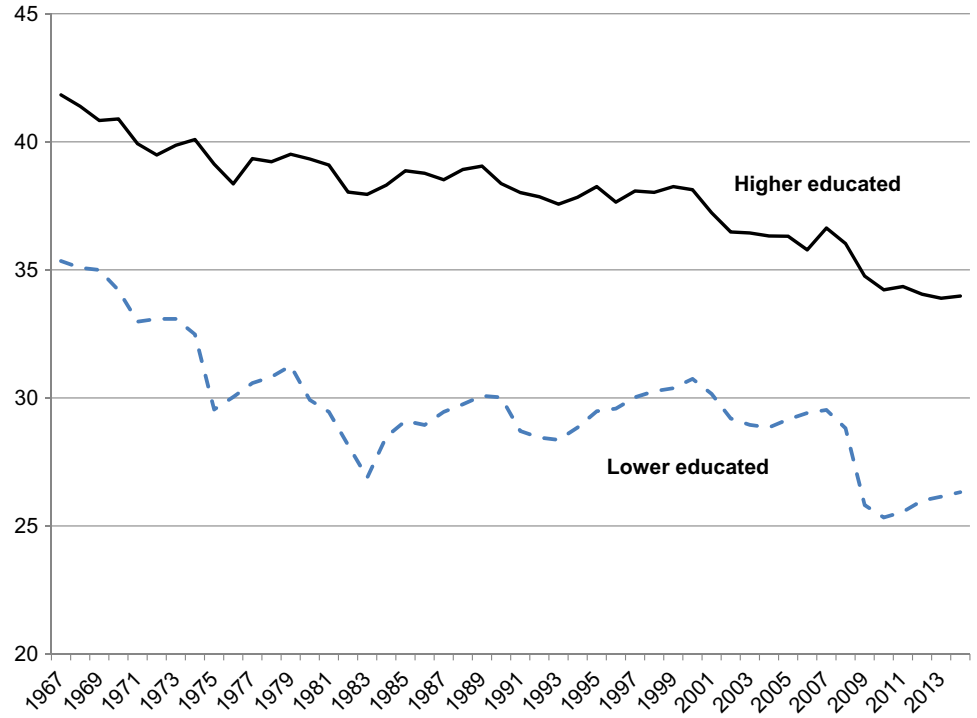


Fig. 5 CPS trends in market hours: men by skill (21–75). Note: Figure shows the trends in market hours per week worked for higher skilled men (*solid line*) and lower skilled men (*dashed line*) between 1967 and 2014. Data come from the March Current Population Survey. The sample includes all men between the ages of 21 and 75 (inclusive) within the survey. Higher educated men are defined as those men with a bachelor's degree or higher. Lower educated men have years of schooling less than 16 years. Hours worked per week in the market are based on the self-reported response to a question of how many hours the individual worked last week.

4 h per week between 1999 and 2014. The combination of these patterns caused inequality market work hours to also increase during the 2000s for lower skilled prime-aged women relative to higher skilled prime-aged women.

Given these large fluctuations in market work hours over time, across genders, across skill groups within gender and across age groups within a gender * skill group, it is interesting to understand how time allocated to activities other than market work have been changing as well. We turn to that analysis now.

3. A THEORY OF TIME USE

The modern theory of time allocation was first laid out in the seminal Becker (1965). The Beckerian approach recognizes the consumption "commodities" produced using both

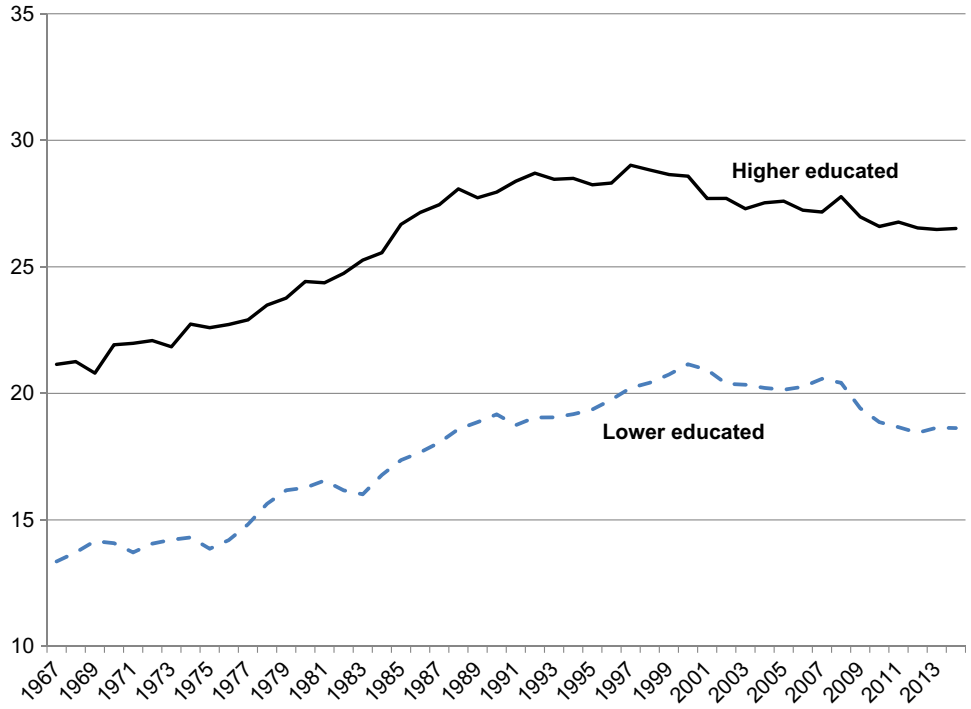


Fig. 6 CPS trends in market hours: women by skill (21–75). Note: Figure shows the trends in market hours per week worked for higher skilled women (*solid line*) and lower skilled women (*dashed line*) between 1967 and 2014. Data come from the March Current Population Survey. The sample includes all women between the ages of 21 and 75 (inclusive) within the survey. Higher educated women are defined as those women with a bachelor's degree or higher. Lower educated women have years of schooling less than 16 years. Hours worked per week in the market are based on the self-reported response to a question of how many hours the individual worked last week.

market goods and one's time. In this section, we highlight a few implications of the Beckerian model that have proved useful in understanding empirical time allocation and associated market expenditures. The version of Becker's model presented below draws on Aguiar and Hurst (2007b) and Aguiar et al. (2012). For expositional reasons, we make a number of simplifying assumptions which can easily be relaxed in order to highlight the key mechanisms.

Consider an agent which enjoys utility over I different consumption commodities, $c_1, \ldots, c_i, \ldots, c_I$. Commodity i is produced using market input x_i and time input h_i according to the technology:

$$c_i = f^i(x_i, h_i).$$

We assume that there is no joint production, so x_i and h_i are used only to produce commodity i.

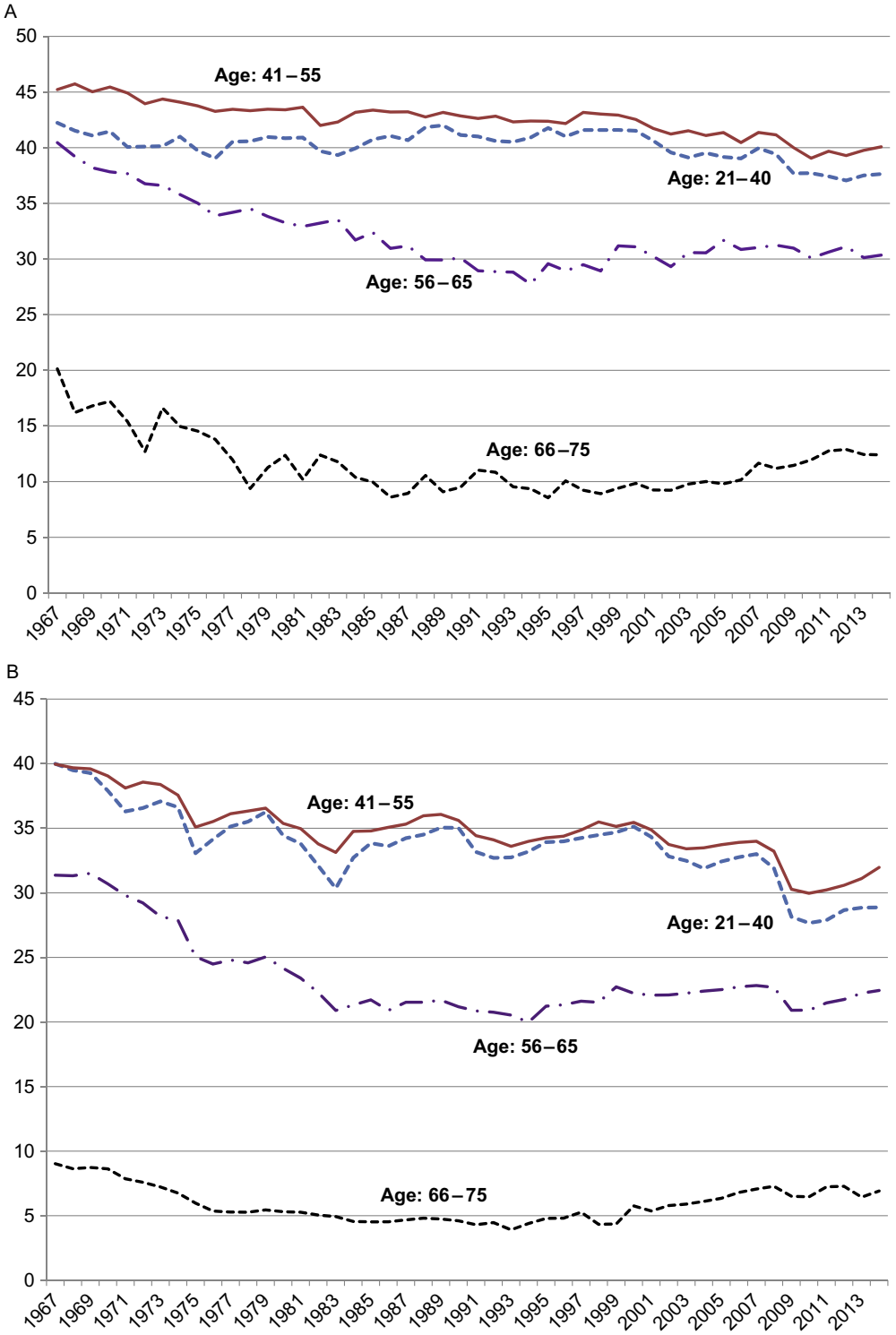


Fig. 7 See legend on opposite page.

To motivate the framework, a commodity could be a meal, which is produced using ingredients (a market good) as well as cooking time. In this example, time and goods are substitutes, as one could purchase the meal partially or completely prepared at a higher goods price but a lower time cost. Another example, in which time and goods are complements, is watching TV. For this commodity, the ability to substitute market expenditures for time inputs is limited; however, the purchase of additional inputs (like a premium channel) raises the value of time spent in the production of the commodity.

The agent lives for T periods and has preferences over sequences of consumption given by:

$$\sum_{t=0}^{T-1} \beta^t u(c_1(t), \ldots, c_I(t)).$$

There is no uncertainty and utility is separable across periods.

We assume that the agent can borrow and lend freely at a an interest rate $R = \beta^{-1}$ and in period t chooses to supply labor $n(t)$ at a market wage $w(t)$. Starting from some initial assets a_0, the budget set is therefore:

$$\sum_{t=0}^{T-1} \beta^t \left(\sum_{i=1}^{I} p_i(t) x_i(t) - w(t) n(t) \right) \leq a_0.$$

We normalize the time endowment to one each period. The time allocation budget constraint is:

$$\sum_i h_i + n \leq 1, h_i, n \geq 0.$$

We shall assume that labor is interior, and so the wage is the opportunity cost of time inputs into home production. We also assume that $h_i \geq 0$ is never binding as well.

If we assume that f^i has constant returns to scale, then the implied price index for a unit of consumption commodity c_i can be expressed by $q^i(p_i, w)$, where q^i solves:

$$q^i(p_i, w) = \min_{x_i, h_i} p_i x_i + w h_i$$

subject to

$$f^i(x_i, h_i) \geq 1.$$

Fig. 7 CPS trends in market hours: men by education and age. Note: Figure shows the trends in market hours per week worked for more educated (A) and less educated (B) men by age between 1967 and 2014. Data come from the March Current Population Survey. The sample includes all men between the ages of 21 and 75 (inclusive) within the survey. More educated men are defined as those men with a bachelor's degree or higher. Less educated men have years of schooling less than 16 years. Hours worked per week in the market are based on the self-reported response to a question of how many hours the individual worked last week.

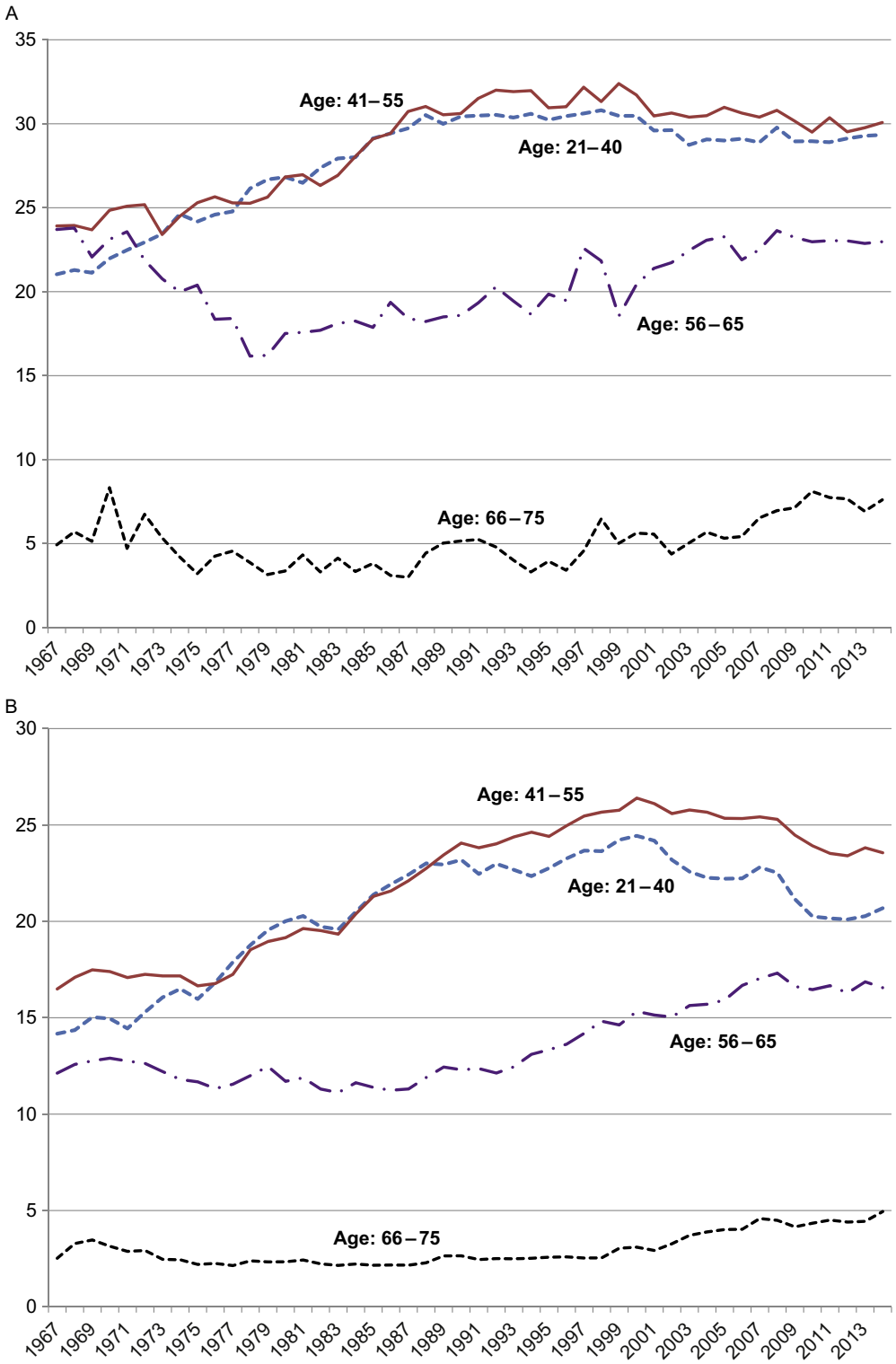


Fig. 8 See legend on opposite page.

Home production implies that the price of a consumption commodity depends on the price of the market input as well as the opportunity cost of time.

It is straightforward from the cost-minimization problem that:

$$\frac{f_h^i}{f_x^i} = \frac{w}{p_i},$$

that is, the marginal rate of technical substitution is set equal to the relative price of inputs. Denote the elasticity of substitution between x_i and h_i associated with the technology f^i by σ_i. As the relative cost of time increases, the agent will reduce the ratio of time to market inputs $\left(\frac{h_i}{x_i}\right)$ in production, the extent of this substitution being governed by σ_i. Again, for notational simplicity, we take σ_i to be constant.

The agent's problem can be rewritten as:

$$\max_{\{c_i(t)\}} \sum_{t=0}^{T-1} \beta^t u(c_1(t), \ldots, c_I(t))$$

subject to

$$\sum_{t=0}^{T-1} \beta^t \left(\sum_i q_i(p_i(t), w(t)) x_i(t) - w(t) \right) \leq a_0.$$

Letting λ be the multiplier on the budget constraint, the first-order condition is:

$$u_i = q^i \lambda.$$

An interesting question is how does time and market inputs vary with the wage holding constant λ. A little algebra leads us to:

$$\left. \frac{d \ln x_i}{d \ln w} \right|_{\lambda} = s_h^i \left(\sigma_i - \frac{1}{\gamma_i} \right), \tag{1}$$

where:

$$s_h^i = \frac{\partial \ln q^i}{\partial \ln w} = \frac{wh}{q_i c_i}$$

is the cost share of time input into commodity i and

Fig. 8 CPS trends in market hours: women by education and age. Note: Figure shows the trends in market hours per week worked for more educated (A) and less educated (B) women by age between 1967 and 2014. Data come from the March Current Population Survey. The sample includes all women between the ages of 21 and 75 (inclusive) within the survey. More educated women are defined as those women with a bachelor's degree or higher. Less educated women have years of schooling less than 16 years. Hours worked per week in the market are based on the self-reported response to a question of how many hours the individual worked last week.

$$\frac{1}{\gamma_i} = -\frac{u_i}{u_{ii}c_i}$$

is the intertemporal elasticity of substitution for commodity i.

Eq. (1) states that if the intratemporal elasticity of substitution is greater than the intertemporal elasticity of substitution, an increase in the cost of time (holding λ constant) will lead to an increase in market expenditure, and vice versa if $\sigma_i < \frac{1}{\gamma_i}$. The intuition is the following. An increase in the price of time induces substitution away from h_i and toward x_i for a given level of production. This substitution is governed by σ_i. However, an increase in the price of time raises the cost of consuming today relative to other periods, as $q^i(p_i, w)$ is increasing in both arguments. This induces a shift in consumption away from the high-wage period, and both expenditure and time inputs correspondingly decline. The size of this effect is governed by the intertemporal elasticity of substitution, $1/\gamma_i$. Whether expenditure goes up or down in response to variation in w depends on which effect dominates. Moreover, the effect is scaled by the share of time input into production of the commodity, s_h^i.

Similarly, the agent's first-order conditions imply:

$$\left.\frac{d\ln h_i}{d\ln w}\right|_{\lambda} = -\sigma_i(1-s_h^i) - \frac{1}{\gamma_i}s_h^i. \tag{2}$$

This elasticity is unambiguously negative, as both intra- and intertemporal considerations imply reducing time inputs when the wage is high. The total effect is a weighted average of the two elasticities.

Using the time constraint, which implies $\sum_i h_i = 1 - n$, we can express the Frisch elasticity of nonmarket time $1 - n$ as:

$$\left.\frac{d\ln n}{d\ln w}\right|_{\lambda} = \sum_{i=1}^{I}\left(\frac{h_i}{n}\right)\left(\sigma_i(1-s_h^i) + \frac{1}{\gamma_i}s_h^i\right), \tag{3}$$

which is a weighted average of the elasticity of each commodity's time input from Eq. (2). Eq. (3) implies that the elasticity of market labor depends on how time is allocated away from the market, and how elastic those activities are with respect to the wage. This insight goes back at least to Mincer (1962), who argued that women have a higher elasticity of market labor as their nonmarket time was concentrated in activities with close market substitutes, which would be high σ_i in our framework. As we shall see, women have been substituting nonmarket time away from home production and toward leisure in recent decades. In the Beckerian framework, this implies a corresponding evolution in the elasticity of labor supply. An interesting question for future research is whether this is reflected in the data.

4. TIME-USE DATA

Before proceeding, it is worth discussing how we measure time away from market work. For our primary data source, we use data from the 2003 to 2013 waves of the American Time-Use Survey (ATUS). The ATUS is conducted by the US Bureau of Labor Statistics (BLS) and individuals in the sample are drawn from the exiting sample of the CPS. On average, individuals are sampled approximately 3 months after completion of their final CPS survey. Given this, we can link each respondent to their labor market conditions when they were in the CPS. The ATUS is a highly detailed and easy-to-use survey, and the link to the CPS makes it straightforward to link time diaries to a long list of covariates.

At the time of the ATUS survey, the BLS updates the respondent's employment and demographic information. Each wave is based on 24-h time diaries where respondents report the activities from the previous day in detailed time intervals. Survey personnel then assign the activities reported by the individual to a specific category in the ATUS's set classification scheme which is comprised of over 400 detailed time-use categories. For more information on the types of activities that are recorded in the ATUS, see Hammermesh et al. (2005). The 2003 wave of the survey includes over 20,000 respondents, while each of the remaining waves includes roughly 13,000 respondents.

We segment the allocation of time into six broad time-use categories. We construct the categories to be mutually exclusive and to sum to the individual's entire time endowment. The six categories we look at are described in detail below and are based on the response for the primary time-use activity. These categories are defined similar to Aguiar et al. (2013).

Market work includes all time spent working in the market sector on main jobs, second jobs, and overtime, including any time spent commuting to or from work and time spent on work-related meals and activities. We separate from total market work the time spent on job search and the time spent on other income-generating activities outside the formal sector. This allows us to study the extent to which households spend time looking for employment or substitute time from the formal to the informal sector.

Job search includes all time spent by the individual searching for a job. As with all time-use categories, we include the time spent commuting associated with job search as part of time spent on job search. Job search includes, among others, activities such as sending out resumes, going on job interviews, researching details about a job, asking about job openings, or looking for jobs in the paper or the Internet.

Child care measures all time spent by the individual caring for, educating, or playing with their children. Guryan et al. (2008) show that the time series and life cycle patterns of time spent on child care differ markedly from the patterns of time spent on home production. In particular, the income elasticity of time spent on child care is large and positive, while the income elasticity of time spent on home production is large and

negative. Additionally, some components of child care have a direct leisure component. For example, according to Juster (1985), individuals report spending time playing with their children as among their most enjoyable activities. On the other hand, there is a well-developed market for child care services that parents are willing to pay for to reduce their time spent with their children. Given these dichotomies, we treat child care as a separate category.

Nonmarket work (home production) consists of four subcategories: core home production, activities related to home ownership, obtaining goods and services, and care of other adults. Core home production includes any time spent on meal preparation and cleanup, doing laundry, ironing, dusting, vacuuming, indoor household cleaning, cleaning or repairing vehicles and furniture, and activities related to the management and the organization of the household. Home ownership activities include time spent on household repairs, time spent on exterior cleaning and improvements, time spent on the garden, and lawn care.[b] Time spent obtaining goods and services includes all time spent acquiring any goods or services (excluding medical care, education, and restaurant meals). Examples include grocery shopping, shopping for other household items, comparison shopping, coupon clipping, going to the bank, going to a barber, going to the post office, obtaining government services, and buying goods online. Finally, care of other adults includes any time supervising and caring for other adults, preparing meals and shopping for other adults, helping other adults around the house with cleaning and maintenance, and transporting other adults to doctors offices and grocery stores.

Leisure includes most of the remaining time individuals spend that is not on market work, nonmarket work, job search, or child care. Specifically, we follow Aguiar and Hurst (2007c, 2009) and try to isolate goods for which time and expenditure are complements. The time spent on activities which comprise leisure includes time spent watching television, time spent socializing (relaxing with friends and family, playing games with friends and family, talking on the telephone, attending and hosting social events, etc.), time spent exercising and on sports (playing sports, attending sporting events, exercising, running, etc.), time spent reading (reading books and magazines, reading personal mail and email, etc.), time spent on entertainment and hobbies that do not generate income (going to the movies or theater, listening to music, using the computer for leisure, doing arts and crafts, playing a musical instrument, etc.), time spent with pets, and all other similar activities. We also include in our leisure measure activities that provide direct utility but may also be viewed as intermediate inputs such as time spent sleeping, eating, and

[b] With respect to the long-run trends in time use, there is a debate about whether time spent gardening or spending time with one's pets should be considered as home production or leisure. See, for example, Ramey (2007). Given that the ATUS time-use categories can be disaggregated into finer subcategories, in this paper we include gardening and lawn care in nonmarket work and we include pet care into leisure.

personal care. While we exclude own medical care, we include activities such as grooming, having sex, and eating at home or in restaurants.

Other includes all the remaining time spent on one's education, time spent on civic and religious activities, and time spent on one's own medical and health care. Some of this time can be considered home production as well, as they represent time investments into the stock of health and human capital.[c]

For our main sample, we include all ATUS respondents between the ages of 21 and 75 (inclusive) who had complete time-use record. Specifically, we exclude any respondent who had any time allocation that was not able to be classified by the ATUS staff. In total, we have 107,768 individuals in our base sample. We use the sample weights provided by the ATUS to aggregate responses by age or by year. Throughout our analysis, we also look at subsamples by age, gender, and accumulated schooling.

We also bring in results from Aguiar and Hurst (2007c, 2009) when exploring historical trends in time use. For these historical trends, data are used from the *1965–1966 America's Use of Time* and the *1985 Americans' Use of Time*. The 1965–1966 Americans' Use of Time was conducted by the Survey Research Center at the University of Michigan. The survey sampled one individual per household in 2001 households in which at least one adult person between the ages of 19 and 65 was employed in a nonfarm occupation during the previous year. This survey does not contain sampling weights, so we weight each respondent equally (before adjusting for the day of week of each diary). Of the 2001 individuals, 776 came from Jackson, Michigan. The time-use data were obtained by having respondents keep a complete diary of their activities for a single 24-h period between November 15 and December 15, 1965, or between March 7 and April 29, 1966. When recounting historical trends in Aguiar and Hurst (2007c, 2009), the Jackson, Michigan sample was included. The 1985 Americans' Use of Time survey was conducted by the Survey Research Center at the University of Maryland. The sample of 4939 individuals was nationally representative with respect to adults over the age of 18 living in homes with at least one telephone. The survey sampled its respondents from January 1985 through December 1985. Again, weights were used to ensure that each day of the week was represented equally. The classification scheme for the time-use data used in Aguiar and Hurst (2007c, 2009) was nearly identical to the classification outlined above.[d]

[c] The "other" category also includes any time spent engaging in activities that generate income outside the formal market sector. These include time spent preparing hobbies, crafts, or food for sale through informal channels. Additionally, activities like informal babysitting are included in this category. As shown in Aguiar et al. (2013), this subcategory of time spent on income-generating activities outside the formal market sector is close to zero on average, suggesting that it is not worth analyzing as a separate category.

[d] While nearly identical, there were some differences. In particular, Aguiar and Hurst (2007c, 2009) included lawn care and gardening as a component of "leisure." In the classification using the 2003–3013 ATUS discussed above, lawn and gardening was included as a component of home production.

5. LONG-RUN TRENDS IN TIME USE

5.1 Historical Trends in Time Use

As show above, time spent on market work for men has been falling within the United States since the late 1960s, while time spent on market work for women has been increasing steadily during this time period. Using the detailed time diaries, we can measure the trends in three other time-use categories: nonmarket work, child care, and leisure. For much of the historical trends we document in this section, we draw on the work of Aguiar and Hurst (2007c, 2009). In those papers, Aguiar and Hurst restrict their attention to individuals between the ages of 18 and 65 who are nonretired. The nonretired restriction is necessitated by the restrictions to the 1965 survey which only sampled people who were nonretired. Likewise, the restriction excluding individuals over the age of 65 was necessitated by the 1965 survey not interviewing individuals above the age of 65. While these restrictions are slightly narrower than the restrictions, we impose on the ATUS data in subsequent sections, the restrictions do not alter the main take aways for the time series trends in any meaningful way.

Fig. 9 shows the time series patterns in nonmarket work, child care, and leisure for the full sample, men and women in 1965, 1985, and 2003 as documented by Aguiar and Hurst (2007c). Fig. 9A shows the trends in nonmarket work. Between 1965 and 2003, women dramatically decreased the time they allocated to home production by roughly 10 h per week. Men, conversely, increased their home production between 1965 and 1985 by roughly 3 h per week. Between 1985 and 2003, male home

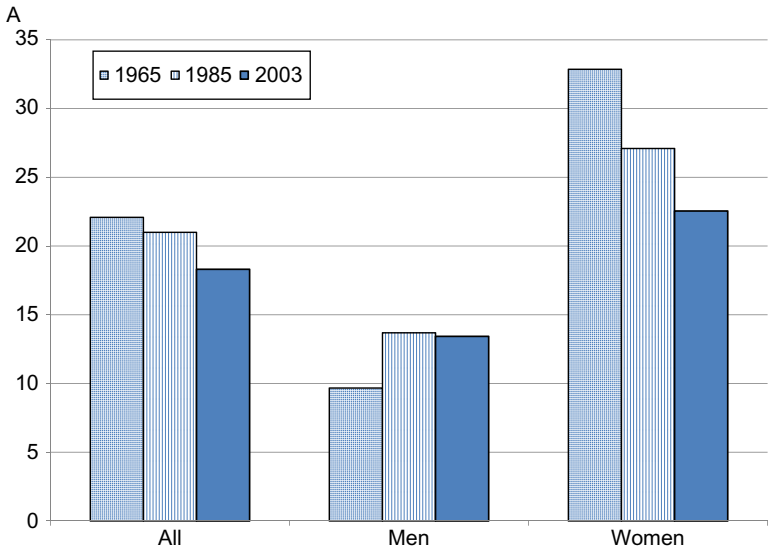


Fig. 9 Trends in time allocation: all men and women. Note: Figure shows the amount of time allocated to nonmarket work (A), child care (B), and leisure (C), in 1965, 1985, and 2003. Results in the figure come from tables II and III of Aguiar and Hurst (2007c). See text for additional details.

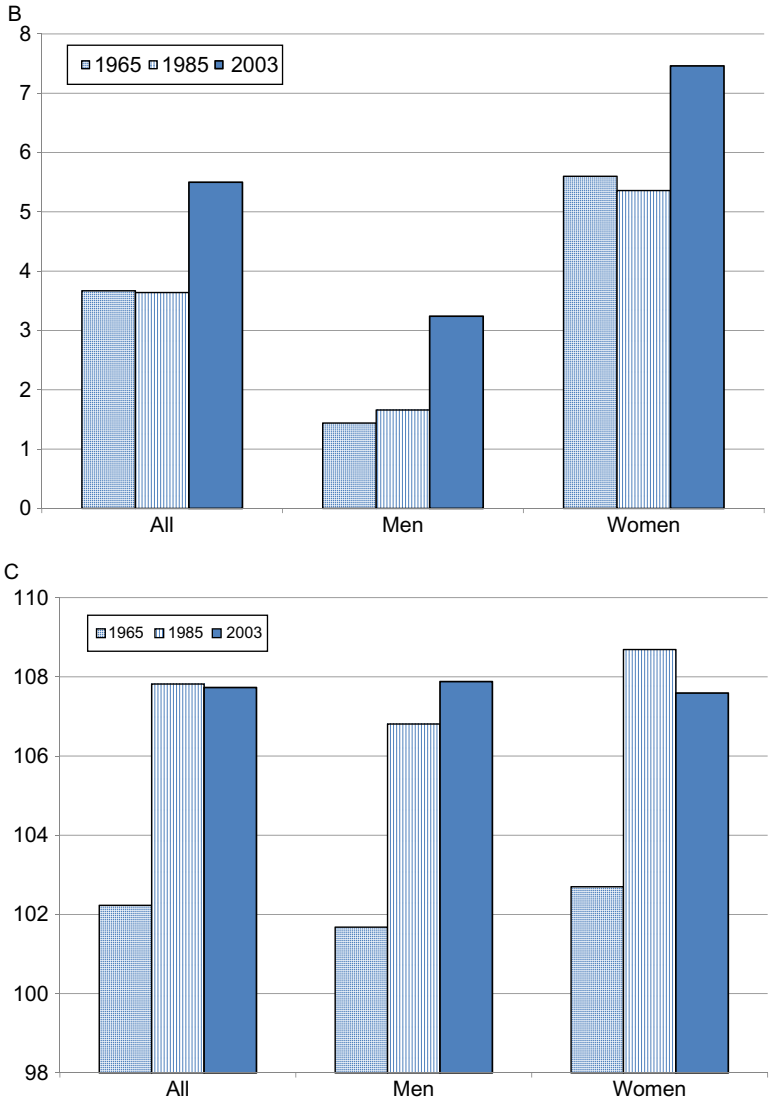


Fig. 9—Cont'd

production hours have been roughly constant. Not only has nonmarket work become less prevalent within the United States during the last 40 years, but also men and women are converging in their nonmarket work levels. Existing work has emphasized that innovations in the nonmarket sector caused women's increase in market work. For example, Greenwood et al. (2005) have shown that innovations in labor-saving devices used in home production allowed women to increase their labor supply in a model where home production is an active margin of substitution.

In Fig. 9B, we see time spent on child care has increased in recent years as well for both men and women. All of the increase took place after 1985. It is hard to tell how much of that increase is real or an artifact of the different survey designs between the 2003 ATUS and the earlier surveys. In particular, the ATUS had as a goal to measure parental time inputs into children. Ramey and Ramey (2010) document that the increase in time spent with children has increased more for high educated parents relative to low educated parents. The increasing gap in time spent with children by education has occurred in all categories of child care time: time spent on basic child care, time spent on educational child care, and time spent on recreational child care. They suggest that the increase in time spent on child care is real and a result of increased competition to get children into elite universities.

In Fig. 9C, the time series trends in leisure are shown. The large declines in market work for men during the 1960s, 1970s, and 1980s led to a large increase in leisure time for males between 1965 and 1985. Likewise, the large declines in home production for women during the 1960s, 1970s, and 1980s led to a large increase in leisure time for females between 1965 and 1975. For both men and women, leisure was roughly constant between 1985 and 2003. Men's leisure increase by roughly 1 h and women's leisure declined by roughly 1 h over the two decades between 1895 and 2003. It is interesting to note, however, that despite very different levels of market work, home production, and child care, men and women's leisure time is nearly identical in each decade. For example, in 2003, both men and women allocated roughly 107 h per week to leisure time activities. The 107 h includes time spent sleeping. Removing sleep from the leisure activities does not change any of the cross-sectional or time series patterns given that sleeping time is roughly constant over the decades and roughly constant between men and women.

Figs. 10 and 11 show the trends in home production and leisure by sex-skill groupings. The take aways from these figures are twofold. First, the trends in home production are nearly identical across educational attainment, conditional on sex. Second, the trends in leisure have diverged sharply between higher skilled and lower skilled individuals. Higher skilled individuals only experienced modest increases in leisure between 1965 and 2003. After experiencing large increases between 1965 and 1985, the leisure gains reversed between 1985 and 2003. Conversely, lower skilled individuals tracked their higher educated counterparts in terms of increased leisure time between 1965 and 1985 but continued to increase their leisure time between 1985 and 2003. The increase in leisure inequality has matched the well-documented increase in income and consumption inequality during the last 30 years documented by many in the literature.[e]

The above facts are drawn from the work of Aguiar and Hurst (2007c, 2009). However, Aguiar and Hurst (2007c, 2009) were not the only papers to harmonize historical

[e] See, for example, Aguiar and Bils (2015).

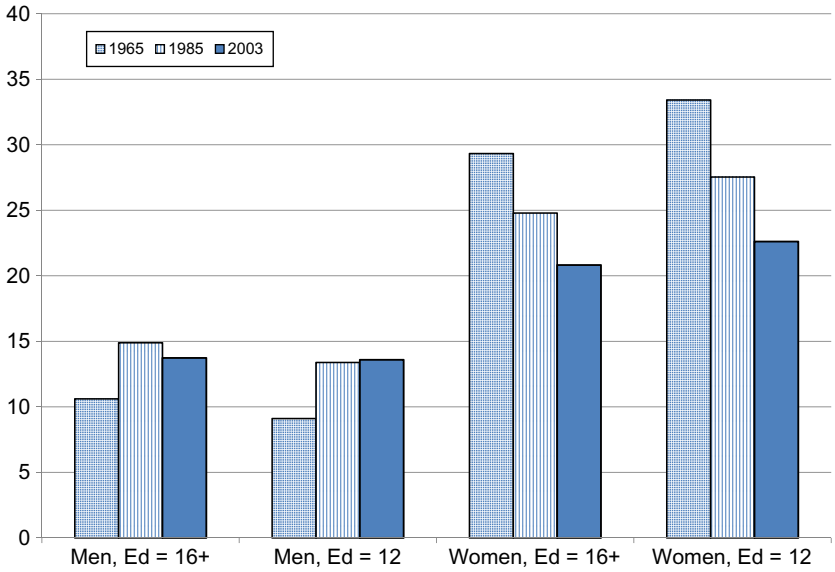


Fig. 10 Trends in nonmarket work hours: all, men, and women, by skill. Note: Figure shows the amount of time allocated to home production activities in 1965, 1985, and 2003 by sex and skill. The figure focuses on those with schooling levels of a bachelor's degree or more (Ed = 16+) and schooling levels of exactly a high school degree (ED = 12). Results in the figure come from tables V of Aguiar and Hurst (2007c). See text for additional details. Unlike the results in Fig. 7A–C, the results in this figure also adjust for the changing demographic composition over time within each sex-skill group. The demographic adjustment accounts for changing age distribution and family composition. The demographic adjustments made little difference to the broad time trends.

US time-use surveys to examine trends in nonmarket work and leisure over time. In classic books, Juster and Stafford (1985) and Robinson and Godbey (1999) harmonized the subset of the time-use data sets used by Aguiar and Hurst to explore trends in leisure and nonmarket work time during the 1960s, 1970s, and 1980s. Like Aguiar and Hurst (2007c, 2009), they also find large increases in leisure time for men and women during the 20-year period between 1965 and 1985. Contemporaneous to Aguiar and Hurst, Ramey and Francis (2009) harmonized the US time-use data and documented trends in leisure and home production for the population as a whole and for men and women separately. Like Aguiar and Hurst (2007c), Ramey and Francis (2009) also found a large decline in aggregate home production time for prime-age individuals between 1960 and the early 2000s. Ramey and Francis (2009), however, find that there was very little increase in leisure for either prime-age men or women during this time period.[f]

[f] See Ramey (2007) and Aguiar and Hurst (2007a) for a reconciliation of the differences in leisure trends between the two papers. A large part of the debate is whether eating while at market work is considered market work (Aguiar and Hurst) or leisure (Ramey and Francis).

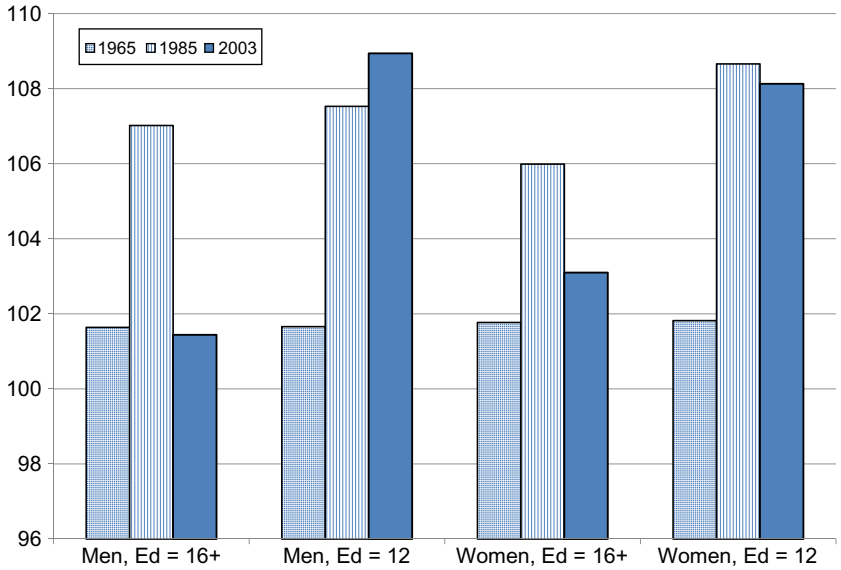


Fig. 11 Trends in leisure hours: all, men, and women, by skill. Note: Figure shows the amount of time allocated to leisure activities in 1965, 1985, and 2003 by sex and skill. The figure focuses on those with schooling levels of a bachelor's degree or more (Ed = 16+) and schooling levels of exactly a high school degree (ED = 12). Results in the figure come from tables V of Aguiar and Hurst (2007c). See text for additional details. Unlike the results in Fig. 7A–C, the results in this figure also adjust for the changing demographic composition over time within each sex-skill group. The demographic adjustment accounts for changing age distribution and family composition. The demographic adjustments made little difference to the broad time trends.

Additionally, Ramey and Francis (2009) incorporate the findings of Ramey (2009) into their analysis which allows them to compute trends in nonmarket work and leisure prior to 1965. This is a very ambitious task given that there are no nationally representative time diaries within the United States prior to 1965. The goal of Ramey (2009) is to use nonrepresentative time-use surveys conducted within the United States prior to 1965 to compute the amount of home production done in the United States for an average individual by weighting the nonrepresentative samples appropriately. Using this methodology, Ramey (2009) concludes that between 1900 and 1965, nonmarket work time for women fell by about 6 h per week, while nonmarket work time for men increased by about 7 h per week. Given the Ramey (2009) estimates, Ramey and Francis (2009) state that aggregate leisure increased by an additional 2 h per week for prime-aged individuals between 1900 and 1965.

In summary, there is ample evidence that home production has been declining in the aggregate and leisure has been increasing in the aggregate over long time periods.

5.2 Recent Trends in Time Use

One of the prominent downsides to harmonizing the different time-use surveys to compute long-run trends is that there is no guarantee that the data collection methods, sample

frame, and time-use categorization remained constant over time. Changes in collection methods, sample frames, and categorization may cause the trends highlighted above to be mismeasured. The recent advent of the American Time-Use Survey (ATUS) helps to mitigate such issues. Since 2003, a nationally representative sample of individuals have been asked to record their time use using a consistently defined method and categorization procedure. Given the data have been in existence for 11 years now, it is possible to create time series trends using only within ATUS variation.

Using the sample described in the preceding section, Fig. 12 shows the trends in market work, nonmarket work, child care, and leisure over the 2003–2013 period. Each panel focuses on a different time-use category. Within each panel, four lines are shown.

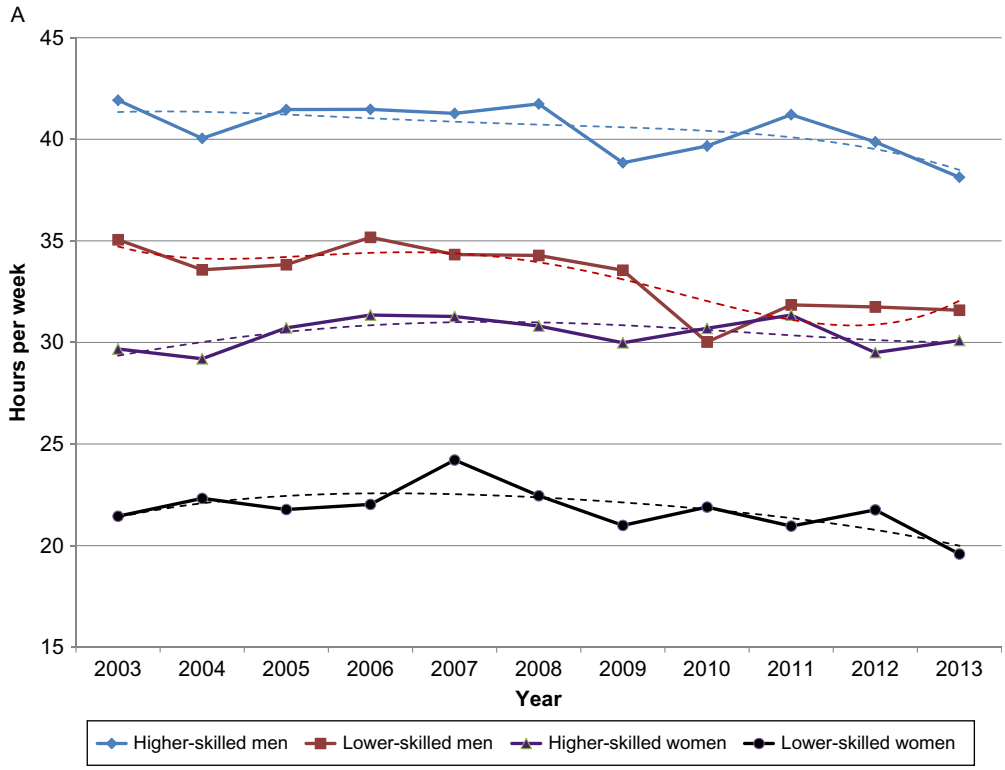
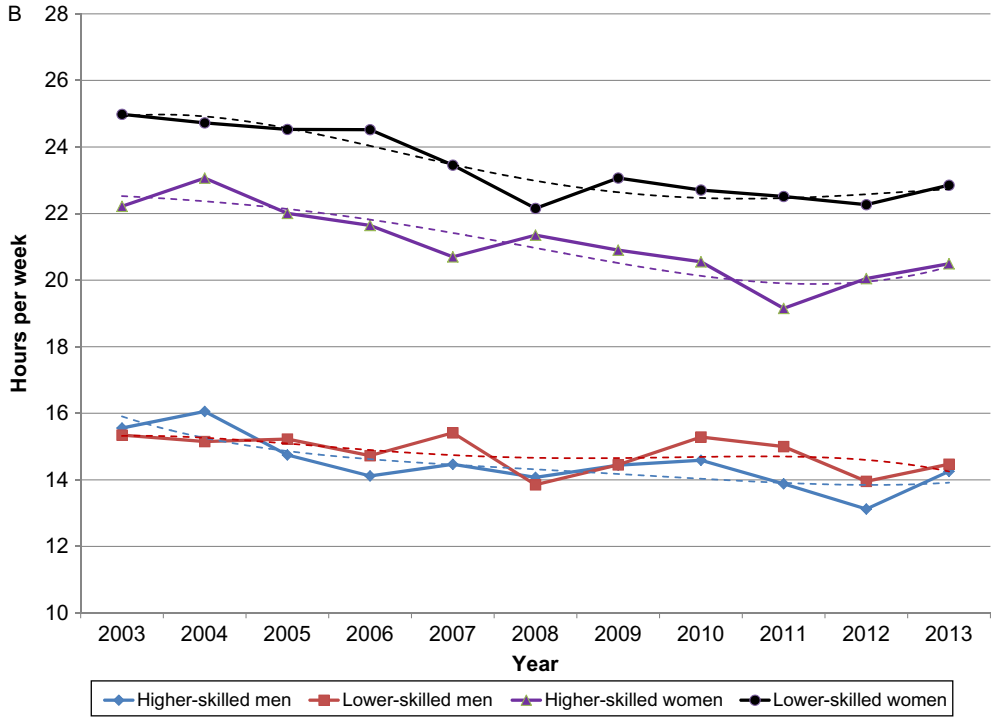


Fig. 12 ATUS trends by education and age. Note: Figure shows the trends in market hours (A), nonmarket work (B), child care (C), and leisure (D), per week worked for higher skilled men (*diamonds*), lower skilled men (*squares*), higher skilled women (*triangles*), and lower skilled women (*circles*) between 2003 and 2013. Data come from the American Time-Use Survey. The sample includes all individuals between the ages of 21 and 75 (inclusive) within the survey who had complete time diaries. Market work includes all time working on jobs for pay as well as any time commuting to work and any time spent at work associated with work meals and breaks. Nonmarket work includes activities such as cooking, cleaning, doing laundry, and shopping for groceries. Higher educated men are defined as those men with a bachelor's degree or higher. Lower educated men have years of schooling less than 16 years.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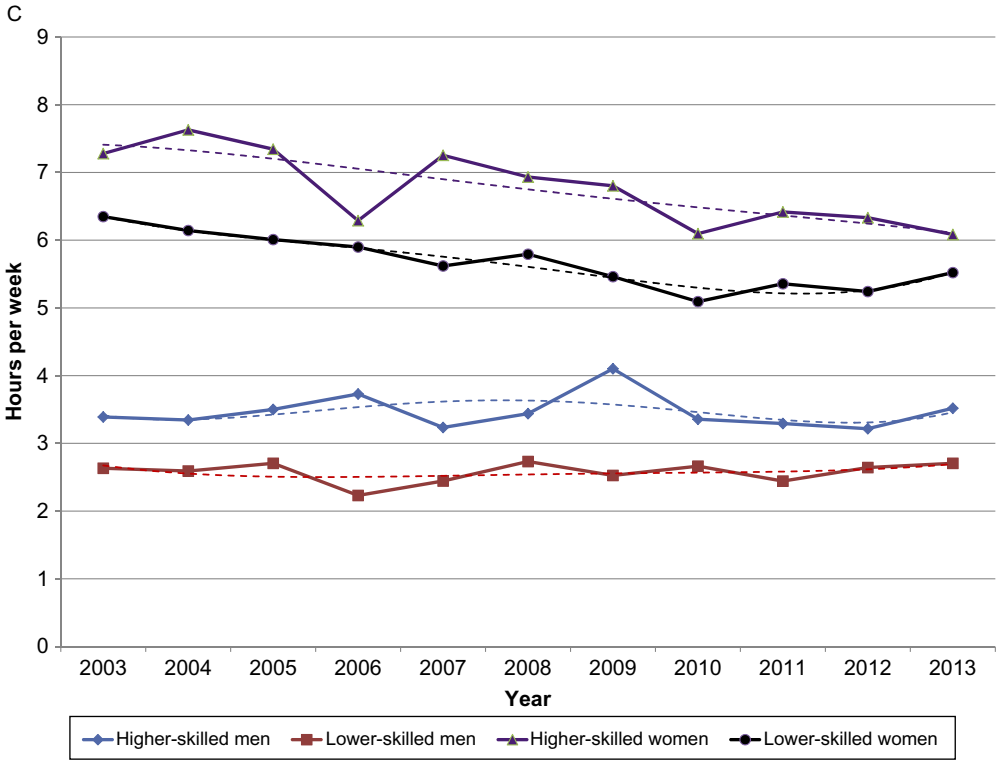
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Fig. 12—Cont'd

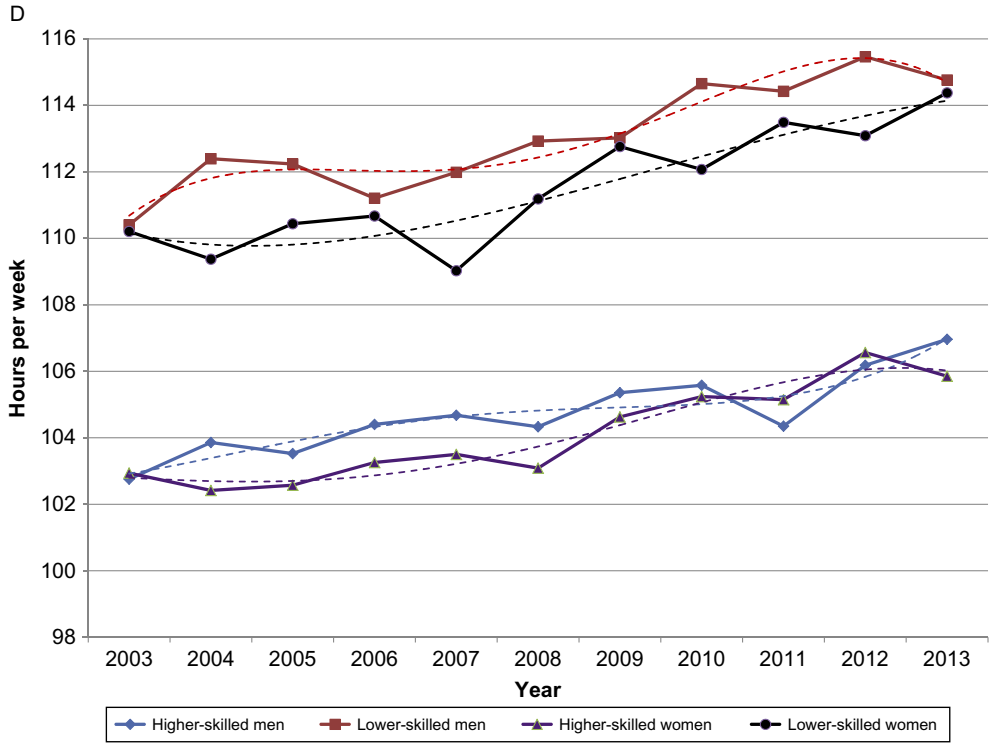

Fig. 12—Cont'd

Each line represents a sex-skill group pair. The data include all individuals between the ages of 21 and 75 who have all of their time use categorized by the ATUS. Fig. 13 is analogous to Fig. 12 except that the sample is restricted to individuals between the ages of 21 and 55.

Fig. 12A shows patterns similar to Figs. 5 and 6. During the last decade, all workers reduced the amount of time spent in market work with the declines being greater for those with less than at least a bachelors degree. Notice that the amount of time allocated to market work is higher in the ATUS relative to CPS totals documented in Figs. 5 and 6. The reason for this is that we are including time commuting to work and time spent at work during breaks and meals as being part of our market work measure. If we restrict our analysis to just time spent engaged in market work, the totals in the ATUS would be much closer to the market work totals reported in the CPS. Fig. 11A shows that the broad patterns are similar even restricting our analysis to those workers between the ages of 21 and 55 (as opposed to 21–75).

Figs. 12B and 13B show that home production has declined for all groups during the 2003–2013 period. For women, this just represents a continuation of the home production decline during the prior four decades. Notice that even within the ATUS, higher skilled women reduced their home production hours per week from about 22 h per week to about 19 h per week during the 2002–2013 period. This was made possible despite an overall decline in market work. As we show in the next section, a decline in market work is almost always associated with an increase in home production. What is also noticeable from Figs. 12B and 13B is that men actually reduced their nonmarket hours during this period as well. Again, this occurred despite their declines in market work hours. This

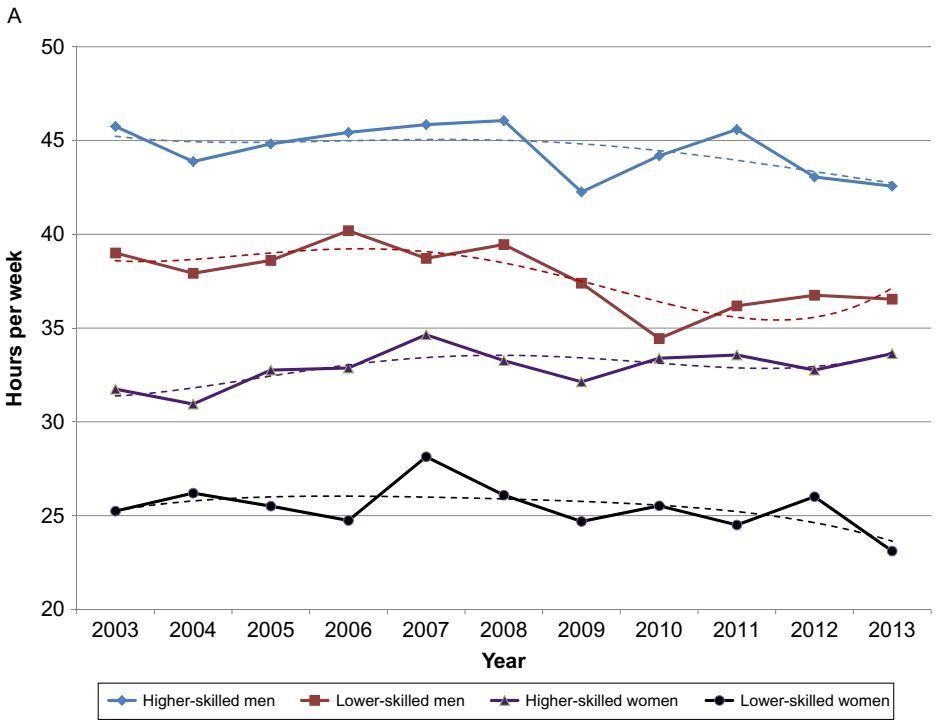

Fig. 13 ATUS trends by education and age: prime age. Note: Figure shows the trends in market hours (A), nonmarket work (B), child care (C), and leisure (D), per week worked for higher skilled men (*diamonds*), lower skilled men (*squares*), higher skilled women (*triangles*), and lower skilled women (*circles*) between 2003 and 2013. Data come from the American Time-Use Survey. The sample includes all individuals between the ages of 21 and 55 (inclusive) within the survey who had complete time diaries. Market work includes all time working on jobs for pay as well as any time commuting to work and any time spent at work associated with work meals and breaks. Nonmarket work includes activities such as cooking, cleaning, doing laundry, and shopping for groceries. Higher educated men are defined as those men with a bachelor's degree or higher. Lower educated men have years of schooling less than 16 years.

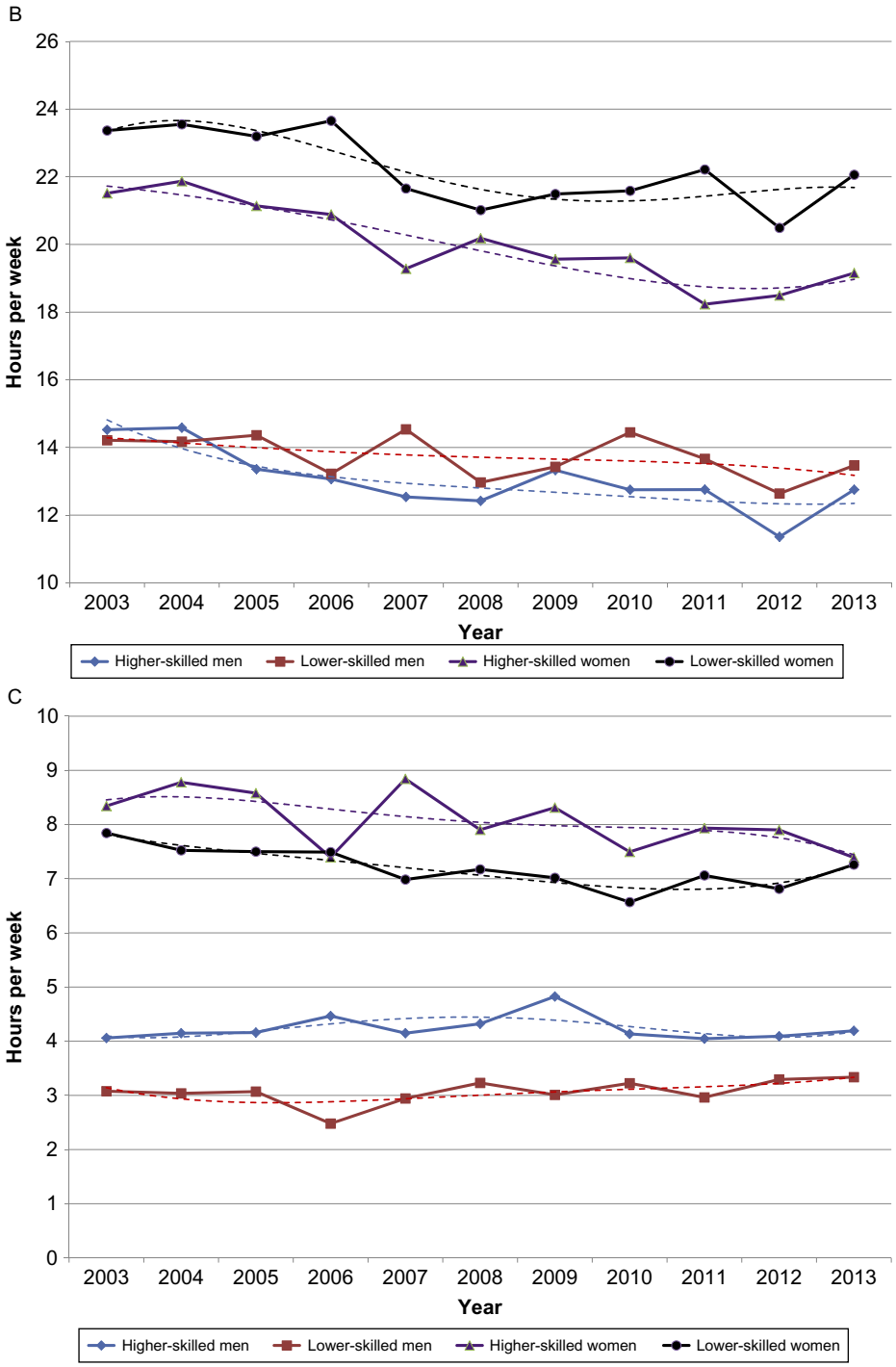
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Fig. 13—Cont'd

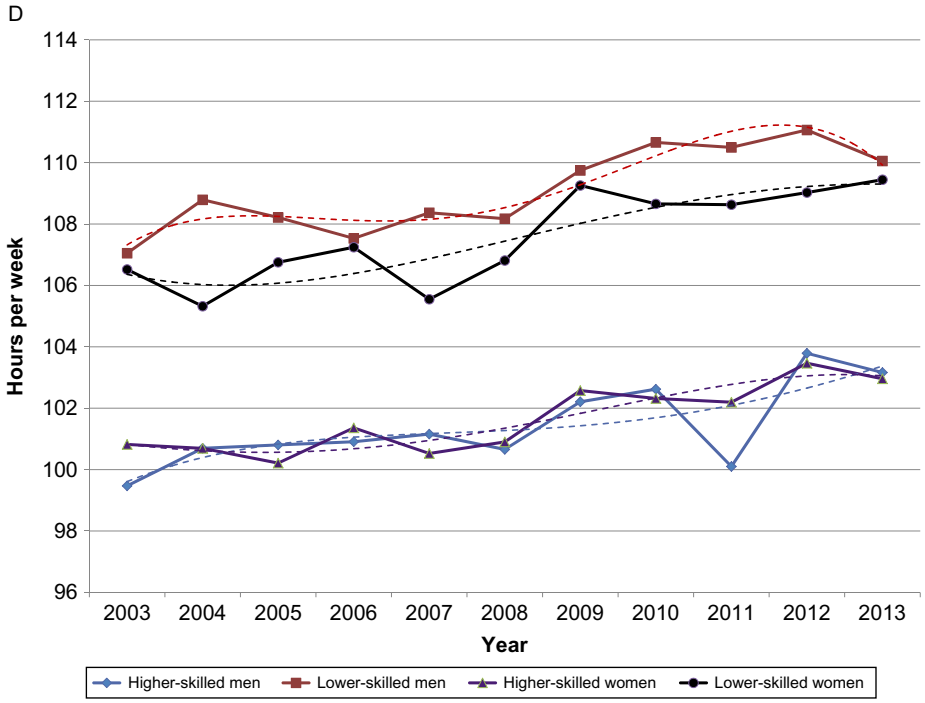


Fig. 13—Cont'd

recent trend is a slight reversal of the near constant nonmarket hours between 1985 and 2003 highlighted in the prior section.

Figs. 12C and 13C show that trends in child care also reversed slightly relevant to the trends over the prior 20 years. Both higher and lower skilled women reduced their child care time by about 1 h per week between 2003 and 2013. This increase reduced much of the gains in child care time that occurred between 1985 and 2003. For men, child care time was essentially flat during the last decade.

Figs. 12D and 13D show the trends in leisure for higher and lower skilled men and women between 2003 and 2013. All groups experienced an increase in time allocated to leisure during this period. What is noticeable is that the trends are nearly identical in terms of both levels and growth rates within a skill category. For example, high-skilled men and women again have nearly identical times allocated to leisure despite having dramatically different time allocated to market work, home production, and child care. Likewise, low-skilled men and women have nearly identical time allocated to leisure. Prime-aged lower skilled individuals increased their time allocated to leisure by roughly 3 h per week over the last decade. Prime-aged higher skilled individuals increased their leisure time by about 2 h per week during the last decade. Again, the recent time series results suggest a

continuation of the increased leisure inequality trends that have been occurring during the prior few decades.

5.3 Business Cycle Variation in Time Use

In the prior section, we showed that leisure time increased while market work and home production time fell for all sex-skill groups during the last decade. However, it is hard to tease out the time series trends from the potential effects of the recent business cycle using time series data alone. As described in Aguiar et al. (2013), business cycle effects can be estimated using cross-region data.

We begin this section by documenting the business cycle effects on time use by exploiting cross-region variation in employment changes during the recent recession. Specifically, we estimate the following specification:

$$\Delta Time^{j}_{kt} = \alpha^{j}_{0} + \alpha^{j}_{1} \Delta Time^{market}_{kt} + \epsilon^{j}_{kt},$$

where $\Delta Time^{market}_{kt}$ is the average hour per week change in market hours across individuals in state k between period t and $t + s$ and $\Delta Time^{j}_{kt}$ is the average hour per week change in time spent on category j across individuals in state k between period t and $t + s$. To estimate these relationships, we use data for all individuals between the ages of 21 and 75 in the ATUS samples between 2007 and 2013. To increase power when computing means at the state level, we collapse the underlying data into multiyear samples. In particular, we create state level means for each time-use category in 2007–2008, 2009–2010, and 2011–2013. For each state, we compute $\Delta Time^{j}_{kt}$ by taking the difference in average time spent in category j in state k between the two adjacent time periods (2009–2010 vs 2007–2008 and 2011–2013 vs 2009–2010). As a result, we have 102 observations in the regression (two observations each for the 50 states plus the District of Columbia). The identification restriction for this exercise is that the underlying trends in time use for each category are similar across states. Therefore, the state variation is isolating only the business cycle variation in time use.[g]

Fig. 14 shows the cross-state relationship between market work changes and home production changes (A), child care changes (B), leisure changes (C), and job search (D). The change in market work within each state during the adjacent time periods (measured in hours per week) is on the x-axis. This stays the same across each of the four panels. On the y-axis of each panel is the respective change in the relevant activity, also measured in hours per week. According to Fig. 14A, as market work hours fall at business cycle frequencies, 36% is reallocated to home production ($\alpha^{nonmarket}_{1} = -0.36$ with a standard error = 0.04). As seen in Fig. 14C, a fall in market work of 1 h at business cycle frequencies leads to an increase in leisure of 0.44 h ($\alpha^{leisure}_{1} = -0.44$ with a standard error = 0.04). Taking the two together, 80% of the foregone time from a decline in

[g] See Aguiar et al. (2013) for a more complete discussion of the identification issues.

Fig. 14 Time allocation during the Great Recession. (A) Nonmarket hours, (B) child care, (C) leisure, and (D) job search. Note: Each panel shows change in market hours per week at the state level vs change in the indicated activity at the state level during the 2007–2013 period. For each state, three time-use observations are computed for each category: average time use in a given category pooled over years 2007 and 2008 (period 1), average time use in a given category pooled over years 2009 and 2010 (period 2), and average time use in a given category between 2011, 2012, and 2013 (period 3). The figure plots the change in time use between the first and the second period as well as the change in time use between the second and third time period. As a result, each state plus the District of Columbia is in the figure twice (for a total of 102 observations). The size of the *circle* represents the number of ATUS respondents within the state in the initial period from which the change is computed. The *line* is a weighted regression line through the scatter plots where the weights are the number of ATUS respondents within the state in the initial period from which the change is computed. The slope of the line is −0.31 with a standard error of 0.03 where the standard error is clustered by state.

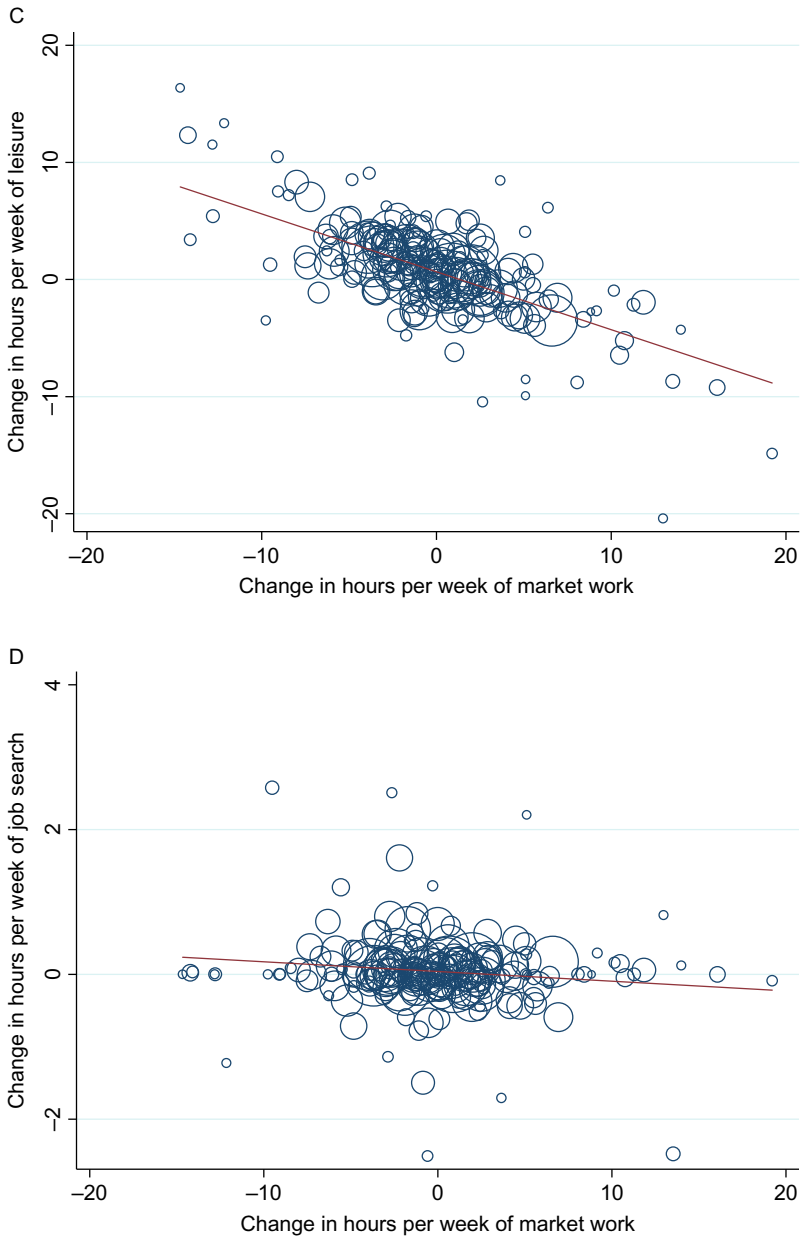


Fig. 14—Cont'd

market work is allocated to either leisure or home production. However, these findings complicate the interpretation of the time series trends shown in the prior sections. The fact that home production times fell for both high- and low-skilled men and women from the mid-2000s through 2013 despite the fact that the economy was in a recession may

seem puzzling. If there were only business cycle factors driving the time series patterns, we would have expected home production times to increase as market work hours fell. The fact that home production times fell suggests that there was a large secular decline in home production time above and beyond the business cycle. This is not surprising given that home production times have been declining for decades.

Fig. 14B shows that child care time also increases in states as market work fell during the recession. Again, the time series patterns of time use suggest that during the recession child care time in the aggregate actually fell. The fact that aggregate time spent on child care activities fell despite the aggregate recession again suggests that there may have been a secular decline in child care time during the 2000s. If true, this would represent a reversal of the trends documented in Ramey and Ramey (2010), showing that time spent with children was increasing particularly among higher skilled parents.

While not formally extended in this chapter, Aguiar et al. (2013) show that investments in education, civic activities, and health care also absorb an important fraction of the decrease in market work hours (more than 10%), whereas job search absorbs around 1% of the decrease in market work hours (Fig. 14D). The latter finding is not surprising, given how little time unemployed spent searching for a job (Krueger and Mueller, 2010). The results suggest whether the job search measures in time-use surveys are designed to measure actual job search efforts of individuals looking for a job.

5.4 Time Use of the Unemployed

Another way to look at the effects of business cycle conditions on time use is to compare the time use of the unemployed relative to the employed. Such a comparison may suffer from composition differences across individuals. For example, individuals with a higher taste for leisure may be more likely to end up in the unemployment pool. Despite that limitation, we feel it is still informative to document the time use of individuals with different labor market status.

Table 1 shows the allocation of time in market work, nonmarket work, child care, leisure and other for men with at least 16 years of schooling (top panel) and men with less than 16 years of schooling. Each column represents a distinct labor market status. The first and second columns include men employed in the formal market sector (column 1) and men who are unemployment (column 2). The unemployed men are those individuals who are currently not working but who are actively seeking employment. Columns 3 and 4 include men who are out of the labor force. This category includes those who are disabled, retired, students, or who are otherwise not working and not seeking employment. We segment those out of the labor force into those under 63 and those 63 and over. The reason for this bifurcation is to identify potentially retired households. Most households over the age of 63 who are not attached to the labor force are retired.

Table 1 Time allocation by employment status: men

	More educated			
Activity	**Employed**	**Unemployed**	**NILF (age < 63)**	**NILF (age ≥ 63)**
Leisure	100.27	121.47	127.80	134.11
Market work	47.70	1.98	0.47	0.11
Job search	0.09	9.37	0.58	0.00
Home production	12.73	23.64	21.42	25.26
Child care	3.59	4.25	2.70	1.71
Other	3.45	6.86	14.70	6.55
Observations	13,746	412	783	1,054
	Less educated			
Activity	**Employed**	**Unemployed**	**NILF (age < 63)**	**NILF (age ≥ 63)**
Leisure	103.36	131.58	139.14	140.42
Market work	46.15	0.76	0.38	0.20
Job search	0.11	4.90	0.22	0.00
Home production	12.91	21.89	16.85	20.62
Child care	2.63	3.74	2.49	1.21
Other	2.72	4.59	8.71	5.31
Observations	22,319	1625	3603	3399

A few things are noticeable from Table 1. First, higher (lower) educated men who are unemployed still allocate roughly 2 (1) h per week to market work. All of this work, however, is outside the formal sector. This work includes side jobs for pay outside the formal sector. Second, higher educated unemployed men spend roughly 9 h per week in job search. The comparable number for lower educated men is 5 h per week. The number is essentially zero for employed men and men out of the labor force regardless of years of schooling. Third, like with the business cycle analysis discussed above, roughly 47% of the foregone difference in market work hours for higher skilled men (21/45) and 62% of foregone difference in market work hours for lower skilled men (28/45) are allocated to leisure. About 20–25% of the difference in work hours between unemployed and employed men—regardless of skill—is allocated to nonmarket work. The increase in leisure for lower skilled unemployed relative to the higher skilled unemployed is primarily due to differences in job search.

Table 2 shows similar patterns for women. The main difference between men and women is that lower educated women and higher educated women both have an increase in leisure time that represents roughly 45% of foregone differences in market work between the employed and unemployed. That is much smaller than the 62% of foregone work hours for lower educated men. Again, regardless of the analysis we perform—time series, life cycle, or business cycle—lower educated men take the most leisure.

Table 2 Time allocation by employment status: women

	More educated			
Activity	**Employed**	**Unemployed**	**NILF (age < 63)**	**NILF (age ≥ 63)**
Leisure	99.56	115.96	112.79	128.24
Market work	40.96	0.78	0.19	0.17
Job search	0.10	4.74	0.11	0.00
Home production	17.75	29.40	30.79	29.27
Child care	5.36	7.68	14.89	2.06
Other	4.13	9.28	8.99	8.08
Observations	13,878	548	2,825	1,234
	Less educated			
Activity	**Employed**	**Unemployed**	**NILF (age < 63)**	**NILF (age ≥ 63)**
Leisure	102.13	119.33	121.51	131.28
Market work	37.57	0.44	0.22	0.06
Job search	0.04	2.85	0.08	0.00
Home production	19.57	28.77	28.97	28.51
Child care	4.62	8.81	9.61	1.76
Other	3.90	7.07	7.32	6.23
Observations	22,665	2068	8878	5671

One final question we want to address is whether the long-term unemployed have different allocation of time relative to shorter term unemployed. If differences exist, it could represent either selection or potential duration dependence on time use. However, as seen in Table 3, there does not appear to be any differential time-use patterns between the short- and long-term unemployed. To measure the duration of unemployment, we bring in data from the individual's labor market status in their last interview of the CPS. As discussed above, the ATUS sample is drawn from the exiting rotation of the CPS. In the last interview of the CPS, an individual's current employment status is measured. If the individual is unemployed, it asks the duration of their unemployment spell. While the ATUS asks respondents of their current employment status, it does not ask them the duration of their unemployment spell if they were unemployed. By linking individuals across the two samples, we can get an imperfect measure of current unemployment duration.[h]

In Table 3, we restrict our sample to those individuals who are unemployed (not working and currently looking for job) in the ATUS who were either employed or unemployed in the CPS 3 months earlier.[i] We then estimate the following regression:

[h] There is no information on employment spells between the CPS and ATUS interviews.

[i] We restrict observations to having a 3-month gap between the ATUS and CPS. This was the overwhelming majority of ATUS respondents.

Table 3 Time use of the unemployed: duration dependence

Duration (weeks)	Leisure	Search	Home production	Child care
0–9	0.23	−0.70	0.34	0.37
	(1.57)	(0.77)	(1.29)	(0.69)
10–19	0.43	0.48	−0.80	−0.23
	(1.95)	(0.96)	(1.61)	(0.86)
20–29	−0.97	−2.16	2.23	1.95
	(2.51)	(1.23)	(2.08)	(1.10)
30–39	−1.53	1.83	0.04	0.59
	(2.61)	(1.29)	(2.16)	(1.15)
40–49	−5.64	2.86	−0.10	1.53
	(3.58)	(1.76)	(2.95)	(1.57)
50+	3.14	−1.23	1.11	−0.20
	(1.76)	(0.87)	(1.45)	(0.77)

Note: The sample consists of ATUS respondents between the ages of 21 and 62 who report being unemployed at time of ATUS interview and whose interview is 3 months after last CPS interview. The sample size is 2164. The omitted group consists of respondents who were employed at the time of the last CPS interview. The rows of the table report coefficients on dummy variables for being unemployed at the time of the CPS interview for a duration of 0–9 weeks, 10–19 weeks, etc. Other controls include age, age squared, marital status, a dummy indicating having a child, and a dummy indicate race=white.

$$Time_{it}^{j} = \beta_0^j + \beta_1^j UnempDur_{it} + \beta_2 X_{it} + \beta_4 D_t + \eta_{kt}^j,$$

where $Time_{it}^{j}$ is the time use of individual i in time t on category j, $UnempDur_{it}$ is the duration of the respondent's unemployment spell as measured in the CPS 3 months earlier, X_{it} is a vector of individual-level controls, and D_t is a vector of 1-year time dummies. The X_{it} vector includes age, age squared, a marital status dummy, a dummy for whether the individual had a child, and a race dummy. The unemployment duration measure is a series of dummy variable indicating the length of the CPS unemployment spell: 0–9, 10–19, 20–29, 30–39, 40–49, and 50+ weeks. The omitted dummy in the regression is those individuals who were employed in their last CPS interview but are currently unemployed. As a result, the regression estimates how time use among the current unemployed differs by the duration of their CPS unemployment spell relative to the current unemployed who were working in their last CPS interview. If unemployment spells are persistent, those unemployed in the ATUS working in their last CPS interview will have shorter unemployment durations than those unemployed in the ATUS who were also unemployed in the CPS. It should be stressed that this is an imperfect measure of unemployment duration because we do not observe the individual's employment status in 3 months in between the CPS and ATUS.

The results in Table 3 show that there is no statistically significant relationship between time use and the duration of the unemployment spell in the CPS. However, standard errors of our estimates are large. As a result, we cannot rule out that time use

evolves with the duration of unemployment. Additionally, as discussed above, there is some noise in the unemployment duration measure. Just because an individual was unemployed for 10 weeks in their last CPS interview does not mean they were unemployed for 22 weeks when we measure them in the ATUS. There is, on average, 12 weeks between an individual's CPS and ATUS interview. The individual could have found employment in that interval but because unemployed again by the start of the ATUS. We view this as suggestive evidence at best about the relationship between unemployment duration and time use.

5.5 Macro Implications of Time Use over the Business Cycle

One of the most important contributions of the economics of time is in improving our understanding of aggregate fluctuations. The first wave of dynamic general equilibrium models, pioneered by Kydland and Prescott (1982), assumed that total time is allocated into only two activities, market work and leisure. There are good reasons why introducing a third activity, time spent on home production, can make a difference for these models. First, when individuals derive utility both from market-produced goods and from home-produced goods, volatility in goods and labor markets can arise because of relative productivity differences between the two sectors, and not just because of productivity shocks in the market sector. Second, relative price changes cause households to substitute goods and time not only intertemporally between periods but also intratemporally between the market and the home sector. Intratemporal substitution introduces a powerful amplification channel which is absent from the standard real business cycle model. In fact, in his review of the home production literature Gronau (1997) writes that " …the greatest contribution of the theory of home production in the past decade was in its service to the better understanding of consumption behavior and changes in labor supply over the business cycle."

The first papers to introduce home production into the stochastic neoclassical growth model were Benhabib et al. (1991) and Greenwood and Hercowitz (1991). Benhabib et al. (1991) show that the real business cycle model with home production performs better than the standard real business cycle model along a number of dimensions. Specifically, in a calibrated version of their model, one of the main findings is that home production increases the volatility of labor and consumption relative to output. This is because home production introduces an additional margin of substitution toward which market work and market consumption can be directed following exogenous technology shocks. Second, the introduction of technology shocks in the home sector lowers significantly the correlation of productivity with labor hours. This is because technology shocks in the home sector shift the labor supply schedule and tend to generate a negative correlation between productivity and hours. This tends to offset

the positive correlation induced by technology shocks in the market sector which shift the labor demand schedule.

However, the model also produces some notable discrepancies relative to the data. As Greenwood and Hercowitz (1991) show, the model produces a counterfactual negative correlation between investment in the market sector and investment in the home sector. This is because in a two-sector frictionless model, resources tend to flow to the most productive sector. In general, this implies that investment does not increase in both sectors simultaneously following a technology shock in one of the sectors. Greenwood and Hercowitz (1991) show that introducing highly correlated technology shocks between the home and the market sector and increasing the complementarity of time and capital in the production of home goods help address this discrepancy. Chang (2000) shows that adjustment costs in the accumulation of capital help resolve the investment anomaly when time and capital are substitutes in the production of home goods.

6. LIFE CYCLE VARIATION IN TIME USE

The economics literature typically analyzes life cycle patterns of consumption and work by appealing to models that emphasize only the intertemporal substitution of goods and time. However, as discussed above, intratemporal substitution between time and goods could be important for explaining the life cycle patterns of both time use and expenditures. In this section, we begin by documenting life cycle patterns in time use for both men and women of different schooling levels. We then briefly highlight recent research that has found evidence on the importance of intratemporal substitution in explaining life cycle profiles of expenditure.

6.1 Life Cycle Profiles of Time Use

When estimating the life cycle profiles of time use, one has to consider the potential that either time or cohort effects are driving the results. However, as is well known, colinearity prevents the inclusion of a full vector of time dummies, cohort dummies, and age dummies when estimating life cycle profiles. In particular, as discussed in Hall (1968), age, year, and cohort effects are identified in repeated cross sections up to a log-linear trend that can be arbitrarily allocated across the three effects. To isolate age profiles, additional assumptions are required.

In the remainder of this section, we proceed in two steps. First, we assess the extent to which cohort effects alter the life cycle profiles of market work using repeated cross-sectional data from the CPS between 1967 and 2013. Second, we then document the life cycle profiles of market work, home production, child care, and leisure using repeated cross sections from the ATUS between 2003 and 2007. For the latter analysis, we stop in 2007 to isolate periods before the Great Recession took place.

Fig. 13A–D uses the CPS data to show the life cycle patterns for market work for higher educated men, lower educated men, higher educated women, and lower educated women, respectively. As above, "higher educated" means having at least 16 years of schooling. Specifically, each figure shows the age coefficients (relative to age 25) from the following regression:

$$market\_hours_{it}^{g} = \beta_0^g + \beta_{age}^g Age_{it} + \beta_c^g Cohort_{it} + \beta_t^g D_t^{norm} + \varepsilon_{it}^g, \quad (4)$$

where $market\_hours_{it}^{g}$ is market hours of household i during year t from group g, Age_{it} is a vector of 50 1-year age dummies (for ages 26–75) referring to the age of the household head, $Cohort_{it}$ is a vector of 1-year birth cohort dummies, and D_t^{norm} is a vector of normalized year dummies. Our approach is to attribute hours differences across households to age and cohort effects and use year dummies to capture cyclical fluctuations. Specifically, we restrict the year effects to average zero over the sample period. Henceforth, we refer to the year dummies with this restriction on their coefficients as normalized year dummies.

Each of the four panels in Fig. 15 contains three lines. The first line estimates the above equation as is using the CPS data from 1967 through 2013. These lines are represented with triangles on each of the four figures. The second line drops the cohort effects and does not restrict the year effects to sum to zero. Formally, we report the age coefficients from the following specification:

$$market\_hours_{it}^{g} = \beta_0^g + \beta_{age}^g Age_{it} + \beta_t^g D_t + \varepsilon_{it}^g.$$

This specification is also estimated on the CPS data from 1967 through 2013. The second line is designated with squares on each of the figures. By comparing the first line to the second line, we can provide an assessment of the importance of omitting cohort effects when estimating life cycle profiles in market work off repeated cross sections. The third line on each figure—designated with the triangles—is the same as the second regression except restricted to the 2003–2007 period. By comparing the third line to the second, we can see the extent to which the life cycle profiles with no cohort effects and unrestricted time effects differ in the 2003–2007 period relative to the longer 1967–2013 period. This is important given that for the ATUS data, we will only be estimating life cycle profiles using the 2003–2007 period.

There are three interesting take aways from Fig. 15. First, the life cycle profiles of market work differ across sex-skill groups. For higher skilled men, market work hours per week increase by about 6–7 h between the ages of 25 and 31. Between 31 and 51, hours worked per week were roughly constant for these men. After the age of 51, market work hours declined steadily toward zero by age 75. For lower skilled men, market work hours did not increase as much between the ages of 25 and 31 (2–3 h per week). For these

men, peak market hours worked per week occurred around 40 h per week. So lower skilled men start decreasing their hours worked per week much earlier than higher skilled men. The life cycle patterns for market work for higher skilled women is dramatically different relative to either lower or higher skilled men. Higher skilled women reduce their work hours per week by about 5 h between the ages of 25 and 35. These are the ages when higher skilled women leave the labor force to start families. However, by the early 40s, their market work hours per week are back to the levels in their mid-20s. Their hours remain high through their mid-50s before declining toward zero by age 75. Lower skilled women

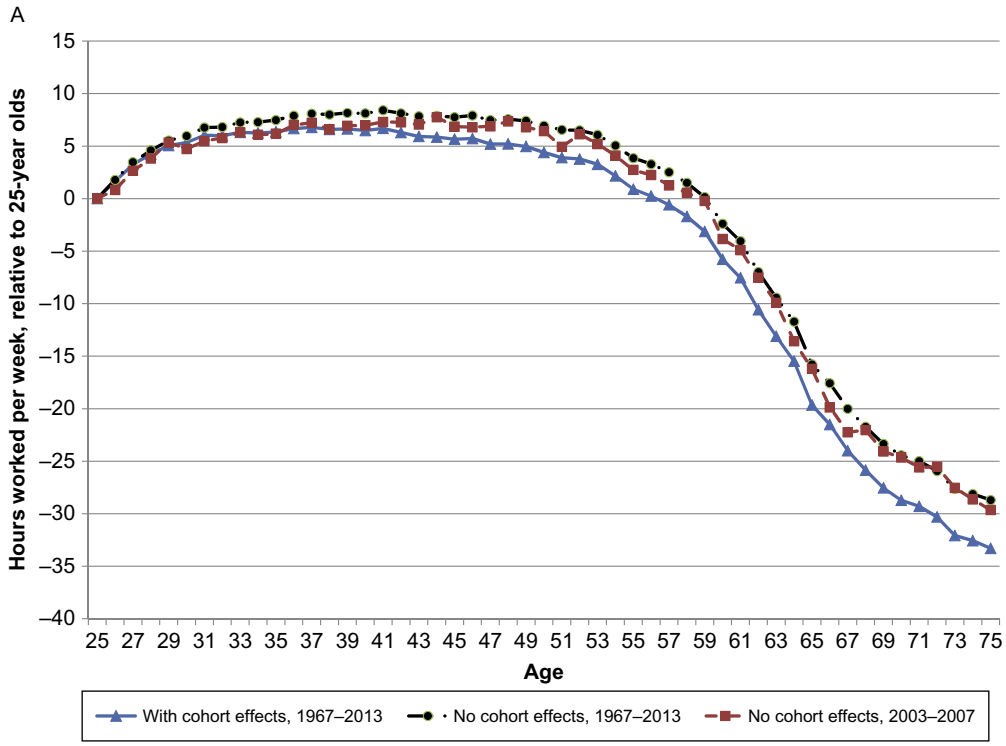
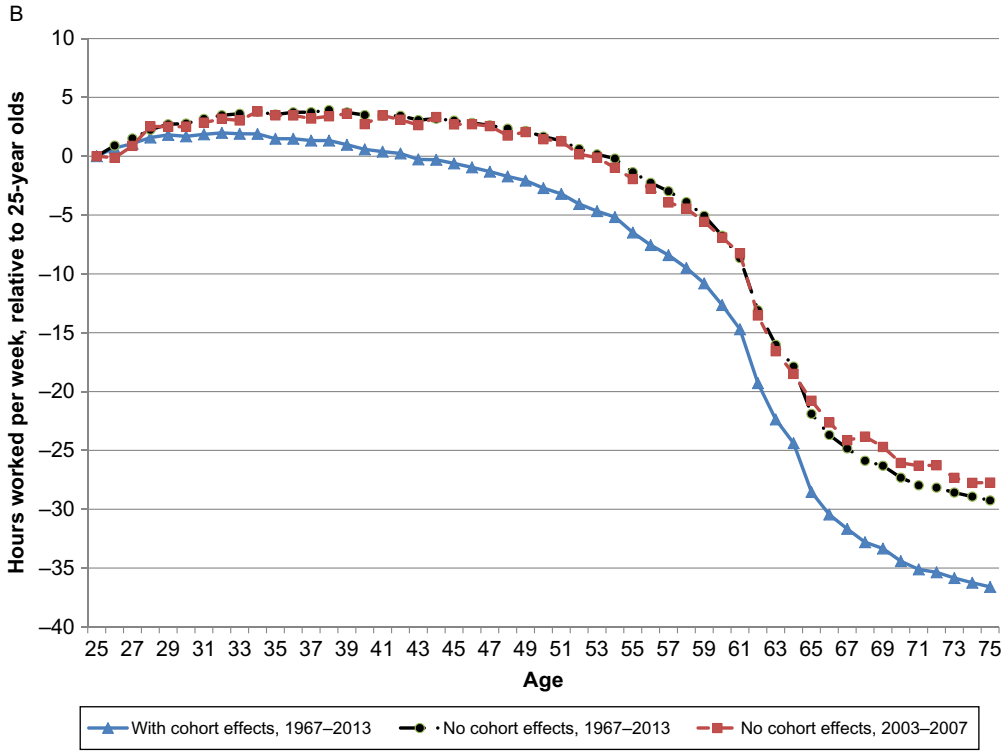


Fig. 15 Market hours over the life cycle. (A) More educated men, (B) less educated men, (C) more educated women, and (D) less educated women. Note: Figure shows the life cycle profile of market hours worked in the Current Population Survey (CPS) for men with at least 16 years of schooling (A), men with less than 16 years of schooling (B), women with at least 16 years of schooling (C), and women with less than 16 years of schooling (D). The *solid line with triangles* shows the life cycle profile using data from 1967 to 2013 controlling for 1-year cohort effects and normalized year effects. The normalized year effects are constrained to sum to zero across all years. The *dashed line with circles* shows the life cycle profile using data from 1967 to 2013 with no cohort effects but instead including year effects for each year separately. The *dashed–dotted line with squares* shows the life cycle profile using only data from 2003 to 2007 including year effects for each year separately.


B
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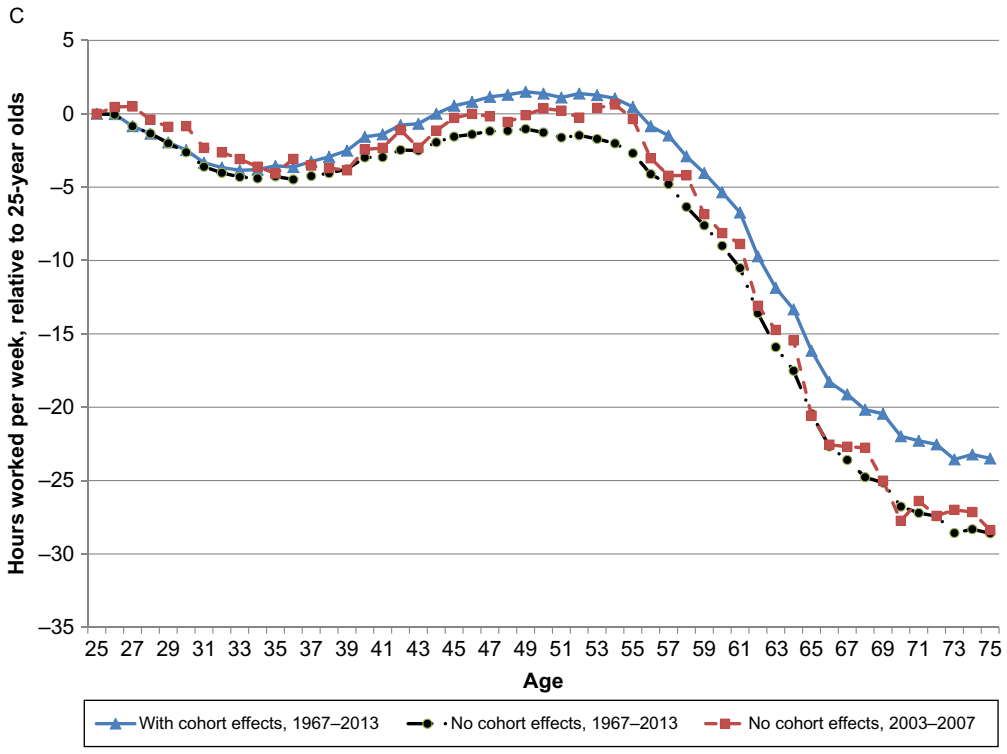
Age
With cohort effects, 1967–2013
No cohort effects, 1967–2013
No cohort effects, 2003–2007


C
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25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75
Age
With cohort effects, 1967–2013
No cohort effects, 1967–2013
No cohort effects, 2003–2007

Fig. 15—Cont'd

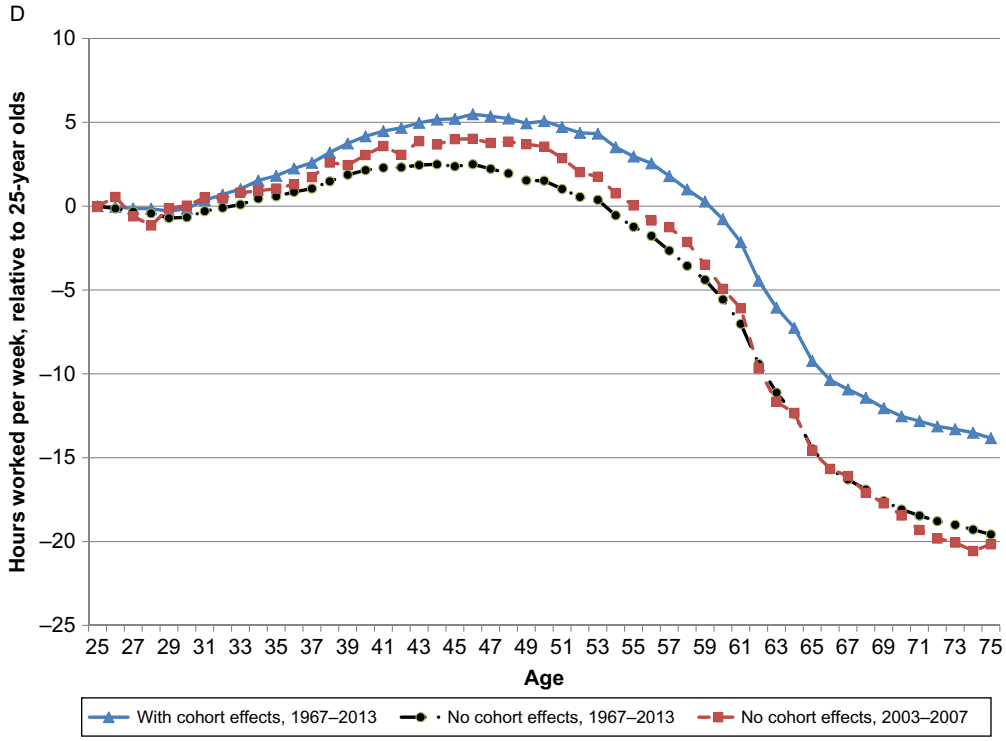


Fig. 15—Cont'd

have relatively low labor supply through their early 30s before increasing by roughly 3–5 h per week in their mid-40s.

The second thing to notice from Fig. 15 is that not controlling for cohort effects has only trivial effects on the life cycle profiles of market work for higher skilled men and women. This can be seen from the fact that the coefficients controlling for cohort effects (triangles) are nearly identical to the coefficients omitting the cohort effects (circles). When deviations exist, the differences are small. For example, controlling for cohort effects, higher educated men increase their hours worked per week by about 7 h per week between the ages of 25 and 40 and then decrease hours worked per week by about 41 h between 40 and 75. Without controlling explicitly for cohort effects, higher educated men increase their hours worked per week by about 8 h per week between ages 25 and 40 and then reduce hours worked per week by about 38 h between 40 and 75. The differences are slightly more pronounced for lower educated men and women. However, the life cycle patterns are for the most part quite similar regardless of whether or not one controls explicitly for cohort effects.

The final thing to notice from Fig. 15 is that life cycle profiles estimated from 1967 to 2013 with no cohort effects are again nearly identical as life cycle profiles estimated from 2003 to 2007 with no cohort effects. This fact holds for all sex-skill groups. This result

gives us confidence that even though the ATUS data only start in 2003, the life cycle patterns we get from this period should be broadly consistent with the life cycle patterns over the past half century.

Fig. 16A plots the life cycle profiles of market work for higher educated men (diamonds), lower educated men (squares), higher educated women (triangles), and lower educated women (circles) using the 2003–2007 ATUS data. Instead of using 1-year age dummies, we regress hours per week in a given time-use category on a fourth-order polynomial in age. Using the coefficients from the fourth-order polynomial, we fit the predicted life cycle patterns for each time-use category. We use the fourth-order polynomial to smooth out some of the fluctuations over the life cycle in the 1-year age dummies given that the sample size of the ATUS is much smaller than the CPS. We then anchor the plots by taking the mean time use in each category for each sex-skill group at age 25.[j] This allows us to measure both the level and changes over the life cycle in hours per week allocated to a given activity.

Fig. 16A shows that the life cycle patterns in market work estimated of the cross section in the ATUS using 2003–2007 data are nearly identical to the patterns in Fig. 15A using CPS data. Higher educated men increase hours slightly from 25 to 40 before experiencing decline hours in their early 50s. Higher educated women decline their hours in market work between their mid-20s and mid-30s before increasing hours in market work through their early 50s. We view it as comforting that the life cycle patterns in market work in the ATUS are broadly similar with the life cycle patterns in the CPS.

Fig. 16B–D shows the life cycle patterns of time allocated to home production, child care, and leisure, respectively. Among younger individuals, lower educated women spend the most hours per week in nonmarket work. However, by the early 40s and throughout the remainder of the life cycle, the hours spent on home production for higher educated and lower educated women is nearly identical. All women, regardless of skill level, spend roughly 25 h per week in nonmarket work in their mid-40s. This number rises to about 30 h per week by age 65. Likewise, men spend nearly identical amounts in home production regardless of skill. As seen from Fig. 16B, the higher educated men and lower educated men lines are nearly on top of each other throughout most of the life cycle. Men spend about 12 h per week in home production in their mid-20s, about 15 h per week in their mid-40s, and about 20 h per week in their mid-60s. Between the ages of 40 and 70, the difference in home production hours per week between men and women narrows considerably. For all groups, as households age their time spent on home production increases.

Fig. 16C shows the life cycle patterns of time spent on child care for each group. A few things are noticeable from this figure. First, higher educated women have their peak in child care time around the age of 35. This is much later than the peak for lower

[j] When we report age 25 values, we actually take the mean for each sex-skill group for each category for ages 23–27. Again, we do this to help mitigate the measurement error given the smaller sample sizes within the ATUS.

educated women (around age 29). This reflects the fact that higher educated women have children later. Second, after the age of 29, higher educated women spend considerably more time in child care than lower educated women at every age. For example, at age 35, higher educated women allocate 17 h per week to child care. The comparable number is only about 10 h per week for lower educated women. Third, conditional on skill, men spend much less time on child care than do their female counterparts. Fourth, after the age of around 35, higher educated men spend much more hours per week in child care than lower educated women. Finally, higher educated men spend more time in child care at essentially every age. The uptick in time spent in child care in the 60s for higher educated men and women likely represents time spent with grandchildren.

Fig. 16D shows the life cycle patterns in leisure for all groups. Like the results above, lower skilled men experience the most leisure at every age of the life cycle. Higher educated men and women experience the least leisure at every age of the life cycle. However,

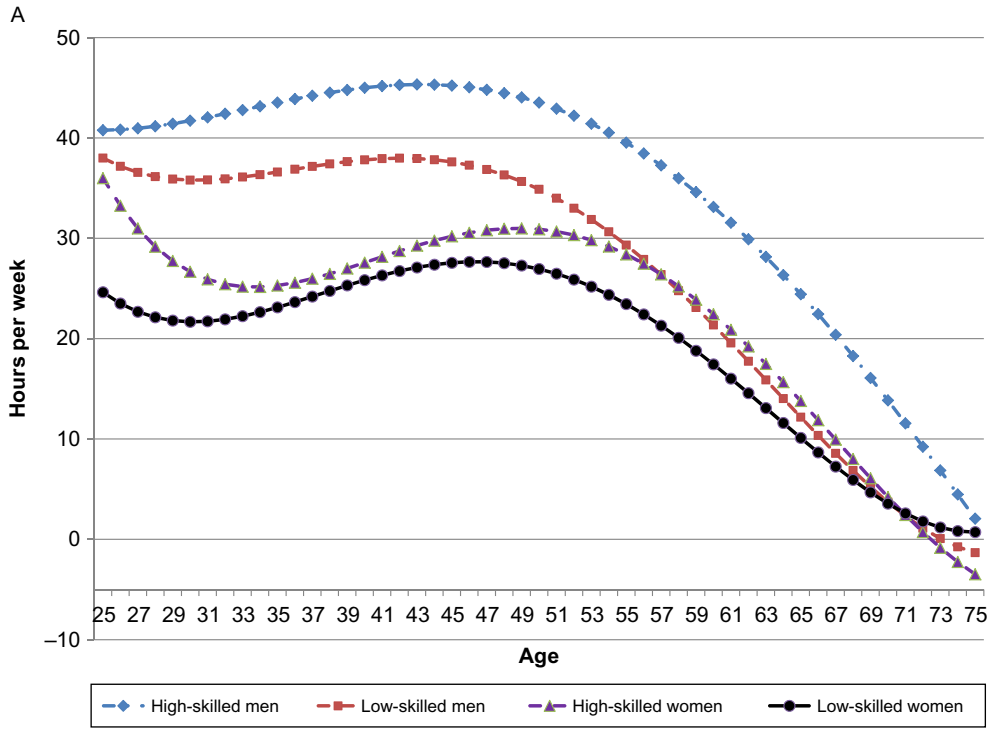
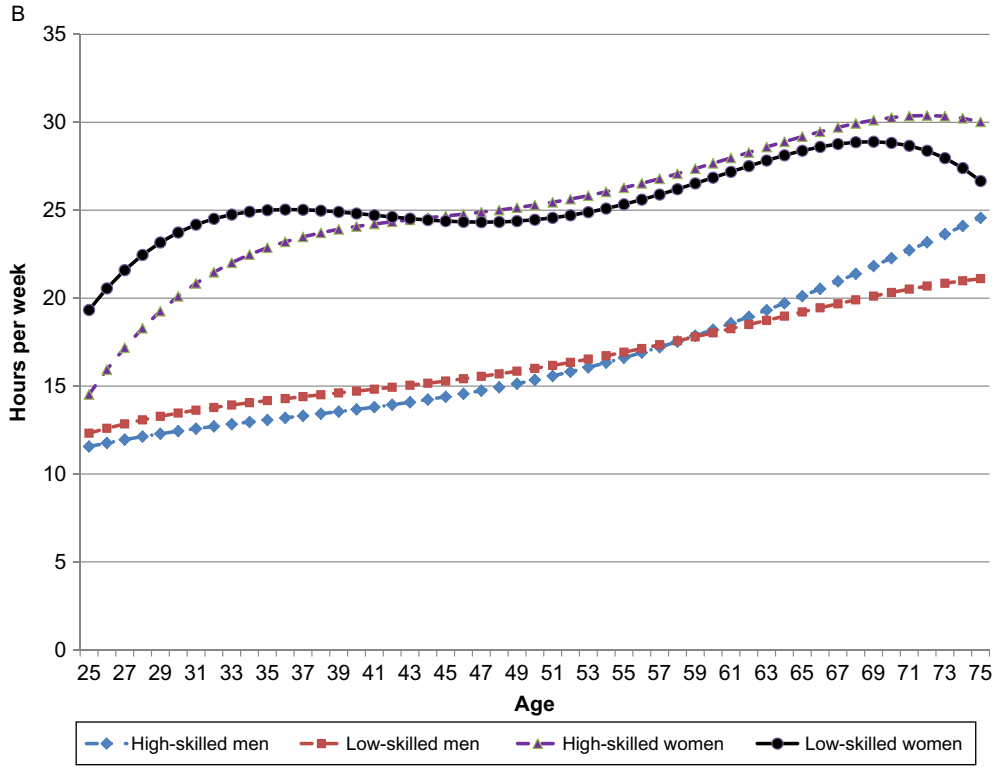


Fig. 16 Time allocation over the life cycle: ATUS data. (A) Market work, (B) nonmarket work, (C) child care, and (D) leisure. Note: Figure shows the life cycle profile of time allocation in the American Time-Use Survey (ATUS) by sex and skill group. The *line marked with diamonds* shows the pattern for men with at least 16 years of schooling. The *line marked with squares* shows the pattern for men with less than 16 years of schooling. The *line marked with triangles* shows the patterns for women with at least 16 years of schooling. The *line marked with circles* shows the patterns for women with less than 16 years of schooling. The profiles do not control for cohort effects but do include year effects for each year separately.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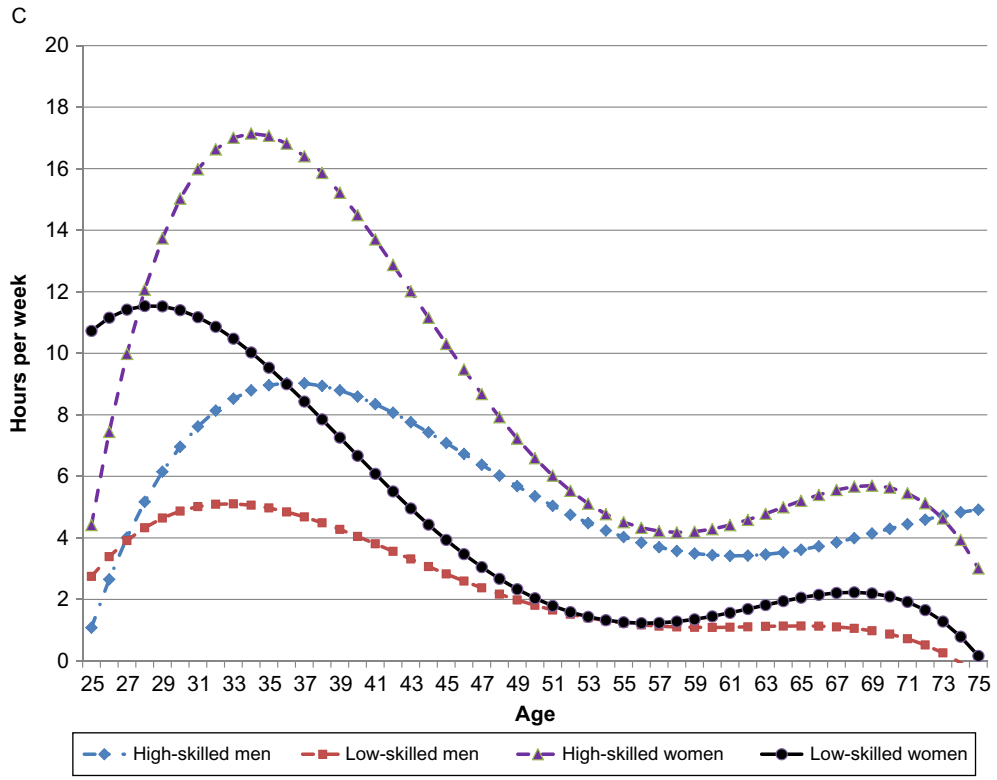
Age
High-skilled men
Low-skilled men
High-skilled women
Low-skilled women


C
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Hours per week
25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75
Age
High-skilled men
Low-skilled men
High-skilled women
Low-skilled women

Fig. 16—Cont'd

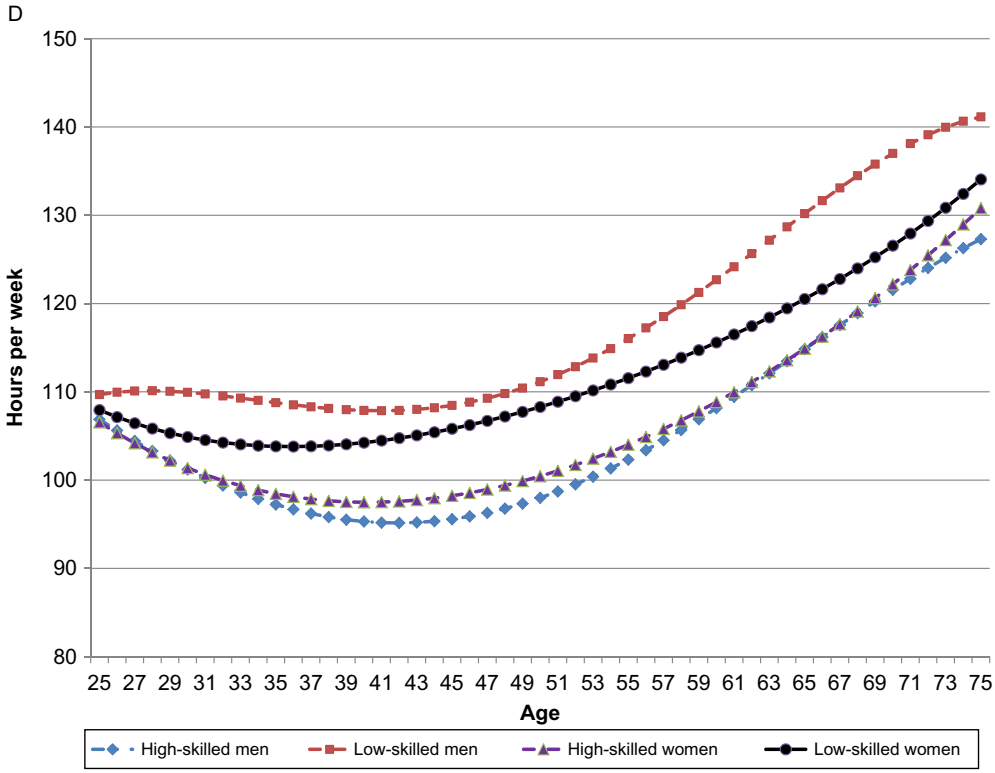

Fig. 16—Cont'd

one of the most striking facts from Fig. 16D is that despite the dramatic differences in market work, home production, and child care over the life cycle between higher educated men and women, their leisure times are nearly identical at every age. So, while the composition of work activities may differ between higher educated men and women, they are taking nearly identical amounts of leisure times. This is consistent with the time series evidence discussed above. Additionally, all households increase their leisure time dramatically after middle age. For example, higher educated men and women increase their weekly leisure time by about 35 h per week between the ages of 41 and 75. The increase is about 30 h per week for lower educated men and women.

6.2 The Importance of Intratemporal Substitution Between Time and Goods

The workhorse model of consumption over the life cycle, the permanent income hypothesis, posits that individuals allocate their resources in order to smooth their marginal utility of consumption across time (see, eg, Attanasio, 1999 for a review). If the marginal utility of consumption depends only on measured consumption, this implies

that individuals will save early in their life cycle in order to maintain a smooth level of expenditures at retirement. During the last decade, there was a large amount of research that has showed that the substitution between time and expenditures is a first-order explanation as to why consumption varies over the life cycle.

The typical finding in the literature has been that consumption follows a hump-shaped pattern over the life cycle with consumption being low early in the life cycle, peaking at middle age and falling sharply at retirement. Some authors have argued that this life cycle profile represents evidence against the forward-looking consumption smoothing behavior implied by permanent income models, particularly since the hump in expenditures tracks the hump in labor income (as documented by Carroll and Summers, 1991). This view interprets expenditure declines in the latter half of the life cycle as evidence of poor planning. Other authors argue that the hump-shaped profile of consumption reflects optimal behavior if households face liquidity constraints combined with a need to self-insure against idiosyncratic income risks (see, for example, Zeldes, 1989; Deaton, 1991; Carroll, 1997; Gourinchas and Parker, 2002). Households build up a buffer stock of assets early in the life cycle, generating the increasing expenditure profile found during the first half of the life cycle. The decline in the latter half of the life cycle is then attributed to impatience once households accumulate a sufficient stock of precautionary savings.

In a recent paper, Aguiar and Hurst (2013) demonstrate that there is tremendous heterogeneity in the life cycle patterns of expenditures across different spending categories. In particular, some categories (eg, food and transportation) display the familiar hump-shaped profile over the life cycle, but other categories display an increasing (eg, entertainment) or decreasing (eg, clothing and personal care) profile over the life cycle. This heterogeneity cannot be captured by the standard life cycle model of consumption that emphasizes only the intertemporal substitution of goods and time. They show that home-produced goods (food) and work-related expenditures (clothing and nondurable transportation) account for the entire decline in total expenditures after middle age. Additionally, these same goods explain the overwhelming majority of the increase in the cross-individual dispersion in expenditures after middle age. The paper shows that failure to account for home-produced and work-related goods leads one to overestimate the amount of income risk faced by individuals.

A separate literature focused on the "retirement consumption puzzle." The literature found that that household expenditure falls discontinuously upon retirement. Banks et al. (1998) look at the consumption smoothing of British households around the time of retirement. Controlling for factors that may influence the marginal utility of consumption (such as family composition and age, mortality risk, labor force participation), they find that consumption falls significantly at retirement. Bernheim et al. (2001) find that total food expenditure declines by 6–10% between the preretirement and the postretirement period, which leads them to conclude that households do not use savings to smooth

consumption with respect to predictable income shocks. Haider and Stephens (2007) use subjective retirement expectations as an instrument to distinguish between expected and unexpected retirements and find a decline in food expenditures ranging from 7% to 11% at retirement.

Aguiar and Hurst (2005) argue that tests of the life cycle model typically equate consumption with expenditure. However, as stressed by the model above, consumption is the output of a home production process which uses as inputs both market expenditures and time. As the above model highlights, individuals will substitute away from expenditures toward time spent on home production when the market price of time falls. Since retirees have a lower opportunity cost of time than their preretired counterparts, time spent on the production of commodities should increase during retirement. If this is the case, then the drop in expenditure does not necessarily imply a large decrease of actual consumption at retirement.

To test this hypothesis, Aguiar and Hurst (2005) explore how actual food consumption changes during retirement. Using data from the Continuing Survey of Food Intake of Individuals, a data set conducted by the US Department of Agriculture which tracks the dollar value, the quantity, and the quality of food consumed within US households, they find no actual deterioration of a household's diet as they transition into retirement. To test the hypothesis that retirees maintain their food consumption relatively constant despite the declining food expenditures, Aguiar and Hurst (2005) use detailed time diaries from the National Human Activity Pattern Survey and from the American Time-Use Survey and show that retirees dramatically increase their time spent on food production relative to otherwise similar nonretired households. That retirees allocate more time to nonmarket production has been also shown by Hurd and Rohwedder (2006) and Schwerdt (2005).

In light of these evidence, Hurst (2008) concludes that the retirement puzzle "has retired." That is, even though it is a robust fact that certain types of expenditures fall sharply as households enter into retirement, standard life cycle models with home production are able to explain this sharp fall because retirees spent more time producing goods.[k] Additionally, as we discuss in the next section, declines in expenditures are mostly limited to two types of consumption categories: work-related items (such as clothing and transportation expenditures) and food (both at home and away from home). When expenditures exclude food and work-related expenses, the measured declines in spending at retirement are either close to zero or even increasing.

A key parameter in whether household expenditures on a given good will increase or decrease as the household's opportunity cost of time falls is the elasticity of substitution between time and expenditures (σ from the theoretical discussion above) is greater than

[k] Hurst (2008) also discusses how health shocks that lead to early retirement can help reconcile the fact that actual consumption falls for a small fraction of households upon retirement.

or less than 1. In Aguiar and Hurst (2005) leisure goods are defined as goods for which the intratemporal elasticity between time and expenditures is less than 1. For these goods, spending increases when the opportunity cost of time falls (holding the marginal utility of wealth constant). For example, suppose that as individuals retire they play more golf. If the marginal utility of wealth was held constant during the retirement transition, golf would then be considered a leisure good. Conversely, Aguiar and Hurst argue that home-produced goods are goods for which the intratemporal elasticity between time and expenditure is great than 1 (holding the marginal utility of wealth constant). These goods may include groceries and cleaning services.

A large literature has developed to estimate the exact value of σ_i. Rupert et al. (1995) use home production time and food expenditure data from the Panel Study of Income Dynamics (PSID) to estimate σ for food. Most of their estimates point out for an elasticity that exceeds 1. Aguiar and Hurst (2007b) use data from the American Time-Use Survey. Assuming that the relevant opportunity cost of time is the marginal rate of technical substitution between time and goods in the shopping technology, they find a value of σ of around 1.8 for home-produced goods. Using PSID data, Gelber and Mitchell (2012) find that, in response to tax shocks, the elasticity of substitution between market- and home-produced goods is around 1.2 for single men and as high as 2.6 for single women. Finally, using consumer-level data on hours, wages, and consumption expenditure from the PSID and metro-level data on price indices p_i from the US BLS, Gonzalez Chapela (2011) estimates a life cycle model with home production and finds a value of σ in the production of food of around 2.

7. CONCLUSION AND DISCUSSION

The wealth of new data on measuring time use enable researchers to empirically investigate a variety of substantive questions in macroeconomics. Detailed diaries, linked to larger surveys, allow us to gain a better understanding of time series trends in market work, life cycle movements in household expenditures, and business cycle fluctuations in consumption and employment. This advances the agenda set forth in Gary Becker's Presidential Address. We conclude this chapter by highlighting some of the limitations of the existing time-use data and then discuss some directions for future research.

There are four major limitations to existing time-use surveys: (i) individual time-use data are not linked to individual data on expenditures; (ii) the data are from repeated cross sections, and do not contain a panel component; (iii) the data do not include measures of time use from multiple members of the same household; and (iv) the data do not measure detailed activities while at market work.

Researchers have worked around the lack of panel data by creating synthetic cohort data. Twenty-five-year-old white male high school graduates in year t of a time-use survey are, on average, the same individuals who are 26-year-old white male high school

graduates in survey year $t + 1$. By tracking demographic groups across different years of cross-sectional data, synthetic panel data can be constructed. The synthetic cohort method also allows for a solution to the problem that time-use data and consumption data are measured in different surveys. If the samples are nationally representative, the consumption of 25-year-old white male high school graduates in year t from expenditure surveys can be merged with data for this same group in year t of the time-use surveys. The variation from the synthetic cohort method comes from variation across these demographic groups. Often this variation is enough to identify the questions of interest. But, the limitation is that lots of individual variation within a demographic group are thrown away when the synthetic panel method is used. Having panel data of time use—ideally in a survey which also measures expenditure—would allow researchers to exploit more variation to identify questions of interest. It would allow to compute changes in time allocation in response to, for example, demographic or employment status, while controlling for an individual's fixed characteristics. Moreover, multiple surveys would provide a better sense of how frequently an activity is undertaken.

Another major limitation of current time-use measurement is that we do not collect time-use information for multiple members of the same household. Many of the key questions that can be answered with time-use data can benefit from measuring the time use of multiple household members. If women start working more in the market, do their husbands work more at home? If one family member starts caring for an elderly parent, how is time use reallocated among additional family members? How do parents invest their time into their children? To really get a sense of the role of the family in explaining time series, life cycle, and business cycle variation in expenditure and labor supply, it is necessary to have time-use data that span multiple members of the same household.

Finally, no current nationally representative survey within the United States tracks in detail how individuals spend their time while at work. For example, within the American Time-Use Survey, time spent at market work is just one category. There is no additional detail provided about the tasks individuals perform while at work. It may be informative, for example, to know how much time individuals spend on the computer while at work vs in meetings. Or, alternatively, how much time an individual spends interacting with customers vs stocking shelves. How much time is spent in manual labor relative to time spent in cognitive activities? Making progress measuring how individuals allocate their time at work can help us to understand how the nature of work changes over time, over an individual's life cycle, and over the business cycle. As time-use surveys evolve, the type of questions researchers can answer will expand.

Nevertheless, the time-use data we now have available enable researchers to address many interesting macroeconomic questions. One line of research is obtaining a better understanding of labor supply, including how technological advances in nonmarket sectors shift labor force participation. Business cycle research can also benefit from incorporating data on time allocation. Particularly of interest is the time spent searching for

employment, and the cyclical returns to job search. Time spent investing in children's human capital (viewed broadly) is also an active area of study. Time allocation is a key determinant of human capital accumulation, and it is important to quantify the return to time spent acquiring skills, on and off the job. More broadly, time-use surveys can shed light on how differences in the parental time allocated to child care influence the economic prospects of the next generation.

ACKNOWLEDGMENTS

We thank our discussant, Thibaut Lamadon, as well as the editors, John Taylor and Harald Uhlig, for helpful comments. The chapter also owes a debt to our collaborations with Loukas Karabarbounis. We thank Hilary Shi for excellent research assistance.

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